SPANISH NATIONAL COMMITTEE
OF GEODESY AND GEOPHYSICS

NATIONAL REPORT

2003-2006

Presented to the
XXIV General Assembly of the
International Union of Geodesy and Geophysics
Perugia, Italy
July 2007

INTRODUCTION

This report has been elaborated by the Comisión Española de Geodesia y Geofísica (CEGG), which is the International Union of Geodesy and Geophysics (IUGG) adhering organization. CEGG administer the Spanish National Committee for the IUGG, whose current membership is presented below.

The main goal of this report is to summarize the research activities on Geodesy and Geophysics carried out in Spain during the years 2003-2006. This activities are presented in the form of reports elaborated by the Associations.

However, other activities has been carried out by the CEGG during the last four years as, for example, the joint organization of two Spanish-Portuguese Assemblies on Geodesy and Geophysics: the first one held in Figueira da Foz (Portugal) in 2004, and the second held in Sevilla (Spain) in 2006. These Joint Assemblies proved very fruitful in establishing scientific cooperations for the study of the Iberian area.

MEMBERS OF THE SPANISH NATIONAL COMMITTEE OF GEODESY AND GEOPHYSICS

The current membership of CEGG is:

President:
Albero Sereno Álvarez
Director General del Instituto Geográfico Nacional
General Ibáñez de Ibero, 3
28003 Madrid
Tf: 34-91-5979410
Fax: 34-91-5979753
e-mail: asereno@fomento.es

Vice-President:
Ricardo Vieira Díaz
Consejo Superior de Investigaciones Científicas
Instituto de Astronomía y Geodesia
Facultad de Ciencias Matemáticas
Ciudad Universitaria
28040 Madrid
Tf:34-91 3944586
Fax: 34-91 3944615
e-mail: vieira@iagmat1.mat.ucm.es

Secretary General:
Jesús Gómez González
Subdirección General de Astronomía, Geodesia y Geofísica
Instituto Geográfico Nacional
General Ibáñez de Ibero, 3
28003 Madrid
Tf: 34-91-5979460
Fax: 34-91-5979616
e-mail: jggonzalez@fomento.es

NATIONAL CORRESPONDENTS OF THE ASSOCIATIONS

IAG
Miguel Sevilla de Lerma

Instituto de Astronomía y Geodesia
Facultad de Ciencias Matemáticas
Universidad Complutense
28040 Madrid
Tf:34-91-3944582
Fax:34-91-3944615
e-mail: miguel_sevilla@mat.ucm.es

IASPEI

Antonio Roca Adrover
Instituto Geologico de Cataluña
Balmes, 209-211
08006 Barcelona
Tf: 34-93-5538430
Fax: 34-93-5538440
e-mail: aroca@igc.cat

IAVCEI

Ramón Ortiz Ramis
Museo Nacional de Ciencias Naturales.
Dpto. de Volcanología
José Gutiérrez Abascal, 2
28006 Madrid
Tf:34-91-4111328
Fax: 34-91-5644740
e-mail: ramon@mncn.csic.es

IAGA

Alicia García García
Museo Nacional de Ciencias Naturales.
Dpto. de Volcanología
José Gutiérrez Abascal, 2
28006 Madrid
Tf:34-91-4111328
Fax: 34-91-5644740
e-mail: aliciagg@mcnc.csic.es

IAMAS

Manuel Gil Ojeda
Instituto Nacional de Técnica Aeroespacial
Ctra. Torrejón-Ajalvir Km. 4,5
28820 Torrejón (Madrid)
Tf: 34-91-5201564
Fax: 34-91-5201317
e-mail: gilm@inta.es

IAHS

Emilio Custodio Gimena
Instituto Geológico y Minero de España
Ríos Rosas, 23

28003 Madrid
Tf: 34-91-3495962
Fax: 34-91-3495817
e-mail: e.custodio@itge.mma.es

IAPSO
Juan José Dañobeitia Canales
Instituto de Ciencias de la Tierra Jaume Almera
Luis Solé i Sabaris, s/n
08028 Barcelona
Tf: 34-93-4095410
Fax: 34-934110012
e-mail: jjdanobeitia@ija.csic.es

ASSOCIATION REPORTS

The following report summarizes the research carried out in Spain during the quadrennial 2003-2006.

Section 1: IAG
Section 2: IAGA
Section 3: IAHS
Section 4: IAMAS
Section 5: IAPSO
Section 6: IASPEI
Section 7: IAVCEI

COMITÉ ESPAGNOL DE GÉODÉSIE ET GÉOPHYSIQUE
SPANISH COMMITTEE OF GEODESY AND GEOPHYSICS

NATIONAL REPORT ON GEODESY

FOR

2003 - 2006

IUGG XXIV GENERAL ASSEMBLY

PREFACE

This report outlines some Spanish activities in Geodesy for the period 2003 to 2006. It has been prepared for submission to the International Association of Geodesy (IAG) on the occasion of the XXIV General Assembly of the International Union of Geodesy and Geophysics in Perugia, Italy, 2-12 July, 2007. It is issued on behalf of the Spanish Committee of Geodesy and Geophysics

In the report the main activities in Geodesy developed in Spain in the period 2003-2006 by different Institutions are presented. These Institutions in alphabetic order are.

1. Astronomy, Geodesy and Cartography Laboratory. Facultad de Ciencias. Universidad de Cádiz, Puerto Real. CÁDIZ
2.- Institute of Astronomy and Geodesy (Instituto de Astronomía y Geodesia), (UCM-CSIC). MADRID.
3.- Institute Cartographic of Catalonia (Instituto Cartográfico de Cataluña). BARCELONA.
4.- Microgeodesia Jaén Research Group. Universidad de Jaén. JAEN
5.- National Geographic Institute (Instituto Geográfico Nacional). MADRID.
6.- Royal Institute and Observatory of the Navy. (Real Instituto y Observatorio de la Armada). San Fernando. CÁDIZ.

The information provided by the Institutions has been incorporate in the Report, and due to the quantity and diversity of works done these has been resumed, giving for each Institution a list of the activities followed by the list of papers published in the period.

Madrid, June, 2007

Miguel J. Sevilla
(IAG Spanish National Correspondent)

1. ASTRONOMY, GEODESY AND CARTOGRAPHY LABORATORY

Departamento de Matemáticas. Facultad de Ciencias .Campus de Puerto Real
Universidad de Cádiz. 11510 Puerto Real (Cádiz) SPAIN
Tlf. 0034 956 01 64 73, 0034 956 01 62 87; Fax. 0034 956 01 62 88
URL: http://www2.uca.es/grup-invest/geodesia/
e-mail: geodesia@uca.es

People at the Laboratory

		Research Interest
Manuel Berrocoso Domínguez	Ph.D. in Mathematics	Astronomy, Geodesy, Cartogrpahy
María José González Fuentes	Ph.D. in Mathematics	Mathematical Analysis
Alberto Fernández Ros	Ph.D. in Mathematics	Astronomy, Geodesy, Cartogrpahy
María Eva Ramírez Rodríguez	MsC in Mathematics (DEA)	Astronomy, Geodesy
Alejandro Pérez Peña	MsC in Mathematics (DEA)	Spatial Geodesy
José Manuel Enríquez de Salamanca	MsC in Mathematics (DEA)	Astronomy, Geodesy
Cristina Torrecillas Lozano	MsC (Geodesy and Cartography Engineer)	Geodesy, Cartography
Raúl Páez Jiménez	MsC in Mathematics (DEA)	Spatial Geodesy
Alfonso Lorenzo Moya	Postgraduate Students (Mathematics)	Astronomy
Alberto Sánchez Alzola	Geodesy and Cartography Engineer	Geodesy, Cartography
Juan Antonio Fernández Prada	Postgraduate Students (Mathematics)	Geomatics
Columba Fernández Muñoz	Postgraduate Students (Mathematics)	Geomatics
Bismarck Jigena Antelo	Geodesy and Cartography Engineer	
Amós de Gil Martínez	Superior Studies (Ministry of Defence)	

Research interests

1. Design and development of GNSS geodetic network and its applications.

    - Establishment of a geodetic reference frame for South Shetland Islands, Bransfield Sea and the Antarctic Peninsula (RGAE geodetic network).
    - Establishment of geodetic networks in Deception Island: REGID geodetic network, RENID levelling network and REGRID gravimetric network.

- Design and development of the Andalusian GPS Positioning Network (RAP network)
- Establishment of a geodetic network on Tenerife Island to control its volcano-tectonic (TEGETEIDE-GEO network).
- Establishment of a levelling network to control the deformation of the volcanic complex TEIDE-Pico Viejo (TEGETEIDE-NIVEL network)

2. Determination of volcanic and tectonic deformation models.

    - Application of the RGAE geodetic network to determine the tectonic deformation occurring in the South Shetland Islands, Bransfield Sea and the Antarctic Peninsula.
    - Monitoring of the volcano-tectonic activity in Deception Island and its environment and volcanic deformation models determination.
    - Determination of tectonic deformation models for Andalusia and the North of Africa.
    - Volcano-tectonic deformation models for Tenerife Island and Teide-Pico Viejo volcanic complex.
    - Real time monitoring of the volcanic activity on Deception Island and in the Teide-Pico Viejo volcanic complex.

3. Determination of experimental geoids

    - Determination of geophysical and geodetic experimental models in volcanic areas (Deception Island and Teide-Pico Viejo volcanic complex).
    - Geoid determination in Cádiz Bay for seaside areas delimitation.

4. Cartography: Technical and scientific information systems and remote sensing.

    - Design and development of a multidisciplinary system of scientific support (SIMAC). An application of Deception Island.
    - Maps Server development and Web Client.
    - Design and elaboration of an information system for universities management (SIGUCA), by means of free software and web client.
    - Quality control for the toponimy of cartographic series.
    - Satellite images for multispectral sensors. Using of panchromatic images for cartography update.

<u>Publications (Papers and Book Chapters)</u>

M. E. Ramirez, Y. Jiménez, M. J. González, M. Berrocoso, M. Sánchez-Francisco (2006)**. A new data analysis technique in the study of mutual even lightcurves.** Astronomy & Astrophysics, 448, pp. 1197-1206.

C. Torrecillas, M. Berrocoso, A. García (2006). **The Multidisciplinary Scientific Information Support System (SIMAC) For Deception Island.** En: Fütterer DK, Kleinschmidt G, Miller H, Tessensohn F (eds): Antarctica: Contributions to global earth sciences. Springer-Verlag, Berlin Heildelberg New York, pp 397-402.

M. Berrocoso, A. García, J. Martín-Dávila, M. Catalán- Mogollón, M. Astiz, M. E. Ramírez, C. Torrecillas, J. M. Enríquez de Salamanca. **Geodynamical studies in Deception Island from 1999 (DECVOL AND GEODEC PROJECTS).** En: Fütterer DK, Kleinschmidt G, Miller H, Tessensohn F (eds): Antarctica: Contributions to global earth sciences. Springer-Verlag, Berlin Heildelberg New York, pp 283-288.

M. Berrocoso, A. Fernández-Ros, C. Torrecillas, J. M. Enrique de Salamanca, M. E. Ramírez, A. Pérez-Peña, M. J. González, R. Páez, Y. Jiménez, A. García-García, M. Tárraga, F. García-García (2006). **Geodetic Research on Deception Island.** En: Fütterer DK, Kleinschmidt G, Miller H, Tessensohn F (eds): Antarctica: Contributions to global earth sciences. Springer-Verlag, Berlin Heildelberg New York, pp 391-396.

M. Berrocoso, Y. Jiménez, J. M. Enríquez-Salamanca, M. E. Ramírez (2006). **Analysis and comparison of the different mathematical techniques for the establishment of physical reference frames and its application to Deception Island (Antarctica).** Proceedings of the International Conference on Computational and Mathematical Methods in Science and Engineering, CMMSE 2006 Madrid, 21ï 25 September 2006, pp. 121-124.

M. Berrocoso, M. E. Ramírez, A. Fernández-Ros, Y. Jiménez (2006). **Crustal deformation model in volcanic areas. An application to Deception Island Volcano (South Shetland Islands, Antarctica).** Proceedings of the International Conference on Computational and Mathematical Methods in Science and Engineering, CMMSE 2006 Madrid, 21ï 25 September 2006, pp. 116-120.

M. Berrocoso, M. E. Ramírez, A. Fernández-Ros (2006). **Deformation models for the Deception Island.** En: Sansó F, Gil AJ (eds). **Geodetic Deformation Monitoring: From Geophysical to Engineering Roles,** IAG Symposium Jaén, Spain, March 7-19, 2005. Series: International Association of Geodesy Symposia , Vol. 131, ISBN-10: 3-540-38595-9, ISBN-13: 978-3-540-38595-0.

M. Berrocoso, M. E. Ramírez, Y. Jiménez, S. García-López, V. Pérez-Martín y C. Navarro (2005). **Conceptos básicos sobre Sistemas de Representación Terrestre y Cartografía.** En: M. Berrocoso (Coordinador)**. Aplicación de Sistemas de Geolocalización.** Servicio de Publicaciones de la Universidad de Cádiz. ISBN-10: 84-9828-052-4, ISBN-13: 978-84-9828-052-4.

M. Berrocoso, A. Pérez-Peña, R. Páez, A. Fernández-Ros, M. Boyano (2005). **El Sistema de Posicionamiento Global.** En: M. Berrocoso (Coordinador)**. Aplicación de Sistemas de Geolocalización.** Servicio de Publicaciones de la Universidad de Cádiz. ISBN-10: 84-9828-052-4, ISBN-13: 978-84-9828-052-4.

S. García-López, R. Páez, J. A. Fernández-Prada, C. Torrecillas, C. Fernández-Muñoz (2005). **Conceptos básicos sobre Sistemas de Información Geográfica y Cartografía.** En: M. Berrocoso (Coordinador)**. Aplicación de Sistemas de Geolocalización.** Servicio de Publicaciones de la Universidad de Cádiz. ISBN-10: 84-9828-052-4, ISBN-13: 978-84-9828-052-4.

C. Torrecillas, F. J. Sánchez-Díaz, R. Páez, A. Pérez-Peña (2005). **Estado actual de la Red Andaluza de Posicionamiento (RAP).** En: XVII Congreso Internacional INGEGRAF ï ADM, Sevilla. ISBN: 84-96377-41-5.

F. J. Sánchez, C. Torrecillas (2004). **Diseño de la Red Andaluza de Posicionamiento.** Mapping. ISSN: 1131-9100. Madrid.

M. Berrocoso, J. Martín, M. Catalán-Morollón, A. García, M. Astiz (2003). **El proyecto GEODEC: Un estudio multidisciplinar de la actividad geodinámica de la**

isla Decepción (Islas Shetladn del Sur, Antártica). Proceedings de la III Asamblea Hispano-Portuguesa de Geodesia y Geofísica. Páginas 766-769. Universidad Politécnica de Valencia. Valencia.

C. Torrecillas, M. E, Ramírez, A. Pérez-Peña, J. M. Salamanca, M. Berrocoso (2003). **El sistema de información multidisciplinar de apoyo científico (SIMAC).** Páginas 799-801. Universidad Politécnica de Valencia. Valencia.

A. Fernández-Ros, M. E. Ramírez, A. Pérez-Peña, M. Berrocoso (2003). **Establecimiento de un modelo de deformación de la isla Decepción (Antártica) a partir de observaciones GPS**. Proceedings de la III Asamblea Hispano-Portuguesa de Geodesia y Geofísica. Páginas 330-333. Universidad Politécnica de Valencia. Valencia.

F. J. Sánchez, C. Torrecillas (2003). **Las infraestructuras de datos espaciales**. Mapping. ISSN: 1131-9100. Madrid.

Books and monographies

M. Berrocoso, J. M. Salamanca (2006). **El potencial gravitatorio.** Servicio de Publicaciones de la Universidad de Cádiz. ISBN-13: 978-84-9828-044-9. ISBN-10: 84-9828-044-3. Depósito Legal: CA-361/06. Cádiz.

M. Berrocoso (Coordinador) (2005). **Aplicación de Sistemas de Geolocalización**. Servicio de Publicaciones de la Universidad de Cádiz. ISBN-10: 84-9828-052-4. Cádiz.

M. Berrocoso, J. M. Enríquez de Salamanca, M. E. Ramírez, A. Pérez-Peña (2004). **Notas y Apuntes de Trigonometría Esférica y Astronomía de Posición.** 248 pág. Servicio de Publicaciones de la Universidad de Cádiz. ISBN: 84-7786-651-1. Cádiz.

M. Berrocoso, M. E. Ramírez, A. Pérez-Peña, J. M. Enríquez de Salamanca, A. Fernández-Ros, C. Torrecillas (2004). **El Sistema de Posicionamiento Global.** 175 pág. Servicio de Publicaciones de la Universidad de Cádiz. ISBN 84-7786-642-2. Cádiz.

M. J. González-Fuentes, M. E. Ramírez, M. Berrocoso (2004). **Del Análisis de Fourier a la Teoría de Wavelets.** 95 pág. Servicio de Publicaciones de la Universidad de Cádiz. ISBN: 84-96274-49-7. Cádiz.

García-Silva, C., Gárate, J., Martín-Dávila, J., Pérez-Peña, A. (2006). **Análisis de las series temporales efectuadas por el roa en el marco del proyecto ESEAS-RI**. Proceedings de la V Asamblea Hispano-Portuguesa de Geodesia y Geofísica (ISBN 84-8320-373-1). Páginas 330-333. Comisión Española de Geodesia y Geofísica (Ministerio de Medio Ambiente). Madrid

Pérez-Peña, A. (2005). **Cálculo de vectores desplazamiento en el Sur de España-Norte de África deducidos a partir de las observaciones GPS.** Boletín ROA (ISSN: 1131-5040). Páginas 1-117. Ministerio de Defensa. San Fernando (Cádiz).

Conferences and meetings attended

CONFERENCE ON MATHEMATICAL METHODS IN SCIENCE AND ENGINEERING (MADRID, 21-25 SEPTIEMBRE 2006)

Analysis and comparison of the diferent mathematical techniques for the establishment of physical reference frames and its application to Deception

Island (Antarctica). M. Berrocoso, Y. Jiménez, J. M. Enríquez-Salamanca and M. E. Ramírez

Crustal deformation model in volcanic areas. An application to Deception Island Volcano (South Shetland Islands, Antarctica). Manuel Berrocoso, María Eva Ramírez, Alberto Fernández-Ros and Yolanda Jiménez

VII SYMPOSIUM DE ESTUDIOS ANTÁRTICOS (GRANADA, 18-20 SEPTIEMBRE 2006)

Diseño, desarrollo, objetivos y estado actual de las redes geodésicas establecidas en la Antártida durante las campañas antárticas españolas. M. Berrocoso, M. E. Ramírez, A. Fernández-Ros, C. Torrecillas, J. M. Enríquez-Salamanca, A. Pérez-Peña, R. Páez, Y. Jiménez, M. J. González-Fuentes, A. García-García, M. Tárraga, F. García-García, A. Sánchez-Alzola

Modelos de deformación volcano-tectónicos en la isla Decepción. M. Berrocoso, M. E. Ramírez, A. Fernández-Ros, A. Sánchez-Alzola, A. Pérez-Peña

Determinación de la superficie física de referencia para la isla Decepción a partir de observaciones GPS, medidas de nivelación y medidas gravimétricas. M. Berrocoso, Y. Jiménez, J. M. Enríquez-Salamanca, M. E. Ramírez.

Diseño, metodología y desarrollo de un Sistema de Información Multidisciplinar de Apoyo Científico (SIMAC) para la isla Decepción (Antártida). M. Berrocoso, C. Torrecillas

Actualización del mapa topográfico Isla Decepción 1:25.000 y nuevos productos cartográficos para la isla Decepción. M. Berrocoso, C. González-Bielsa, R. Páez, A. Sánchez-Alzola, S. García-López, C. Torrecillas

Aplicaciones de la Cartografía Espacial de Precisión a estudios científicos en la isla Decepción. M. Berrocoso, R. Páez, A. Sánchez-Alzola, C. González-Bielsa, C. Torrecillas

XII CONGRESO NACIONAL DE TECNOLOGÍAS DE LA INFORMACIÓN GEOGRÁFICA (GRANADA, SEPTIEMBRE-2006)

La Red Andaluza de Posicionamiento. M. Redondo, C. Torrecillas, M. Berrocoso, R. Páez.

CONGRESO ñThe EUREF 2006 Symposium of the IAG Commission 1 - Reference Frames, Subcommission 1-3a Europe (EUREF)ò (RIGA (LETONIA), JUNIO-2006)

The RAP Net: a geodetic positioning network for Andalusia (South Spain), M. Berrocoso, R. Páez, A. Sánchez-Alzola, M. E. Ramírez, A. Pérez-Peña, Y. Jimenez, A. Hermosilla, M. Redondo

XIII ASAMBLY OF WEGENER (NIZA, 4-7 SEPTIEMBRE 2006) Sesión especial: ñPERMANENT GPS NETWORKS IN EUROPE AND THE MEDITERRANEAN: DEVELOPPMENT, ANALYSIS AND INTERPRETATIONò

A permanent GPS network for Andalusia (Spain). M.Berrocoso, R.Páez, A.Sánchez-Alzola, A.Pérez-Peña, A.Hermosilla, M.Redondo, J. Gárate

WORKSHOP ñTIME SERIAL DATA IN VOLCANOLOGY: METHODS OF ANALYSISò dell 26 al 30 de junio de 2006, Puerto Real (Cádiz)

Series geodésicas en dos volcanes activos: Decepción (Antártida) y Teide-Pico Viejo (Islas Canarias). M. Berrocoso.

Aplicación de la teoría wavelets a las series temporales en Volcanología. M. E. Ramírez.

Series geodésicas en Volcanología. M. E. Ramírez, A. Sánchez, R. Páez

CONGRESO DE LA EUROPEAN GEOSCIENCES UNION (VIENA, ABRIL-2006)

Using ASTER-TIR space image for the monitoring of the volcanic activity in Tenerife Island (Spain). Manuel Berrocoso, Alicia García, Santiago García, Yolanda Jiménez, Raul Páez, Alberto Sánchez-Alzola.

Determination of a physical reference frame for Deception Island (Antarctica). M. Berrocoso, Y. Jiménez, J. M. Salamanca, M. E. Ramírez, A. Sánchez-Alzola, R. Páez

Horizontal deformation models in Deception Island Volcano from GPS surveying. Berrocoso, M., Ramírez, M. E., Fernández, A.

A positioning Network for Andalusia (Spain), Ramirez, M.E. for the RAP Team: M. Berrocoso, R. Paez, A. Sanchez-Alzola, M. E. Ramírez, A. Perez-Peña, J. A. Fernandez-Prada, A. Hermosilla, M. Redondo, J. Gárate, C. Garcia-Silva, A. J. Gil

Plate boundary deformation at the strait of gibraltar area from gps episodic surveys and CGPS: preliminary results. J. Gárate, J. Martín-Davila, A. Pérez-Peña, C. García-Silva

NTRIP SYMPOSIUM AND WORKSHOP (FRANKFURT, FEBRERO-2006)

The Andalusian Positioning Network. M. Berrocoso, R. Páez, A. Hermosilla, M. E. Ramírez, A. Sánchez-Alzola, J. A. Fernández-Prada, A. Pérez-Peña, M. Redondo.

ASAMBLEA HISPANO-PORTUGUESA DE GEODESIA Y GEOFÍSICA (SEVILLA, ENERO-2006)

La Red Andaluza de Posicionamiento. M. Berrocoso, D. Fernández-Bruna, J. A. Fernández-Prada, J. Gárate, C. García-Silva, A. J. Gil, A. Hermosilla, Y. Jiménez, R. Páez, A. Pérez-Peña, J. Peñafiel, M. E. Ramírez, M. Redondo, A. Sánchez-Alzola, F. J. Sánchez-Díaz, C. Torrecillas

Estudios geodésicos para el control de la actividad volcánica del complejo Teide-Pico Viejo. M. Berrocoso, J. Doniz, A. García-García, S. García-López, C. García-Silva, C. Guillén, J. A. Fernández-Prada, C. Fernández-Muñoz, Y. Jiménez, R. Ortíz, R. Páez, A. Pérez-Peña, M. E. Ramírez, C. Romero, U. Ruiz, A. Sánchez-Alzola, C. Torrecillas

Análisis de series temporales efectuado por el ROA en el marco del proyecto ESEAS_RI. C. García-Silva, J. Gárate, J. Martín-Davila, A. Pérez-Peña.

INTERNACIONAL SYMPOSIUM ON GEODETIC DEFORMATION MONITORING: FROM GEOPHYSICAL TO ENGINEERING ROLES (MARZO-2005)

Southern Spain-Northern África displacements from CGPS observations. J. Gárate, J. Martin Dávila, A. Pérez-Peña, C. García Silva.

XVII CONGRESO INTERNACIONAL INGEGRAF ï ADM (SEVILLA, JUNIO-2005)

Estado actual de la Red Andaluza de Posicionamiento (RAP). C. Torrecillas, F. J. Sánchez-Díaz, R. Páez, A. Pérez-Peña.

GRAVITY, GEOID AND SPACE MISSIONS (IAG INTERNATIONAL SYMPOSIUM) (OPORTO, AGOSTO-SEPTIEMBRE 2004)

Determination of an experimental geoid for Deception Island. M. Berrocoso, J. M. Enríquez-Salamanca, Y. Jiménez, A. Fernández, C. Torrecillas, M. E. Ramírez, M. J. González-Fuentes, A. Pérez-Peña, R. Páez, M. Tárraga, A. García-Garcia, M. Tárraga, F. García-García, R. Soto.

IV ASAMBLEA HISPANO PORTUGUESA DE GEODESIA Y GEOFÍSICA (Figueira da Foz, Febrero 2004)

Investigaciones geodésicas en la isla Decepción. M. Berrocoso, A. Fernández-Ros, C. Torrecillas, J. M. Enríquez-Salamanca, M. E. Ramírez, M. J. González-Fuentes, R. Soto, A. Pérez-Peña, R. Páez, M. Tárraga, A. García-García, F. García-García

Medidas gravimétricas en la isla Decepción, Shetland del Sur. M. Berrocoso, F. García-García, A. Fernández-Ros, M. Tárraga, A. García-García, C. Torrecillas, M. E. Ramírez, J. M. Enríquez-Salamanca

El sistema SIMAC para la isla Decepción. Estado actual. C. Torrecillas, M. Berrocoso

Modelos de deformación para la isla Decepción. A. Fernández-Ros, M. Berrocoso

El potencial gravitatorio generado por una esfera multipreñada. J. M. Enríquez-Salamanca, M. Nicasio, M. Berrocoso

La red geodésica REGID y la red de nivelación RENID para el control geodinámico de la isla Decepción. M. Berrocoso, A. Fernández-Ros, C. Torrecillas, J. M. Enríquez-Salamanca, M. E. Ramírez, M. J. González-Fuentes, R. Soto, A. Pérez-Peña, R. Páez, M. Tárraga, A. García-García, F. García-García

Series temporales para las estaciones GPS del Observatorio de la Armada en San Fernando. J. Gárate, J. Martín-Davila, M. Berrocoso

Proyecto TEDESE: principales resultados. J. Martín-Davila, E. Bufforn, J. Gárate, A. Pazos, A. Udías, W. Hanka, M. Berrocoso, A. Pérez-Peña, C. García-Silva

Red geodinámica del observatorio de San Fernando: resultados preliminares a partir de campañas episódicas. A. Pérez-Peña, J. Gárate, J. Martín-Davila, M. Berrocoso, C. García.

EUROPEAN GEOPHYSICAL SOCIETY. XXVIII GENERAL ASSEMBLY (NIZA, ABRIL 2003)

Cuateneo network: preliminary results after first reobservations. J. Gárate, J. Martín, E. Suriñach, M. Berrocoso, A. Pérez-Peña, J. Talaya

TEDESE project: preliminary results. E. Bufforn, J. Gárate, J. Martín-Davila, A. Pazos, A. Udias, A. Pérez-Peña

9º INTERNACIONAL SYMPOSIUM ON ANTARCTIC EARTH SCIENCES (ISAES IX) (POTSDAM, SEPTIEMBRE 2003)

DECVOL and GEODEC projects. M. Berrocoso, A. García-García, J. Martín-Davila, M. Catalán-Morollón, M. Astiz, M. E. Ramírez, C. Torrecillas, J. M. Enríquez-Salamanca

Geodetic research en Deception Island. M. Berrocoso, A. Fernández-Ros, C. Torrecillas, J. M. Enríquez-Salamanca, M. E. Ramírez, A. Pérez-Peña, R. Páez, M. J. González-Fuentes, M. Tárraga, F. García-García

Multidisciplinary scientific information support system (SIMAC) for Deception Island, South Shetland Islands, Antarctica. M. Berrocoso, C. Torrecillas, R. Páez, M. E. Ramírez, J. M. Enríquez-Salamanca, A. Fernández-Ros, A. Pérez-Peña, M. J. González-Fuentes

JORNADAS CIENTÍFICAS 250 AÑOS DE ASTRONOMÍA EN ESPAÑA (1753-2003) (SAN FERNANDO, SEPTIEMBRE 2003)

Estudio del eclipse de Europa por el satélite Io ocurrido durante la campaña PHEMU97. M. E. Ramírez, M. Berrocoso, M. J. González-Fuentes, Y. Jiménez-Teja, M. Sánchez-Francisco

Msc and *Grade Dissertations*

J. M. Enríquez de Salamanca (2003). **Acerca del potencial gravitatorio.** Tutor de investigación: M. Berrocoso. Trabajo de Investigación. Programa de Doctorado: ñMatemáticas: Astronomíaò. Universidad de Cádiz.

A. Pérez-Peña (2003). **El Sistema de Posicionamiento Global (GPS) y su aplicación en el estudio de la Deformación Geodinámica existente en el Sur de España**. Tutor de investigación: J. Gárate. Trabajo de Investigación. Programa de Doctorado: ñMatemáticas: Astronomíaò. Universidad de Cádiz.

M. E. Ramírez (2003)**. Del Análisis de Fourier a la Teoría Wavelets. Aplicación al estudio de las curvas de luz.** Tutor de investigación: M. Berrocoso. Trabajo de Investigación. Programa de Doctorado: ñMatemáticas: Astronomíaò. Universidad de Cádiz.

R. Páez (2006). **La Red Andaluza de Posicionamiento.** Tutor de investigación: M. Berrocoso. Trabajo de investigación. Programa de Doctorado: ñAstronomía, Geodesia y Geofísicaò. Universidad de Cádiz.

Y. Jiménez (2006). **Determinación del geoide en la Isla Decepción (Antártida).** Tutor de investigación: M. Berrocoso. Trabajo de investigación. Programa de Doctorado: ñAstronomía, Geodesia y Geofísicaò. Universidad de Cádiz.

A. Sánchez-Alzola (2005). **Seguimiento de acumulaciones nubosas y determinación de sus trayectorias en series temporales de imágenes satélite.** Proyecto Fin de Carrera I. Geodesia y Cartografía. Director: A. Ureña.

2. INSTITUTE OF ASTRONOMY AND GEODESY (MADRID)
(INCLUDING DEP. OF ASTRONOMY AND GEODESY. UCM)

FACULTAD DE CIENCIAS MATEMÁTICAS
UNIVERSIDAD COMPLUTENSE
28040 MADRID (SPAIN)
Tlf. ++ 34 91 394 45 86, ++ 34 91 394 45 82; Fax. ++ 34 91 394 46 15
E-mail: secras@mat.ucm.es URL: http://www.mat.ucm.es

SUMMARY OF RESULTS DESCRIPTION

Report of activities: R. Vieira, F. G. Montesinos, J. Arnoso, E. Vélez and M. T. Benavent.

Laboratory of Geodynamics of Lanzarote

In the period from 2003 to 2006 in the Laboratory of Geodynamics of Lanzarote we have continued the researches about the local geodynamic, interaction between solid earth-ocean-atmosphere, earth and ocean tides, sea level change and deformation that we have been developing during the last 20 years in Lanzarote Island (Canary Islands).
Through the national projects *REN2001-2271 & UCM2005-910505*, international projects *MAC/2.3/A7 &* 03/*MAC/2.3/A4*, corresponding to the *INTERREG IIIB* call, and the international collaborations with the Institute of Seismology (Prof Cai Weixin, China Earthquake Administration), Bulgarian Academy of Sciences (Prof Angel Venedikov) and the Royal Observatory of Belgium (Dr. Michel Van Ruymbecke) , an important improvement have been done in order to guarantee the quality and precision of the observations, the conditions of the laboratory in relation with its connectivity to internet, and the software development for the signal analysis.
The *Geodynamic Control Network of Lanzarote* was designed selecting 33 points covering the entire island. In each station, gravimetry, GPS, vertical gravity gradiant and microsismic observations have been done.
Annually, the *Levelling Network of Jameos del Agua* is observed to control the vertical movements of the permanent GPS station and the reference mark of the tide gauges, in order to study the sea level variations in relation with the local geodynamic and the possible oceanographic implications of the Global Change.

Gravimetry and inverse problem.

Study of gravity inverse problem, by means of three dimensional model of crustal structures. Development of optimization techniques based on genetic algorithms and non linear approachs. Application to detection of cavities, archaeology, civil engeeneering, volcanic areas, and study of natural hazards. Analysis of gravity field. Joint interpretation with other geophysics techniques (mangetism, seismic).
Gravimetric calibration lines. Gravimetric networks. Establishmet of networks to control of natural hazards (Lanzarote, Fuerteventura, El Hierro y Tenerife) and gravity network of reference (Guipuzcoa, Spain)

Main Zones of research: in Canarian Archipélago (Tenerife, Lanzarote, Fuerteventura, La Gomera, Gran Canaria, El Hierro and La Palma) and Azores (Pico, Faial, Sao Jorge, Sao Miguel, Terceira, Flores y Corvo).
In the year 2005, the Institute of Astronomy and Geodesy (CSIC-UCM) in collaboration with the Bureau Gravimetrique International, the Internacional Center of Earth Tides, the Observatoire Royal de Belgique and the Casa de los Volcanes of Lanzarote, has organized, in Lanzarote Island (Canary Islands), the second Summer School on Microgravimetris Methods. The first one took place in the University of Louvain, in Belgium, in the year 2003.
We have developed in the Institute of Astronomy and Geodesy, a new system for the measurement of the verticals gravity gradients. The objective of this is to raise and to lower smoothly and in a controlled form a gravitymeter Lacoste&Romberg type G and in this way to determine the vertical gravity gradient in that point. The system is light, easily detachable and transportable to can operate in field. The prototype, in its last version, was presented in the ñSummer School on Micro-Gravimetric Methods: static and dynamic aspectsò celebrated in Lanzarote (Canary Islands) on October, 2005, co-organizated by the International Gravimetric Bureau, the International Earth Tides Center and the Institute of Astronomy and Geodesy.
We have also developed and built, a second prototype for automatic determination of the gravity gradient, with a measure range of up to 60 cm. This new prototype has been designed to use with any type of relative gravimeter working under laboratory conditions.

Earth Tides (R. Vieira, Vélez, E., Arnoso, J.)

1.- Observation. During the period 2003-2007, has been continued taking of data in two of the modules of observation of the Laboratory of Geodynamics of Lanzarote (LGL). In the Cueva de los Verdes, to the north of the island, has been continued the series of measurements begined in 1987 with the gravimeter Lacoste Romberg nº 434. In this place we have, at the present time more of 10 years of observation of the three components of earth tides, of oceanic tides and of meteorological parameters. Equally from 1999 we have a geodesic GPS station.
Likewise, in the module of observation of the LGL located the National Park of Timanfaya, to the south of Lanzarote, have been continued, in collaboration with the Real Observatory of Belgium, the observations of gravity tides, begun in the year 2001.
2.-Analysis. We have improved, and enlarged with new options, the software for analysis of temporary series, VAV (Venedikov, Arnoso, Vieira). During these years we have organized two international seminars, in Madrid and Cádiz, on the use and applications of this program, the second of them mainly dedicated to the analysis of oceanographics data.
At the present time it is proceeding to a revision of the data and the realization of new análisis, with the program VAV, of the 25 stations of gravity tides, observed, from 1973, by the Institute of Astronomy and Geodesy.

Monitoring Crustal Movements (M. J. Sevilla, L. García and J. Zurtuza)

In order to obtain real sea level variations a permanent GPS station has been installed near the tide gauges in Lanzarote island. The goal of this GPS station is to measurement vertical crustal movements in order to obtain absolute sea level variations removing these movements from tide gauge data. The results obtained are the evaluation of the

altimetric links and levelling campaigns, and the comparison of the levels of different measurements. The GPS antenna is located in the top of a building and the geodetic control network has been designed and installed around it, to study the stability of the monument and building and to monitoring the possible movements of the crust respect to the sea level. The control net consists of 12 well signalled bench marks and it has been observed since year 2000 till 2006 by means of classic levelling techniques and GPS campaigns. The levelling observations allow a higher precision in the vertical component and it is known that the vertical movements are very important in the records of the tide gauges; while the GPS allows to have a control in the three components.
Also, a real GPS network located in Guipúzcoa has been used to monitor a simulated deformation via the Procrustes solution, which is compared with the Helmetôs datum transformation classic approach.
Finally the region of Chelif (ex-El Asnam), situated in the North West of Algeria, is of an exceptional interest for the study of crustal motion which is related to the region seismic activity. The realised tests have focused on the horizontal movements determination and their errors on the strain tensors from periodic observations. The operation was stretched over a two year campaign of classical geodetic observations The evaluation and simultaneous representation of these deformations and their errors are made by the method of Monte Carlo that allows simulating a great number of series of measures

GPS investigations. New Software (J. Zurutuza and M. J. Sevilla)

Accurate GPS vector determination is nowadays one of the major problems in modern geodesy. Most of the errors are modelled either to smooth atmospheric effects or to remove biases, like clock offsets. The network design criteria and the vector processing solutions are based in distances to the reference stations and in the time span of the vectors involved in the sessions. Thus, the final solutions are computed accurately and the residuals show the quality of the computations. What is not usual to be taken into account in the final vector computation is the bearing of the vector to be processed, as the cut-off angle is considered fixed. The work deals with the variation on the final solution due to the different cut-off angles, and still more important, to the bearing of the vector in high precision GPS vector determination. If in the future, the IGS starts to distribute orbits that are created using the ANTEX file, this elevation-angle dependency should diminish

Cartographic projection (M. J. Sevilla and J. A. Malpica)

It is considered the isoparametric representation in the sense of Oôkeefe for the local transformation of one surface in another. Then one of the surfaces is consider being a plane, therefore only one metric tensor is necessary to represent the properties of the transformation or final projection of the surface into the plane. Using Chovitz development to the second order for the metric tensor a matrix is proposed summing up the more important properties of the cartographic projection. Then it is easy to generate a infinite number of cartographic projections provides a method for the synthesis and unification of the different projections.

Geopotential model for the north-east Atlantic (Catalao J. C. and M. J. Sevilla)

A new gravimetric geoid was determined for the North-East Atlantic between Iberian peninsula, Azores archipelago and Canary Islands (ICAGM05). The main purpose of this geoid surface is to establish the connection between the existing vertical reference systems in Azores, Canary and Madeira islands and Iberia (Portugal and Spain). Several data sources were included for the gravity field determination: 113382 terrestrial free-air anomalies, 533918 shipborne anomalies and 653395 altimeter derived gravity anomalies from KMS02 model. A new digital terrain model (ICADTM05) with a resolution of 500m was constructed from the compilation of altimetric data. A programme for marine gravity data validation and adjustment is preparedð VALDAMA. The aim of the programme is to provide a complete user-friendlysy stem for marine gravity data validation and adjustment that enables the user to define all intervening parameters.

Satellite altimetry (M. J. Sevilla and Rodriguez Velasco)

Actual studies related to calibration of altimeters involves the use of GPS buoys and the determination of absolute bias in just purely geometric sense. Doing so it seems to be avoided the estimating a marine geoid or the mean sea surface.
However, this is not at all true. Firstly we need the cross track geoid gradient in order to account the difference in the distance between the altimeter ground track and the position of the point to use in the comparison. In the second hand, an accurate estimation of the surface slope is also needed for linking offshore altimetric data and coastal tide gauges.
This is the followed method used to process the Spanish/French JASON-1 calibration campaign, IBIZA 2003. This campaign took place in June 9^{th}-17^{th} , 2003. The area, close to a big island and in a singular place from a dynamic point of view, has a complex local geoid and mean sea surface around. For this reason, we have developed some comparisons and correlations between results from this campaign data and some previous results about geoid and mean sea surface in the area, completely independent (in time, and in type of employed data ï gravimetry or altimetry from another satellite -). The compared surface have been some mean sea surface models over the area and local marine geoids, built up from gravimetry and altimetry of ERS ESA satellite, with a higher spatial resolution. The result of such studies is presented in this work.

High precision geoid computation (M. J. Sevilla and J. C. Catalao.)

In 1993, the Instituto Português de Cartografia e Cadastro (now Instituto Geográfico Português) started a new gravimetric project, to perform a more precise and accurate gravity field model in Portugal mainland. With this new gravity data and with a new Digital Terrain Model (obtained from the 1:50 000 cartography) a new gravimetric geoid model was constructed
In the Iberian Peninsula the Ibergeo95 geoid was published in 1995. From then on have appeared new geopotential models, new digital terrain models and new and precise data of gravity anomalies. With all these resources has been proceeded to calculate a new geoid, IBERGEO_2006, more precise than the previous one, although it has been used the same methodology that demonstrated to be extremely useful. In this new geoid computation has been used the following data types: a) the Combined Gravity Field model EIGEN-CG03C complete to degree and order 360, b) a set of 209.752 validated free air gravity anomalies covering the Iberian Peninsula and surrounding regions, c) a

digital terrain model of mesh side 200x200 meters and e) GPS data in levelling points provided by the Geographical Institutes of Spain and Portugal. The final reference heights surface have been compared with those data GPS points resulting a standard deviation of 1.3 centimeters (6 cm. in interpolation) and a relative precision of 0.62 ppm.

Gravity survey in Guipúzcoa (M. J. Sevilla, J. Zurutuza, F. G. Montesinos and E. Vélez)

In the historical territory of Guipúzcoa, a new gravity network has been settled down. The network will be the reference for the future gravity related geodetic tasks. The network has eleven stations with a maximum distance between two consecutive stations of about 20 km. Also, it is connected with the absolute gravity station of the IAG in Madrid by means of a round trip itinerary with gravity measurements in Madrid, Aranda del Duero, Miranda de Ebro and Donostia with distances between stations of about 150 km. This last station of Donostia has been considered as reference station for the itineraries that configure the net of Gipuzkoa. To obtain the gravity values in the 11 stations, three round trip itineraries have been performed, where the starting and closing measure is the station of Donostia.
The used instrument has been a gravimeter LaCoste & Romberg model GRAVITON-EG-1194. The relative precision of this gravimeter is in the order of the 4 or 5 Gal, that together with the absolute gravity value of the station of the IAG in Madrid, which is known with an absolute precision of $\pm 9.0 \times 10^{-8}$ ms^{-2}, guarantee a final precision of 10 Gal. The coordinates of the stations have been determined by GPS in the WGS84 system

BIBLIOGRAPHY

Arnoso, J.; Benavent, M.; Vieira, R.; Kalinina, A.; Gorbatikov, A.; Volkov, V.: Efectos oceánicos en observaciones de marea terrestre de inclinación en Lanzarote. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España), Pub. UPV, CL ISBN 84-9705-297-8. Volumen I, pp. 250-255. 2003.

Arnoso, J.; Vieira, R.; Vélez, E.; Cai Weixin; Tan Shiling: Análisis de observaciones de marea de extensión en Lanzarote. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España), Pub. UPV, CL ISBN 84-9705-297-8. Volumen I, pp. 244-249, 2003.

Arnoso, J., Benavent, M., Ducarme, B., Vieira, R.: Comparación de Modelos Oceánicos de Marea en las Islas Canarias (España). *Proceedings 4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Figueira da Foz (Portugal), pp. 521-522. 2004

Arnoso, J., Benavent, M. Ducarme, B., Montesinos, F.: Ocean tide loading model in the Canary Islands Region. *Journal of Geodynamics*, ISSN 0264-3707 Clave: A Volumen: 41(1-3) Páginas, 100-111 2006 (online version, 2005)

Auz Gómez, A.; Otero Juez, J.: Solución gradiente del problema de contorno GPS-gravimétrico. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España), Pub. UPV, CL ISBN 84-9705-297-8. Volumen I, pp. 190-193, 2003.

Benavent, M., Arnoso, J., Sevilla, M. J., Vieira, R.: Influencia de la Elasticidad de la tierra en las Funciones de Green en el Cálculo de la Carga Oceánicaò.

Proceedings 4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica. Figueira da Foz (Portugal), pp. 525-526. 2004.

Benavent, M., Arnoso, J., F. G. Montesinos: Computation of surface displacements, tilt and gravity variations due to ocean tide loading. *Física de la Tierra*, vol. 17, pp. 97-112 (ISSN: 0214-4557). 2005

Bermejo Solera, M.; Otero Juez, J.: El método de Newton aplicado a la resolución del problema geodésico directo y a la obtención de las ecuaciones inversas de la proyección UTM. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísic*a, Valencia, (España), Pub. UPV, CL ISBN 84-9705-297-8. Volumen I, pp. 129-133. 2003.

Bermejo, M., Otero, J.: Minimum conformal mapping distortion according to Chebyshevôs principle: a case study over peninsular Spain. *Journal of Geodesy*, vol. 79, pp. 124-134. 2005

Blanco, I., Montesinos, F. G., García, A., Vieira, R.: Caracterización magnética de la estructura de la corteza en Lanzarote a partir del análisis conjunto de las anomalías magnéticas y gravimétricas. Proceedings *4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, 491. 2004

Blanco, I, Montesinos, F. G., García, A., Vieira, R., Villalaín, J.: Paleomagnetic determination of Lanzarote from magnetic and gravity anomalies: implications for the early history of the Canary Islands. *Journal of Geophysical Research*, Solid Earth, vol. 110, B12102, doi:10.1029/2005JB003668. 2005

Calvão, J.; Sevilla, M. J.: Ulitização de anomalias da gravidade obtenidas por inversão de dados altimétricos para o aperfeiçoamento da batimetria. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España), Pub. UPV, CL ISBN 84-9705-297-8. Volumen III, pp. 1658-1661. 2003.

Camacho, A.; Vieira, R.; Ortiz, E.; Montesinos, F. G.: Investigación gravimétrica para estudio arqueológico en la Cueva de Maltravieso (Cáceres). *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España), Pub. UPV, CL ISBN 84-9705-297-8. Volumen III, pp. 1779-1782. 2003.

Capitaine, M. Folgueira and J. Souchay. Earth rotation based on the celestial coordinates of the celestial intermediate pole I. The dynamical equations. *Astronomy and Astrophysics.* 445. 347-360. 2006

Catalão, M.; Vasconcelos, J.; Kol, H.; Sevilla, M. J.: Geóide em Portugal-novos resultados. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España), Pub. UPV, CL ISBN 84-9705-297-8Volumen I,pp.185-189, 2003.

Catalao, J.C, Vasconcelos, M., Kol, H., Sevilla, M.J.: Geóide em Portual novos resultados". Actas da *III Conferéncia Nacional de Cartografia e Geodesia*, Ed. Lidel, nº de págs. 10. Lisboa, 2003.

Catalao, J. C. and M. J. Sevilla: Inner and minimum constrain adjustment of marine gravity data. *Computers & Geosciences*, Vol. 30, pp. 949-957. Elsevier. 2004

Catalao, J., M. J. Sevilla y J. Calvao: Icagm05- Geoide no Atlántico Nordeste (Iberia-Canarias-Azores). *5ª Asamblea Hispano Portuguesa de Geodesia y Geofísica*. Sevilla 30 enero a 3 febrero de 2006. CD. Cambridge Univ Press ISBN 84-8320-373-1. 2006

Charco, M.; Fernández, J.; Tiampo, K. F.; Yu, T.-T.; Jentzsch, G.: Efecto de la topografía en las deformaciones y variaciones de gravedad producidas por una intrusión magmática en la corteza. Aplicación al volcán Mayon, Filipinas. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen II, pp. 741-745. 2003.

Charco, M.; Luzón, F.; Fernández, J.: Desplazamientos y esfuerzos producidos por una intrusión magmática en la corteza. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen II, pp. 794-798. 2003.

Charco, M., Fernández, J., Tiampo, K.F., Battaglia, M., Kellogg, L., McClain, J., and Rundle, J.B.: Study of volcanic sources at Long Valley Caldera, California, using gravity data and a genetic algorithm inversion technique. *Pure and Applied Geophysics*, vol 161, nº 7, 1399-1413, DOI: 10.1007/s00024-004-2511-8. 2004.

Charco, M., Tiampo, K. F., Luzón, F., Fernández, J.: Modelling Gravity changes and crustal deformation in active volcanic areas. Física de la Tierraò, vol. 17, pp. 129-146 (ISSN: 0214-4557). 2005

Charco, M., Fernández, J., Luzón, F., and Rundle, J. B.: On the relative importance of self-gravitation and elasticity in modelling volcanic ground deformation and gravity changes. *Journal of Geophysical Research*, 111, B03404, doi:10.1029/2005JB003754. 2006.

Cerdeño, M. L., Hernández, C., Rodríguez-Caderot, G., Folgueira, M.: Novedades culturales y metodológicas en la necrópolis de Herrería (Guadalajara). *Novedades Arqueológicas Celtibéricas*, pp. 43-62, Ed.. Museo Arqueológico Nacional. 2004.

Diaz, G., J. I .Díaz and J. Otero: On an oblique boundary value problem related to the Backus problem in Geodesy. Nonlinear Analysis: *Real World Applications.* Vol. 7. 147-166. 2006.

Ducarme, B., A. P. Venedikov, J. Arnoso,, R. Vieira: Determination of the long period tidal waves in the GGP superconducting gravity data *Journal of Geodynamics*, ISSN 0264-3707: Vol. 38, n. 3-5, pp. 307-324, Ed. Elsevier. 2004.

Ducarme, B., Van Ruymbeke, M., Venedikov, A. P., Arnoso, J., Vieira, R.: ñPolar motion and non tidal signals in the superconducting gravimeter observations in Brusselsò *Bull. dÕInform Mareees Terrestres*. Bruxelles. Nº 140, pp. 153-1171. 2005.

Ducarme B., Venedikov A.P., de Mesquita A.R., De Sampaio França C.A., Costa D.S., Blitzkow D., Vieira R., Freitas S.R.C.: New analysis of a 50 years tide gauge record at Cananéia (SP-Brazil) with the VAV tidal analysis program. IAG Symposia, 130, Vol 130. 453- 460. 2006

Ducarme, B., Venedikov, A. P., Chen X.D., Arnoso, J., Sun H. P., Vieira, R.: Global analysis of the GGP superconducting gravimeters network for the estimation of the polar motion effect on the gravity variations. *Journal of Geodynamics.*Vol.: 41. 334-344. 2006.

Ducarme, B., Venedikov, Arnoso, Vieira, R.: Aanalysis and prediction of ocean tides by the computer program VAV. Journal of Geodynamics. Vol. 41. 119-127. 2006

Fernández, J.; Luzón, F: Sistema de vigilancia geodésica en las Islas Canarias. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen II, pp 751-755. 2003.

Fernández, J., Yu, T-T, Rodríguez-Velasco, G., González-Matesanz, Romero, J ., Rodríguez, G., Quirós, R., Dalda, A., Aparicio, A., Blanco M. J.: New geodetic monitoring system in the volcanic island of Tenerife, Canaries, Spain. Combination of InSAR and GPS techniques, *Journal of Volcanology and Geothermal Research*, nº 124: 241-253. 2003.

Fernández, J., Rundle, J.B.: Postseismic Viscoelastic-Gravitational Half Space Computations: Problems and Solutions. *Geophys. Res. Lett.*, 31, 29 L07608, DOI:10.1029/2004GL019654. 2004

Fernández, J.,: (**Guest Editor**). *Pure and Applied Geophysics*, vol 161, nº 7, Topical Issue ñGeodetic and geophysical effects associated with seismic and volcanic hazards.ò, ISSN 0033-4553, pp. 1301-1611. 2005

Fernández, J.: Geodetic and geophysical effects associated with seismic and volcanic hazards. Introduction. *Pure and Applied Geophysics*, vol 161, nº 7, 1301-1303, DOI: 10.1007/s00024-004-2505-6. 2005

Fernández, J., F. J. González-Matesanz, J. F. Prieto, A. Staller, G. Rodríguez-Velasco, A. Alonso-Medina and M. Charco: GPS Monitoring in the N-W part of the Volcanic Island of Tenerife, Canaries, Spain. Strategy and results. *Pure and Applied Geophysics*, vol 161, nº 7, 1359-1377, DOI: 10.1007/s00024-004-2509-2. 2004

Fernández, J., Romero, R.; Carrasco, D., Tiampo, K. F., Rodríguez-Velasco, G., Aparicio, A., Araña, V., González-Matesanz, F. J.: Detection of displacements in Tenerife Island, Canaries, using radar interferometry. *Geophysical Journal International*, Vol. 160, pp. 33-45. doi: 10.1111/j.1365-246X.2005.02487.x. 2005

Fernández, J., Tiampo, K. F., Rundle, J. B., Jentzsch, G.: On the interpretation of vertical gravity gradients produced by magmatic intrusions *Journal of Geodynamics*, 39/5, 475-492. doi:10.1016/j.jog.2005.04.005. 2005.

Fernández, J. Charco, M., Rundle, J. B., Tiampo, K. F.: A revision of the FORTRAN codes GRAVW to compute deformation produced by a point magma intrusion in elastic-gravitational layered Earth models. Computers & Geosciences, 32/2, 275-281. doi:10.1016/j.cageo.2005.06.015. 2006

Folgueira, M. y Souchay, J.: Free Polar of a triaxial and elastic body in Hamiltonian formalism: Application to the Earth and Mars. *Astronomy and Astrophysic*s. Vol. 432, pp. 1101-1113. 2005.

Gambi, J., Zamorano, P., Romero, P., García del Pino, M. L.: A theorem for rigid motions in Post-Newtonian celestial mechanics, *Revista de la Real Academia de Ciencias*, Serie A, Mat., vol. 97 (1): 113-118. 2003.

García, L.; Cano, M. A.; Ortiz, E.; Sevilla, M. J.: Determinación de coordenadas provisionales en la estación GPS permanente de Lanzarote. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8 Volumen I, pp. 76-80. 2003.

García-Cañada L. and M. J. Sevilla: Monitoring crustal movements and sea level in Lanzarote. Geodetic Monitoring: from Geophysical to Geodetic Roles *IAG Springer Series*, vol. 131. pp. 160-165. Springer Verlag. 2006.

Gil, E., de Toro, C.: Improving tide-gauge data processing: A method involving nidal frequencies and inverted barometer effect. *Computer & Geosciences*, 31, 1048-1058. 2005

Gil, E., de Toro, C.: New determinations of the Ages of Tide in the North Atlantic Ocean. *Marine Geodesy*, nº 28, pp. 231-249. ISDN: 0149-0419. 2005

Gil, E., de Toro, C.: Non-linear processes in shallow waters. Influence on local observed mean seal leveò. *Física de la Tierra*, Vol. 17, pp.77-96 (ISSN: 0214-4557. 2005

González-Matesanz, J.; Fernández, J.; Prieto, J. F. Staller, A.; Rodríguez-Velasco, G., Alonso-Medina, A.: Vigilancia GPS en la isla de Tenerife: metodología y

resultados. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen I, pp. 306-309. 2003.

Gorbatikov, A. V., Kalinina, A. V., Volkov, V. A., Arnoso, J., Vieira, R., Vélez, E.: Results of analysis the data of microseismic survey at Lanzarote Island, Canary, Spain. "Geodetic and geophysical effects associated with seismic and volcanic hazards". *Pure and Applied Geophysics*. Vol. 161 nº 7 , 1561-1578. 2004

Gottsmann, J.; Wooler, L.; Martí, J.; Fernández, J.; Camacho, A. G.; Gonzalez, P. J.; García, A.;y Rymer, H. New evidence for the reawakening of Teide volcano. *Geophysical Research Letters*, vol. 33, L20311, doi:10.1029/2006GL027523, 2006

Gottsmann, J.; Camacho, A. G.; Tiampo, K.; Fernández, J.: Spatiotemporal variations in vertical gravity gradients at the Campi Flegrei caldera (Italy): a case for source multiplicity during unrest. *Geophys. Jour. Int*. 167, 1089-1096, Doi: 10.1111/j.1365-246X.2006.03157.x, 2006

Hayes, T. J., Tiampo, K. F., Rundle, J. B., Fernández, J. B.: Gravity changes from a stress-evolution earthquake simulation of California. Journal of Geophysical Research, 111, B09408, doi:10.129/2005JB004092. 2006

Kalinina, A.V., Volkov, V.A., Gorbatikov, A.V., Arnoso, J., Vieira, R., Benavent, M.: Seismo-Tilt observations in Geodynamic Observatory Cueva de los Verdes, Lanzarote. Pure and Applied Geophysics. Vol. 161, nº 7, 1579-1594. 2004.

Malpica, J. A. y M. J. Sevilla: Estudio de las proyecciones cartográficas con el desarrollo hasta el segundo orden del tensor métrico. *5ª Asamblea Hispano Portuguesa de Geodesia y Geofísica*. Sevilla 30 enero a 3 febrero de 2006. CD. Cambridge Univ Press ISBN 84-8320-373-1

Martinez-Benjamin, J.J., M. Martinez-Garcia, S. Gonzalez Lopez, A. Nunez Andres, F. Buill Pozuelo, M. Espino Infantes, J. Lopez-Marco, J.Martin Davila, J. Garate Pasquin, C. Garcia Silva, P. Bonnefond, O. Laurain, A.M. Baron Isanta, M. A. Ortiz Castellón, J. Talaya Lopez, B. Perez Gomez, E. Alvarez Fanjul, G. Rodriguez Velasco, D. Gomis, M. Marcos, Y. Menard, G. Jan, E. Jeansou, F. Lyard, and L. Roblou:: Ibiza Absolute Calibration Experiment: Survey and Preliminary Results. *Marine Geodesy* (ISSN: 0149-0419 on line: 1521-060X). Vol: 27 N3-4. Ed. Taylor&Francis. 2004

Martínez Benjamin, J. J., Martínez García, M., Ortiz Castellón, M. A., Rodríguez Velasco, G., Martín Dávila, J., Pasquín, J. G., Bonnefond, P., Pérez Gómez, B., García Silva, C.: ñCalibration altimeter sites at Cape of Begur and Ibiza Islandò. *Física de la Tierra*, vol. 17, pp. 33-45 (ISSN: 0214-4557). 2005.

Merbah, A.; Sevilla, M. J.; Yelles-Chaouch, A.: Análisis de movimientos altimétricos de la región sísmica de Chlef por el método de Monte Carlo. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen I, pp. 334-338. 2003.

Merbah, A., Yelles-Chaouch, A., Sevilla, M. J., García, L., Meghraoui, M.: Deformations associated with El Chelif earthquake of 10.10.1980: Vertical movements determinations. *Chaiers du Centre Europén de Géodynamique et de Séismologie*, vol. 23, pp. 165-158 (ISBN 2-9599804-6-8). 2004.

Merbah, A., Gourine, B., Sevilla, M. J.: Evaluation et interprétation des déformations horizontales et de leurs erreurs sur un réseau de surveillance sismique *Proceedings of FIG Working week 2005* and GSDI-8 Pharaohs to Geoinformatics, pp. 16-21. 2005.

Montesinos, F. G.; Vieira, R.; Camacho, A. G.: Estudio gravimétrico en la ñCatedral Viejaò de Cádiz mediante algoritmo genético. *3ª Asamblea Hispano-Portuguesa*

de Geodesia y Geofísica, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen III, pp. 1783-1788. 2003.

Montesinos, F.G., Camacho, A.G., Nunes, J.C., Oliveira, C.S.and Vieira, R.: A 3-D model for a volcanic crater in Terceira Island (Açores). Correlation with geology and seismic anomalies. *Geophys. J. Int.*. Vol. 154. 393-406. 2003.

Montesinos, F.G., Arnoso, J., Vieira, R., Benavent, M.: Estudio gravimétrico en El Hierro (I. Canarias): Resultados preliminares. Proceedings *4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, 359-360, 2004

Montesinos, F. G., Arnoso, J., Benavent, M.: New study of the local gravity field of El Hierro (Canary Islands), *Física de la Tierra*, vol. 17, pp. 113-127 (ISSN: 0214-4557). 2005

Montesinos, F. G., Arnoso, J., Vieira, R.: Using a genetic algorithm for 3-D inversion of gravity data in Fuerteventura (Canary Islands), *International Journal of Earth Sciences*, Vol. 94, 2, pp. 301-316.(ISSN 1437-3254). 2005

Montesinos, F. G., Arnoso, J., Benavent, M. y Vieira, R.: The crustal structure of El Hierro (Canary Islands) from 3-D gravity inversion. *Journal of Volcanology and Geothermal Research* Vol. 150. 283-299. 2006.

Montesinos, FG., Vieira, R., Benavent, M., Arnoso, J., Estudio estructural de la Isla de La Palma mediante inversión gravimétrica. Primeros resultados. Cambridge University Press Congreso: *V Asamblea Hispano-Portuguesa de Geodesia y Geofísica* Pub. Electrónica. ISBN 84-8323-73-1. 2006.

Nunes, J.C., A.G. Camacho, Z. Franca, F. G. Montesinos, M. Alves, R. Vieira, E. Vélez, E. Ortiz: Signature of Crustal Volcano-Tectonic Structures of Pico Island (Azores) based on Gravity Anomalies Journal of Volcanology and Geothermal Research 156, 1-2 :1 55-170. DOI:10.1016/j.jvolgeores. 2006.

Nunes, J.C., Camacho, A.G., Franca, Z., Montesinos, F.G., Alves, M., Vieira, R., Velez,E. y Ortiz, E. Gravity anomalies and crustal signature of volcano-tectonic structures of Pico Island (Azores) *Journal of Volcanology and Geothermal Research*, 156, 55-70, 2006

dôOreye, N., Kervyn, F., and the SAMAAV team: InSAR study of active African volcanoes: preliminary results of the SAMAAV project. In: Proceedings of the Xith International Congress for Mathematical Geology, ñQuantitative Geology from multiple sourcesò. Liège, Belgium, September 3-8, 2006. S04-07, 8 pp. (CD). (SAMAAV team includes J. Fernández) 2006

Otero, J.; Sevilla, M. J.: Análisis de series temporales de observaciones GPS en la estación permanente de Lanzarote. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España),) Pub. UPV, CL ISBN 84-9705-297-8 Volumen I, pp. 81-85. 2003.

Otero, J. and A. Auz: A formal comparison between Marych-Moritz's series, Sansò's change of boundary method and a variational approach for solving some linear geodetic boundary value problems. *International Association of Geodesy Symposia, Vol. 127* (Ed. F. Sansò), Springer-Verlag, Berlin-Heidelberg, pp: 226-233. 2004

Otero, J.: Best conformal map projections. "*Oberwolfach Reports*" (OWR, ISSN 1660-8933), European Mathematical Society. 2004.

Rodríguez Velasco, G.; Romero, R.; Yu, T.-T.; González-Matesanz, J.; Quirós, R.; Dalda, A.; Carrasco, D.; Fernández, J.: ñIntroducción de técnicas espaciales a los sistemas de vigilancia geodésica en Tenerife (Islas Canarias)ò. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen II, pp. 746-750. 2003.

Rodríguez-Velasco, G.: Estudios sobre geoides terrestres y marinos. (ISBN: 84-669-1618-0. Dep. Legal: M-21215-2004). Ed. Universidad Complutense de Madrid. 2004.

Rodríguez Velasco, G., Sevilla, M. J., Martínez Benjamín, J. J.: Analysis of Gemid and Sea Level in the Area of the JASON-1 Calibration Campaign, IBIZA 2003. *Física de la Tierra*, Vol. 17, pp 61-76. (ISSN: 0214-4557). 2005.

Romero, P.; Gambí, J. M.; García del Pino, M. L.: Laser Ranging Satellite utilizando una Descripción Covariante Post-Newtoniana y Sistemas Localmente Inerciales. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8Volumen I,pp. 163-164. 2003.

Romero, P.; Gambí, J. M.; Patiño, E.: ñMantenimiento de Estación Norte/Sur para el Satélite Español Amazonasò. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8Volumen I, pp. 153-154, 2003.

Romero, R., Carrasco, D., Fernández, J., Martínez, A., Moreno, V., Araña, V.: Results from DECIDE-VOLCANO Project. Application to Canary Islands and Ecuador. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen I, pp. 310-314. 2003.

Romero, R., Carrasco, D., Araña, V., Fernández, J.: A new approach to the monitoring of deformation on Lanzarote (Canary Islands): an 8-year radar perspective. *Bulletin Volcanology*, nº 65:1-7. 2003.

Romero, R., and J. M. Gambi: Optimal control in the East/West station-keeping maneuvers for geostationary satellites. *Aerospace Science and Technology* 8, 8 ,729-734. 2004.

Romero, P., Gambi, J. M., **Patiño, E., Antolin, R**.: Optimal Station-Keeping for Geostationary Satellites with Electric Propulsion Systems under Eclipse Constrains. Progress in Industrial Mathematics at ECMI 2006, SERIES: Mathematics in Industry, Springer-Verlag, Vol 11, 2006

Romero, P., J.M: Gambi, E. Patiño: Station keeping manoeuvres for geostationary satellites using feed-back control techniques. *Aerospace Science and Technology* Vol. 10, n8, doi 10.1016 /j.ast2006.08.003, 2006.

Gambi, J. M., García del Pino M. L., Romero, P., Salas M. Post-Newtonian Covariant measurement formulation in Space Geodesy. Progress in *Industrial Mathematics at ECMI* 2006, SERIES: Mathematics in Industry, Springer-Verlag, Vol 11. 2006

Sánchez, F. J.; Sevilla, M. J.: Métodos de Análisis y Validación de Datos Gravimétricos. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8Volumen I, pp. 194-198. 2003.

Sevilla, M. J.: Modelos Digitales del Terreno 1:200.000 y Modelos de Transformación en la Península Ibérica. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8Volumen I. pp.45-49. 2003.

Sevilla, M. J.; García, L.; Ortiz, E.: Red de Apoyo de la Estación GPS permanente de Lanzarote. 3ª *Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen I, pp. 292-296. 2003.

Sevilla, M. J.; Ortiz; E.; García, L.: Enlace Altimétrico GPS-Mareógrafos en la estación permanente de Lanzarote. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen I, pp. 339-343. 2003.

Sevilla, M. J.; Rodríguez Velasco, G.: Análisis del modelo de geopotencial de muy alto grado, GPM98 en las Islas Canarias. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen I, pp. 261-265. 2003.

Sevilla, M. J.; Sánchez, F. J.: Gravimetría, Altimetría y Nivel Medio del Mar en el Norte de África. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen I, pp. 256-260. 2003.

Sevilla, M. J. "Ajustes con constreñimientos. *Publicaciones del IAG*, nº 198. pp.1-43. 2003.

Sevilla, M. J. Actualización de Cálculos Astronómicos I.A.G. ISBN 84-87488-08-0. 190 páginas. CSIC-UCM. *Instituto de Astronomía y Geodesia*. Madrid. 2003

Sevilla, M. J.: Modelización en Física y Astronomía. *Gaceta de la RSME* Vol 8.1, pp 20-22 Madrid. 2005

Sevilla, M. J. Ajustes de redes libres. Modelos matemáticos singulares. Publicaciones del Instituto de Astronomía y Geodesia. Nº 200, (82 páginas). (UCM-CSIC). Madrid 2005.

Sevilla, M. J.- IBERGEO_2006: Nuevo geoide centimétrico de la península Ibérica. *Topografía y Cartografía* Vol. XXIII nº 135. pp. 3-10. Madrid 2006.

Sevilla, M. J., J. Zurutuza y E. Vélez. Red gravimétrica del territorio histórico de Guipúzcoa. *V Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Procedings Instituto Nacional de Meteorología. Ed.: Cambridge University Press. ISBN: 84-8323-73-1 Clave: A. 2006.

Sevilla, M.J., E. Vélez y J. Zurutuza: Red Gravimétrica del territorio histórico de Guipúzcoa. *5ª Asamblea Hispano Portuguesa de Geodesia y Geofísica*. Sevilla 30 enero a 3 febrero de 2006. CD. Cambridge Univ Press ISBN 84-8320-373-1

Sevilla, M. J.: IBERGEO_2006. *5ª Asamblea Hispano Portuguesa de Geodesia y Geofísica*. Sevilla 30 enero a 3 febrero de 2006. CD. Cambridge Univ Press ISBN 84-8320-373-1.2006

Sevilla M. J. y L. García: Estabilidad de la red de apoyo GPS en Lanzarote como resultado de cinco campañas de observación. *5ª Asamblea Hispano Portuguesa de Geodesia y Geofísica*. Sevilla 30 enero a 3 febrero de 2006. CD. Cambridge Univ Press ISBN 84-8320-373-1.2006

T**iampo, K.F., Fernández, J., Jentzsch, G., Charco, M., and Rundle, J.B.:** New results at Mayon, Philippines, from a joint inversion og gravity and deformation measurements. *Pure and Applied Geophysics*, vol 161, nº 7, 1433-1452, DOI: 10.1007/s00024-004-2513-6. 2004

Tiampo, K.F., Fernández, J., Jentzsch, G., Charco, M., and Rundle, J.B.: Inverting for the parameters of a volcanic source using a genetic algorithm and a model for magmatic intrusion in elastic-gravitational layered Earth models. *Computers & Geosciences*, 30/9-10 pp. 985-1001. 2004

Tiampo, K.F., J. Fernández, G. Jentzsch, M. Charco, C. Tiede, C. Gerstenecker , A. Camacho, and J.B. Rundle.:. Elastic-gravitational modeling of geodetic data in active volcanic areas. In: *Recent Res. Devel. Geophysics*, 6. Edit. Research Signpost, Recent Research Developments in Geophysics, 6, 37-58. 2004

Tiede, C., Tiampo, K. F., Fernández, J., Gerstenecker, C.: Deeper Understanding of Non-Linear Geodetic Data Inversion Using a Quantitative Sensitivity Analysis. *Nonlinear Processes in Geophysics*, Vol. 12, pp. 373ï 379. 2005

Tiede, C., A. G. Camacho, C. Gerstenecker, J. Fernández, and I. Suyanto: Modeling the density at Merapi volcano area, Indonesia, via the inverse gravimetric problem *Geochem. Geophys. Geosyst*., 6, Q09011, doi:10.1029/2005GC000986. 2005.

Vélez, E.; Vieira, R.; Arnoso, J.; Cai Weixin; Jiang Jun; Tan Shiling: Desarrollo de tecnología y software aplicado a la investigación en geodinámica de una zona volcánica activa. Cooperación Hispano China en el Laboratorio de Geodinámica de Lanzarote. *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen II, pp. 784-787. 2003.

Vélez, E. y Vieira, R.: Nuevos resultados en las observaciones del nivel del mar en el Laboratorio de Geodinámica de Lanzarote. ***ñ****V Asamblea Hispano-Portuguesa de Geodesia y Geofísica* ï Procedingsò Instituto Nacional de Meteorología. Ed.: Cambridge University Press. ISBN: 84-8323-73-1 Clave: A. 2006

Venedikov, A., Arnoso, J., Vieira, R: A program for tidal data processing. *Computer and Geosciences*. Edit. Pergamon, Elsevier, vol 29, nº , pp. 487-502. 2003.

Venedikov, A.P., Arnoso, J., Vieira, R.: New version 2003 of the program VAV for tidal data processing: *Computers and Geosciences*. 2004

Venedikov, , A., Arnoso, J., Vieira, R.: New version of program VAV for tidal data processing. *Computer and Geosciences*, nº3º, pp. 667-669. 2005.

Vieira, R.; Arnoso, J.; Vélez, E. J.: La observación de variaciones del nivel del mar en el Laboratorio de Geodinámica de Lanzarote (LGL). *3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*, Valencia, (España) Pub. UPV, CL ISBN 84-9705-297-8. Volumen III, pp. 1603-1607. 2003.

Vieira, R., Cai Weixin: Volcano and crustal deformation. *Seismological Press*. ISBN-5028-2639-4/P.1232. Beijing, pp. 1-170. 2005.

Vieira, R. , Valbuena, J. L., Vélez, E.: GRAVIGRAD, a new system for the measurement of the vertical gravity gradien. *V Asamblea Hispano-Portuguesa de Geodesia y Geofísica* ***ï*** *Procedings* Instituto Nacional de Meteorología. Ed.: Cambridge University Press. ISBN: 84-8323-73-1. Clave: A. 2006.

Vieira, R., E. Vélez. The three laboratories of geodynamics of Lanzarote. *Electronic Special Publication* of the Bureau Gravimetrique International. ñ2006 School on Microgravimetric methodsò. ISBN92-990017-1-5. Paris. France. CD.Vol.1. 2006.

Vieira, R.,Vélez E., Arnoso, J., Montesinos F.G. Geodetical and Gravimetric investigations of the Institute of Astronomy and Geodesy (CSIC-UCM) in the project ñVULCMAC: Vulcanism in the MacaronesiaòEditor: Cambridge University PressCongreso: *V Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Pub. Electrónica. ISBN 84-8323-73-1 2006.

Vieira, R, M. J. Sevilla, E. Vélez y F. G. Montesinos: Actividad del Instituto de Astronomía y geodesia con motivo de la llamada ñCrisis del Teideò (2004-2005). *5ª Asamblea Hispano Portuguesa de Geodesia y Geofísica*. Sevilla 30 enero a 3 febrero de 2006. CD. Cambridge Univ Press ISBN 84-8320-373-1

Wadge, G., Parsons, B.E. and EVINSAR Science Team: Achieving the EVINSAR objectives with TERRASAR-L. Proceedings of the Fringe 2003 workshop, 1-5 December, 2003, ESA/ESRIN, Italy (JUNE 2004), LACOSTE H. (ED.) *ESA SP-550 // CD-ROM.* (EVINSAR Science Team includes to J. Fernández) 2004

Zhelev, Z., Petrova, T., Montesinos, F.G., Vieira, R., Arnoso, J., Camacho A.: Some Preliminary Results of the Analysis of the Lanzarote (Canary Islands) Gravity

Anomaly with Elementary Sources. Annual Journal of the University of Mining and Geology, ñSt. Ivan Rilskiò, Sofia, 2004.

Zurutuza, J. and **M. J. Sevilla:** Cálculos precisos GPS: soluciones diarias y productos añadidos. *Mapping* nº 107, pp. 1-10. 2006

Zurutuza, J. and **M. J. Sevilla:** Deformations monitoring by integrating local and global reference systems. Geodetic Monitoring: from Geophysical to Geodetic Roles *IAG Springer Series*, vol. 131. pp. 48-55 Springer Verlag. 2006

Zurutuza, J. S. Hilla, T. Soler y M. J. Sevilla: Sobre la influencia del ángulo de corte y el acinut en el procesamiento GPS de alta precisión. *5ª Asamblea Hispano Portuguesa de Geodesia y Geofísica*. Sevilla 30 enero a 3 febrero de 2006. CD. Cambridge Univ Press ISBN 84-8320-373-1. 2006

3. INSTITUTE CARTOGRAPHIC OF CATALONIA (BARCELONA)

INSTITUT CARTOGRÀFIC DE CATALUNYA (ICC)
Parc de Montjuïc, s/n.
08038 ï BARCELONA (SPAIN)
Tlf. ++ 34 935 671 500
Fax. ++ 34 935 671 567
URL: http://www.icc.es

1. SPGIC: *Sistema de Posicionament Geodèsic Integrat de Catalunya*

Since 1991, the *Institut Cartogràfic de Catalunya* (ICC) has been working on the SPGIC project (Integrated Geodetic Positioning System of Catalonia), based on sparse geodetic networks, the knowledge of the geoid and GPS. SPGIC may be defined as a set of geodetic permanent stations, networks, procedures, regulation data, communications, software, hardware and technical advice for the purpose of high-precision local positioning in Catalonia.

1.1 XU: *Xarxa Utilitària de Catalunya*

The objective of the XU is to have a modern and accessible geodetic network. Modern because XU is a three-dimensional network, where horizontal and vertical components are computed at the same time. Accessible because the distribution of its points adapts to user necessities and technology. In order to know the description, location, coordinates and information associated with each one of the XU vertices, for each point a file with all the information is generated. These files can be consulted and printed free of charge through Internet (http://www.icc.es/ressenyes/homeang.html).

Until the end of 2006, XU has observed 3304 points with GPS technology. In the next years the ICC try to finalize the implantation of the XU at the rate of about 250 points per year. The density of the XU depends on the difficulty of ROI access and on the dynamics of the territory. Has been started the procedures to review the XU points in order to update the information present at web, since there are many points destroyed each year and others that suffer changes on its surrounding area. The goal is to keep all points updated every 10 years.

1.2 XdA: *Xarxa dôAnivellació*

In a high dynamical territory, like Catalonia, the conservation of the leveling network can become a difficult task. In order to densify the NAP (*Nivelación de Alta Precisión)* network from the *Instituto Geográfico Nacional* (IGN) the ICC is leveling since 1998 the Xda network. Other objectives of the XdA are the aim to obtain a more homogenous coverage and to improve the conservation of the leveling points in Catalonia. The permanent GPS stations (CATNET) are also being leveled as part of the XdA project. At the end of the 2006, 927.7 km have been measured. XdA assures a precision 1mm by square root of level km.

Since a part of the leveling signals are located in optimal sites for the GPS measures, the XdA facilitates the precise determination of geoid profiles. These profiles are useful for the evaluation of the precision of the geoid and for its later improvements.

1.3 Tidal gauge stations

Since 1990, the ICC has been storing data from the tidal gauge station lôEstartit and has been collaborating with other institutions in Spain.

1.4 GPS permanent stations

The CATNET network has 14 reference stations tracking the GPS constellation continuously. The network was conceived mainly to offer a public service of GPS data. The network was designed from an initial triangle (corresponding to the three ends of the Catalan territory) and has been increasing its density progressively towards the interior. The coverage provided by a set of 14 stations made possible the installation of a VRS systema capable to offer RTK positioning throurough Catalonia. The system was set in operation on January 2006 as a free of charge public service..

We can distinguish two types of stations: geodynamics, in which the point is materialized with a structure of great robustness anchored in the subsoil and that is going to allow to us to use its data for studies of cortical deformations; and non-geodynamic, with one structure that guarantees the stability of the antenna in the long term although not at the mm level.

By reasons for redundancy the data can be downloaded to ICC by two different ways via modem or via satellite using VSAT (Very Small Aperture Terminal) network. Since 1999, VSAT technology is considered as the main telecommunications system to the GPS stations, covering at the present time 11 stations. This implantation is made jointly with the Unit of Geology that has implanted it in its new seismic network.

The different services are available through internet, so the roving users need a GPRS connection to its ISP provider in order to get access. The protocol used is NTRIP , RTCM SC-106 standard for GNSS data dissemination. ICC has been collaborating in the project EUREF-IP in order to promote the use of NTRIP protocol and assist in its development.

1.4.1. GeoFons

The GeoFons service, initiated in 1995 and at the moment through Internet, have been extended and improved, offering now the following products:

- Observations of CATNET network. RINEX standard format has been adopted for all GPS files, as a standard product.
- Geoid, datum transformation parameters, XU coordinates, etc.
- Reviews of the XU points.
- Software of free distribution created by ICC.

Daily, the files of GNSS data of stations AVEL, BELL, CREU, GARR, EBRE, ESCO, LLIV, MATA and PLAN,SORI,REUS,CASS,SBAR,ICCW are available in the network, as much in form of hour-files at a 1 sec and 15 seconds epoch-rate, and daily-files at a rate of 30 seconds.. Access to the GeoFons service is free of charge through anonymous FTP (ftp.icc.es). More information can be found in http://www.icc.es.

1.4.2. RASANT

Since 1995 the ICC is offering the RASANT service consisting in the transmission of RTCM SC-104 code corrections via Radio Data System (RDS). Its operative phase initiated at the beginning of 2001 with the installation of the Integrity Monitor System, according to standards RSIM. This system allows a continuous monitoring of the state of the broadcasting and the quality of the transmitted corrections.

1.4.3. CATNET-IP

The services provided by the CATNET network for real time positioning through internet are grouped under this category. The services are available at the ICCôs Caster catnet-ip.icc.cat at the 8080 port.
DGPS: Broadcasting of the classical DGPS RTCM 2.1 pseudo range corrections. There is one source linked to each station reference stations.

CODCAT : Interactive service for improved code correction based on Virtual reference stations. It can reach decimetric precissions depending on the quality of the receiver used.

RTKAT: Interactive service for RTK positioning based on Virtual reference stations, allowing centimeter precision. The use of such services improves the consistency on the rover performance both for init time and precision when compared with single station RTK.

CATNET_WEB: This component is a web interface were the users can have access to the reports showing the performance of the whole system , and get RINEX data from a single station or a Virtual Station generated ant the user keyed in coordinates.

1.5. WARTK-EGAL

Under the EU program Galileo Joint Undertaking, ICC participates together with the Universitat Politècnica de Catalunya (UPC) as the project manager, the Finish Geodetic Institute, Pildo (Aerospatial company, Spain) and IFEN (Germany) , in the project WARTK.EGAL, (Wide Area RTK based on EGNOS and Galileo: Technical feasibility study). This project is a demonstrator for the UPC developed algorithms for the Wide area GNSS enhancement, to show the feasibility to operate a pan-european positioning service based on Galileo , using the RIMS stations of this system as reference stations, and using EGNOS channels to broadcast the solution to the final users.

1.5. GeoCat: *Geoide de Catalunya*

Geoid determination is still one of the main activities of the geodetic research. Since the determination of the geoid of Catalonia, UB91, in 1991, the situation has been improved sensibly:

- There are new global gravity field models (EGM96, EGG97, GPM98), which have improved considerably the OSU89 model used in UB91 determination.
- Combined GPS/levelling observations in XU-XdA points.
- New DTM determination of Catalonia.
- Points with observed deflections of the vertical.

- é

During this period 55 points have been measured from combined networks leveling and GPS to have undulations along the Xda network. A test for 24 points have been measured for trigonometric links between leveling and Xu network in order to provide orthometric precise heights to the whole reference frame.

Its under development the works for a new geoid determination using the GRAVSOFT, updated gravimetric data, and a complete set of undulations measurements along the leveling network.

2. High precision positioning

POTSIS : On 2006 a new measurement campaign was done on the Pyrenees network. During this period the calculations of past campaigns was refined and homogenized in order to minimize systematic errors.

3. GEOVAN

Land Based - Mobile Mapping Systems (LB-MMS) is a technique for compiling cartographic information from a mobile vehicle. With the objective to develop its own LB-MMS the ICC has developed the project GEOVAN. GEOVAN is based on the orientation and positioning subsystems and allows a flexible integration of different kinds of sensors (digital cameras, lasersé). The system is equipped with a structure where the sensors are rigidly attached, so it is possible to transfer the orientation computed by the GPS/IMU to the Earth observation sensors. Initially GEOVAN integrates two digital cameras in order to form oriented stereoscopic models.

During this period several demonstration and test campaigns for road inspections and urban cataloge were done. The system has been improved by installing 6 color cameras an a Terrestrial Laser.

5. GeoTeX: *Geodèsia, Teledetecció i Xarxes*

The GeoTeX system is a general geodetic and photogrammetric point determination system, which is able to deal with any type of geometric functional model.

During this period have been done works to improve the performance of the system. Those task were mainly devoted to the dynamic memory managing and also the inclusion of new models.

6. Public service

The ICC is collaborating with lôEscola dôEnginyeria Tècnica Topogràfica de la Universitat Politècnica de Barcelona (UPC) and Departament d'Enginyeria de Geodèsia, Cartografia i Fotogrametria, Universitat Politècnica de Valencia on several student diploma projects.

7. Publications

Baron, A., Talaya, J.: Utilización de enlaces de latencia media (>5s) para RTK ; Proceedings de la 5a Setmana Geomàtica de Barcelona. Febrer 2003.

Cabré, M., Térmens, A., Moysset, M., Soro, M., Ortiz, M. À., Talaya, J.: XdA: Red de nivelación de Cataluña; Proceedings de la 5a Setmana Geomàtica de Barcelona. Febrer 2003.

Parareda, C., Bosch, E., Térmens, A., Ortiz, M. À., Talaya, J.: CATNET: Servicios de posicionamiento de alta precisión y su integración en las nuevas tecnologías de la información; Proceedings de la 5a Setmana Geomàtica de Barcelona. Febrer 2003.

Soro, M., Térmens, A., Ortiz, M. À., Talaya, J.: XU: Red utilitaria de Cataluña ; Proceedings de la 5a Setmana Geomàtica de Barcelona. Febrer 2003.

4. MICROGEODESIA JAÉN RESEARCH GROUP

Grupo de Investigación MICROGEODESIA JAÉN
Universidad de Jaén
Dpto. de Ingeniería Cartográfica, Geodésica y Fotogrametría
Escuela Politécnica Superior de Jaén
Campus Las Lagunillas s/n, Edif. A3
23071 JAEN (SPAIN)
Tlf: +34 953 212 467
Fax: +34 953 212 855
e-mail: ajgil@ujaen.es
URL: http://coello.ujaen.es/investigacion/webmicro/

1.- Introduction

The ñMICROGEODESIA JAÉNò research group was set up in 1997 in the Department of Cartographic, Geodetic and Photogrammetric Engineering of the University of Jaén. It is mainly focused on Geometrical and Physical Geodesy applications and in the period 2003-2006 carried out research on the following areas:

- Geodetic monitoring of surface deformation and its application to natural disaster hazards
- Determination of the Earth figure.
- Surface displacement monitoring in olive trees sloping areas affected by erosion.
- Geodetic networks and GPS.
- Positioning and navigation services based on permanent GNSS networks with RTK applications.

The group actively works collaboratively with various government agencies, cartographic institutes and other academic partners. In the period 2003-2006 we were engaged on several projects and contracts related to:

- Technical advice on Geodesy and Surveying.
- Establishment of high precision local networks to monitor ground movements of dams, walls and landslides.
- Establishment of 1D, 2D and 3D classical and GNSS networks for Geodesy and related applications.
- High precision determination of local and regional geoid models.
- Geodesic methodology for precise agriculture

In 2005, we organised and hosted the *International Symposium on Geodetic Deformation Monitoring: from Geophysical to Engineering Roles. ISGDM2005, March, 17-19,* sponsored by IAG (International Association of Geodesy) (http://www.ujaen.es/huesped/gdeforma). This symposium covered the following topics:

- Mathematical and Statistical Models for Crustal Deformation Analysis.

- Deformation Monitoring from GPS and InSAR data: Analysis and Geophysical Interpretation.
- Geodetic Monitoring of Movements in Civil Engineering.
- Integration of Spatial and Terrestrial Techniques in Deformation Studies.
- Geodynamical Applications of Gravimetric Observations.
- Gravity and Structure of the Earth's Interior.
- Present-day Geodetic Instrumentation for Deformation Monitoring.

The scientific committee consisted of Prof. Fernando Sansò (Politecnico di Milano, Italy), Prof. A. Dermanis (Aristotle University of Thessaloniki, Greece), Prof. E. Brückl (Vienna University of Technology, Austria), Prof. H. Henneberg (University of Zulia, Venezuela) and Prof. Antonio J. Gil (University of Jaén, Spain).

Recently, in September 2006, a collection of 36 peer-reviewed papers presented at the Symposium have been published in the book: *Geodetic Deformation Monitoring: From Geophysical to Engineering Roles IAG Symposium Jaén, Spain, March 7-19,2005*. Series: International Association of Geodesy Symposia, Vol. 131, Springer, edited by Fernando Sansò and Antonio J. Gil.
(http://www.springer.com/east/home/geosciences/geophysics?SGWID=5-10008-22-173674905-0)

2.- Research Projects

Quantifycation of tectonic processes in the South of Spain and the North of Africa.
Funding: Consejería de Innovación, Ciencia y Empresa de la Junta de Andalucía.
Participanting teams:University of Granada, University of Jaén.
2006-2008. 169.400 Euros.
PI: Francisco González Lodeiro (University de Granada).

Current tectonic activity in Balanegra fault and its relation to big folds.
Funding: DGI. Acción Complementaria CGL2004-0167-E.
Participating teams: University of Granada, University of Jaén, University of Alicante and Instituto Andaluz de Ciencias de la Tierra.
2005-2006. 11.000 euros.
PI: Jesús Galindo Zaldívar (University of Granada).

Geometric analysis of basement of the Guadix-Baza basin (Betic Cordillera).
Funding: DGI. Acción Especial BTE2001-5230-E.
Participating teams: Instituto Andaluz de Ciencias de la Tierra, University of Jaén, University of Granada and University of Alicante.
2003-2004**.** 17.725,29 Euros.
PI: Carlos Sanz de Galdeano (Instituto Andaluz de Ciencias de la Tierra).

3.- Main Contract Research

Innovative Concepts for High Accuracy Local Geodetic Networks (GEOLOCALNET)
(RESEARCH AND DEVELOPMENT ACTIVITIES, 6TH FRAMEWORK PROGRAMME, CALL NUMBER 2423, AREA 3 ï Innovation and International Initiatives Innovation by Small and Medium Enterprises)
Funding: GALILEO JOINT UNDERTAKING (ESA ï EC)

2005-2006.

Quality control of ground control points of 1/20,000 flight for the generation of the 1/5.000 Andalusia Digital Ortophoto.
Funding: Empresa Pública para el Desarrollo Agrario y Pesquero de Andalucía S.A.
2003 ï 2004

4.- Publications

Books

- Geodetic Deformation Monitoring: From Geophysical to Engineering Roles. IAG Symposium Jaén, Spain, March 7-19,2005. Series: International Association of Geodesy Symposia , Vol. 131. Sansò, Fernando; Gil, Antonio J. (Eds.). 2006, XII, 306 p., 233 illus., Hardcover. ISBN: 978-3-540-38595-0

International Journals

- A. J. Gil, J. Galindo, M.J. Borque, L. Marín, P. Ruano, C. Sanz de Galdeano. Geodetic deformation monitoring in Zafarralla fault and Sierra Tejada antiform (Spain): Status Report . Acta Geodynamic. Geomater. Vol: 2. 25-28. Czech Republic. 2005.
- Lacy, A. J. Gil, G. Rodríguez-Caderot. A method for the ionospheric delay estimation and interpolation in a local GPS network. Studia Geophysica et Geodaetica. ISSN: 0039-3169. Vol: 49. 63-84. Prague. 2005.
- Ramos M.I., Feito F.R., Gil A.J. Towards high precision digital elevation model. Journal of WSCG. ISSN: 1213-6972. Vol: 12. 145-148. Pilsen, Czech Republic. 2004.
- E.B. Blázquez, A. J. Gil, G. Rodríguez-Caderot, M.C. Lacy, J.J. Ruiz. ANDALUSGEOID2002: The New Gravimetric Geoid Model of Andalusia (Southern Spain). Studia Geophysica et Geodaetica. ISSN: 0039-3169. Vol: 47. 511-520. Prague. 2003.
- J. Galindo-Zaldívar, A. J. Gil, M. J. Borque, F. González-Lodeiro, A. Jabaloy, C. Marín-Lechado, P. Ruano and C. Sanz de Galdeano. Active faulting in the internal zones of the central Betic Cordilleras (SE, Spain). Journal of Geodynamics. ISSN: 0264-3707. Vol: 36/1-2. 239-250. 2003.
- Ruiz A.M., Ferhat G., Alfaro P., Sanz de Galdeano C., Lacy M.C., Rodriguez-Caderot G., Gil A.J. Geodetic Measurement of Crustal Deformation On Nw-Se Faults Of The Betic Cordillera, Southern Spain, 1999-2001. Journal of Geodynamics. ISSN: 0264-3707. Vol: 35. Pp: 259-272. 2003.
- Lacy, F. Sansó, G. Rodríguez-Caderot y A. J. Gil. The Bayesian Approach applied to GPS Ambiguity Resolution. A mixture model for the discrete-real ambiguities alternative. Journal of Geodesy. ISSN: 0949-7714. Vol: 76 (2). 82-94. 2002.

National Journals

- Ruiz Morales M. Una comunicación de J. Mendoza y Ríos a la Royal Society en Junio de 1812, dando cuenta de un estudio geodésico realizado por J. Rodríguez. Biblio 3W. Revista Bibliográfica de Geografía y Ciencias Sociales. 1138-9796. Vol: -. Pp: 1-?. Barcelona. 2005.

- Ruiz Morales M. Dos eclipses observados por Antonio Ulloa en el año 1748. Astronomía. Vol: -. 83-87. Madrid. 2005.
- Ruiz Morales M. Los primeros trabajos del Instituto Geográfico. Mapping: Revista de Cartografía, Sistemas de Información Geográfica, Teledetección y Medio Ambiente. 1131-9100. Vol: 103. Pp: 6-17. Madrid. 2005.
- Ruiz Morales M. Laussedat y la Academia de Ciencias de España (I). Topografía y Cartografía. 0212-9280. Vol: -. Pp: 27-35. Madrid. 2005.
- Ruiz Morales M. Cartas de Carlos Ibáñez de Ibero al francés Aimé Laussedat. Mapping: Revista de Cartografía, Sistemas de Información Geográfica, Teledetección y Medio Ambiente. 1131-9100. Vol: -. Pp: 60-70. Madrid. 2005.
- Borque M.J., Gil A.J., Alfaro P. Nivelación de alta precisión a lo largo de la costa entre La Marina y Torrevieja (Alicante) para controlar movimientos tectónicos verticales. Geotemas. 1576-5172. Vol: 7. Pp: 135-141. Madrid. 2004.
- Peláez J.A., Gil A.J., Álvarez J., López D., Rodríguez A., Rodríguez-Caderot G., Métodos astrogeodésicos como control de geoides gravimétricos. Datum XXI. 1696-7941. Vol: -. Pp: 10-16. Madrid. 2004.
- Galindo J., Gil A.J., Borque M.J., González F., Jabaloy a., Marín C., Ruano P., Sanz de Galdeano C., Desarrollo simultáneo reciente de pliegues y fallas en las Cordilleras Béticas: la falla de Zafarraya y el pliegue de Sierra Tejada. Geotemas. 1576-5172. Vol: 6. Pp: 147-150. Madrid. 2004.
- Sanz de Galdeano C., Galindo J., López A. C., Alfaro P., Delgado J., Marín C., García F. J., Borque M. J., Gil A. J., Anomalías gravimétricas y magnéticas en la cuenca de Guadix-Baza: primeros resultados. Geotemas. 1576-5172. Vol: 6. Pp: 195-198. Madrid. 2004.
- Ruiz Morales M. Aimé Laussedat y el comienzo de la Fotogrametría en el Instituto Geográfico. Datum XXI. 1696-7941. Vol: -. Pp: 4-12. Madrid. 2004.
- Ruiz A. M., Gil A. J., Alfaro P., Sanz de Galdeano C., La falla activa de Padul. Medidas geodésicas para controlar su deformación. Investigación y ciencia. 0210-136X. Vol: -. Pp: 32-34. Barcelona. 2004.
- Ruiz Morales M. El mejor cartógrafo andalusí y su paradójica descripción del Reino de Granada. Topografía y Cartografía. 0212-9280. Vol: -. Pp: 39-41. Madrid. 2004.
- Ruiz Morales M. Aportaciones del General Ibáñez e Ibáñez de Ibero a las ciencias geográficas. Datum XXI. 1696-7941. Vol: -. Pp: 4-16. Madrid. 2003.

Conferences

- Peláez, J.A., Gil, A.J., Sanz de Galdeano, C., Martínez Solares, J.M., and Galindo Zaldívar, J. 2006. A plausible 'geodetic scenario' for the 1884 Arenas del Rey earthquake. 5ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica. 30 Enero - 3 Febrero, Sevilla, 2006
- Ramos M. I., Gil A. J., Feito F. R., García-Ferrer A., Cruz J. L. ¿Se mueven los olivos? XII Simposium Científico-Técnico EXPOLIVA 2005. Jaén (España). 2005.
- Ramos M. I., Gil A. J., Feito F. R., García-Ferrer A., Cruz J. L. Geodetic control of the present tectonic deformation of the Betic Cordillera. International Symposium on Geodetic Deformation Monitoring: from Geophysical to Engineering Roles. ISGDM2005. Jaén (España). 2005.

- Ramos M. I., Feito F. R., Gil A. J. Consecuencias de la erosión en el olivar en pendiente. I Congreso de la cultura del olivo. Jaén. 2005
- Ramos M. I., Feito F. R., Gil A. J. Analysis of slope to study erosion. International Cartographic Conference. ICC2005. A Coruña (España). 2005.
- Peláez J. A., Gil A. J., Álvarez J., López D., Núñez E., Rodríguez A., Rodríguez-Caderot G. Two checking astrogeodetic geoid profiles in southern Spain. 4ª Assembleia Luso-Espanhola de Geodesia e Geofísica. Figueira Da Foz (Portugal). 2005.
- Galindo J., Gil A. J., Borque M. J., Marín C., Ruano P., Sanz C. The Zafarraya fault in the frame of the active tectonic structures of the Central Betic Cordillera (southern Spain). Cost-Action 625
- Camerino (Italia). 2004.
- SanJosé J. J., Blázquez E. B., Atkinson A. D. J. The Argüalas rock glacier analysis in the period 1991-2000. 4ª Assembleia Luso-Espanhola de Geodesia e Geofísica. Figueira Da Foz (Portugal). 2004.
- Lacy C., Rodríguez-Caderot G., Gil A. J. Precise point positioning using undifferenced GPS observations. 4ª Assembleia Luso-Espanhola de Geodesia e Geofísica. Figueira Da Foz (Portugal). 2004.
- Lacy C. The bayesian detection of discontinuities in a linear regression: a GPS application. EGS-AGU-EUG Joint Assembly. Niza (Francia). 2003.
- Ramos M. I., Gil A. J., Feito F. R. Estudio de deslizamiento de ladera en olivar con pendiente. XI Simposium Científico-Técnico EXPOLIVA 2003. Jaén (España). 2003.
- Peláez J. A., Gil A. J., Sanz de Galdeano C., Rodríguez-Caderot G. Constraints on the design of a geodetic network for the control of a normal fault: an application to the Granada fault. 3ª Assembleia Luso-Espanhola de Geodesia e Geofísica. Valencia (España). 2003.
- Gil A. J., Rodríguez-Caderot G., Ruiz M., Sanz de Galdeano C., Alfaro P., Ruiz A. M., Ferhat G., Lacy C., Biagi L., Garrido M. S., Blázquez E. B. Actividades geodésicas de control de deformaciones en el sector central de la Cordillera Bética en el período 1999-2001. 3ª Assembleia Luso-Espanhola de Geodesia e Geofísica. Valencia (España). 2003.
- Blázquez E. B., Gil A. J., Rodríguez-Caderot G., Lacy C., Ruiz J. J. A gravimetric geoid in Andalusia: Results and precision estimates. 3rd Meeting of the International Gravity and Geoid Commission (3). Thessaloniki (Grecia). 2003.

5.- NATIONAL GEOGRAPHIC INSTITUTE

INSTITUTO GEOGRÁFICO NACIONAL (IGN)
Centro de Observaciones Geodésicas
General Ibañez de Ibero, 3 28003 MADRID, (SPAIN)
Tlf.: ++ 34 91 597 9768 Fax: 34 91 597 97666 URL: http://www.ign.es

1. GEODETIC NETWORKS

1.1 R.O.I. in ETRS89

The adoption of ETRS89 as official Geodetic Reference System in Spain has important consequences and changes in all the geodetic, topographic and cartographic works. The National Geodetic Network by Space Techniques (REGENTE) constitutes the frame on which these works must be carrying out. The density of this class C network is one geodetic point each sheet of the National Topographic Map scale 1/50,000, totalizing more than 1100 stations in the whole country (an average density of one by each 450 km^2).

The general characteristics and conditions that this network fulfils (precision better than 5 cm, good accessibility, cleared horizon, etc) make the density of the network enough to support for any geodetic, topographic or cartographic works in any zone of Spain. Nevertheless, the National Geodetic Network of Inferior Order (ROI) ï included REGENTE stations- with coordinates in ETRS89 system, can be used for less precision-demanding works or whenever it is needed to have greater geodetic densification in a zone.

The ROI is constituted by about 11.000 geodetic points in all Spain (density of one bench mark every 45 km2) with coordinates in ED50 Geodetic Reference System and an average precision of 0.2 m in horizontal coordinates and 0.3 m in altimetry in this system. The precision of the network partly results from lack of a sufficiently dense network of superior order to base on. This network was mainly observed during years 80ôs and 90ôs by means of triangulation, measuring three angle's series with the horizon method.

Re-computation of all the ROI has been made in ETRS89 system constraining to the REGENTE network and including classic angular observations and GPS (this last one in the regions that have carried out a re-observation of the ROI with GPS: Balearic Islands, Catalonia, Navarre, Basque Country and Valencia). After thorough revision and quality control of the observables included in the process, a joint adjustment of all the network has been made. In order to make the complete adjustment of ROI in ETRS89 127.000 azimuth directions, 67.000 zenith angles and 7.000 GPS vectors have been used, weighting the observables suitably by calculation blocks.

The results are the coordinates in ETRS89 system of those of the 9.850 remaining geodetic vertices of the ROI that are not included in REGENTE network. The obtained precision depends on the available observables in each zone. In the regions with GPS, the resulting error ellipses (95% confidence) are usually constant of 2 cm in planimetry and 3 cm in altimetry of relative precision, whereas in the classic observable zones,

where only angular measurements are available, the precision is variable depending on the visuals in each geodetic point, with an average magnitude of 8 cm in planimetry and 14 cm in altimetry (relative precision).

1.2 REGENTE

The computation of the last set of coordinates of REGENTE was carried out in 2003.
Aiming at the set of an unified European cartography, it is essential to transform the current National Geodetic Coordinates into the ETRF89 Frame. Such a determination requires to know the coordinates of a geodetic subset in both systems with a very high number of stations and uniformly distributed, but with a bigger density of points in those areas where the distortion of the old network is higher.
In the case of Iberian Peninsula and archipelagos, the IGN decided to solve the problem through REGENTE Project (Spatial technique National Geodetic Network), consisting of setting up a dense GPS high precision network with coincident stations to ROI (Third Order Geodetic Network) and some benchmarks belonging to the High Precision Levelling Network. The mean density was fixed to one station per MTN sheet (National Surveying Map) scale 1:50,000, that is, one station per 300 km^2.
REGENTE will be perfectly linked to the ETRF89 reference network, thus IBERIA95 and BALEAR98 which stations are REGENTE points as well. REGENTE Canarias (Canary Islands) was leaned, as reference station, on Maspalomas (VLBI and IGS station).
With REGENTE Project the following objectives are reached:

- Implementation, observation and coordinate determination, for entire Spain, of a three-dimensional basic class C network, with an absolute precision better or equal than 5 cm.
- Obtainment of precise transformation parameters between reference system of National Geodetic Network, ED50, and that of REGENTE, ETRF89.
- To ease valid data to debug Spanish geoid of centimetric precision. REGENTE project is supported with relative Lacoste-Romberg gravimetric observations in every point.
- To support to the high number of GPS technique users, so that any national point could be inside a maximum circle of 15 km. with centre in a REGENTE station.
- REGENTE points have to fulfil the following requirements:
- Belong to the National Geodetic Network, or VLBI or SLR.
- Common features to a GPS station: good approach itinerary for off-road vehicle, open horizon above 10º, enough distance from elements which might cause multipath or interferences.
- As REGENTE is a three-dimensional network with observed ellipsoidal heights referred to GRS80 and should perfectly be linked to National Geodetic Network ED50, which heights are referred to sea level, it has been established that more than 10 percent of points should have orthometric height, with sub-centimetre precision, through the link to the High Precision Levelling Network, NAP.
- Whenever the requirements of a GPS station are fulfilled, the Laplace points will be included in REGENTE and the second order astronomical stations.
- Each point of IBERIA95 and its extend BALEAR98, belong to REGENTE.
- Finally, REGENTE consists of around 1078 stations in the Iberian Peninsula and Balearic Islands, one per MTN sheet (National Surveying Map) scale 1:50,000,

which implies a mean distance of 20 to 25 km between stations. In the Canary Islands, REGENTE Canarias, REGCAN95, consists of 72 stations delivered in seven islands with a maximum of 21 in Tenerife, and being 5 the minimum in every minor islands of El Hierro and La Gomera.

1.3 GPS Reference Station Network (ERGPS)

ERGPS is the GNSS Permanent Network of the Geodetic Observations Centre of the National Geographic Institute of Spain. The installation of the first station was carried out in March 1998. Currently, ERGPS is constituted by 19 stations. All of them accomplish the requirements to be a station of the EUREF Permanent Network (EPN). The main objectives of this network are:

- To obtain precise coordinates and velocities of the points.
- One of them (YEBE) is an IGS station contributing to the definition of the International Terrestrial Reference Systems ITRS.
- 16 of them are stations of the EPN contributing to all projects that affect at this Network and to the definition of the European Terrestrial Reference Systems ETRS.
- To collaborate in other scientific projects, like Geodynamical, Meteorological or Geophysical projects.
- To participate in the last Real Time Projects (Euref-IP).
- Providing public and free Rinex 1 second hourly data through a public ftp server with the next address: ftp://ftp.geodesia.ign.es

IGN Permanent GNSS stations Network.

0 ERGPS	Instalation date	IGS	EUREF	EUREF-NRT	EUREF-IP	Public data 1 second
ALAC	Abr - 98		X	X	X	X
ACOR	Sep - 98		X	X	X	X
YEBE	May - 99	X	X	X		X
ALME	Dic - 99		X	X	X	X
VALE	Ene - 00		X	X	X	X
MALA	Mar - 00		X	X	X	X
CANT	Mar - 00		X	X	X	X
MALL	May - 00		X	X	X	X
CACE	Dic - 00		X	X	X	X
SONS	Dic - 00				X	X
RIOJ	May -01		X	X	X	X
LPAL	May - 01		X	X	X	X
CEUT	Ago - 01		X	X	X	X
VIGO	Sep - 01		X	X	X	X
HUEL	Dic - 01				X	X
ALBA	Jun - 02				X	X
COBA	Abr - 04		X	X	X	X
ZARA	Abr - 06		X	X	X	X
SALA	Jun - 06				X	X

IGN Permanent GNSS stations Network.

The link of Yebes permanent station (YEBE) to the telescope through high precision geodetic observations and its integration in IGS makes possible the transference from VLBI observations to the network, being its kernel of IGN analysis.
GPS sites that fulfill the recommendations of the IGS have been selected for the installation of these permanent stations as far as monumentation, location, stability, durability, etc..
The ERGPS already installed are located in:

- ALAC: Tide Gauge of Alicante.
- ACOR: Tide Gauge of A Coruña.
- YEBE: Observatorio Astronómico de Yebes.
- ALME: Observatorio Geofísico de Almería.
- VALE: Universidad Politécnica de Valencia .
- MALL: Instituto Español de Oceanografía de Mallorca.
- MALA: Observatorio Geofísico de Málaga.
- CANT: Escuela de Ing. Caminos, Canales y Puertos de Santander (Universidad de Cantabria).
- SONS: Observatorio Sismológico de Sonseca.
- CACE: Universidad de Extremadura en Cáceres.
- RIOJ: Observatorio Geofísico de Logroño.
- LPAL: Observatorio Astronómico Roque de los Muchachos.
- CEUT: Puertos del Estado.

- HUEL: Universidad de Huelva.
- COBA: Universidad de Córdoba.
- ALBA: Universidad de Castilla-La Mancha, Campus de Albacete.
- ZARA: Instituto Nacional de Meteorología en Zaragoza.
- SALA: Aeropuerto de Matacán.
- VIGO: Instituto Español de Oceanografía de Vigo.

1.4 EUREF-IP Project in ERGPS Network.

Within the EUREF frame, the BKG (Bundesamt für Kartographie und Geodäsie) developed a new technique of registry and interchange GNSS data, as well as the derived product diffusion, as for example the transmission of differential corrections in real time. All it has been made on the basis of free code of GNU (General Public License), in particular the one of Internet-radio. Most of the activity in this field is carried out through the dissemination of GPS data (DGPS) in form of differential corrections for precise positioning. The transmission of differential corrections between the reference remote receiver (BASE) and rover is standardized according to proposal of the Radio Technical for Commission Maritime Services, Special Committee 104, RTCM-SC104. RTCM format includes messages with correction to the pseudo-distances and time variation of these. It contains in addition corrections to the phase measures. 18-21 messages are for RTK (Real Time Kinematics) positioning for application in receivers that admit this technique. The ñbase stationò must be distanced a few tens of kilometres (20-30 km) so that the correction is effective. This technique allows reaching centimetric precisions in real time. NTRIP (Networked Transport of RTCM via Internet Protocol) is the new technology and protocol to transfer data GNSS (for example corrections RTCM) by means of Internet network or cell telephony. NTRIP Software has been developed within EUREF under free GNU license and most of topographic GPS receivers incorporate it like stantdard for the reception of RTK corrections. Almost all stations of ERGPS network are transmitting RTK corrections. The client program with the name ñGNSS Internet Radioò available for several platforms (Linux, Windows or Windows EC) can be unloaded in order to get the data of one station of the IGN, the IGNE caster must be chosen, whose IP address is 80.38.104.84 (port 80).

1.5 IGE, Analysis Centre.

IGE as a Local Analysis Centre of EUREF

Since the first week of September of 2001 (GPS WEEK 1130) and after the tests made introducing our solution into the final combined European solution with satisfactory results, the IGN geodetic department became a EUREF Analysis Centre. The three letters acronym used is IGE.

Processing was done by Bernese Proccessing Engine BPE of Bernese 4.2 under UNIX platform in an automatic procedure. Weekly solutions were reported in SINEX format (Solution INdependent EXchange format), together with a weekly SUMMARY of

results and seven troposphere parameter files (one per week day) corresponding to a special project of estimation of troposphere parameters (zenith path delays) of EUREF.
In these four years several topics have changed. The software currently used is Bernese 5.0. under LINUX. The current number of stations that are processed is 39. The processing strategy have changed in these years with new and better models, using new values at processing, using Absolute Antenna Phase Centre Variations, changing to the current Reference System for orbits at the processing epoch etc é . Furthermore, the products provided by IGE to EUREF have been increased with daily SINEX. Nowadays IGE collaborate with EUREF in a new project for near real time processing with Bernese 5.0, such project consists on the daily processing with Rapid Ephemeredes using the same strategy that in weekly processing.

IGE Processing Network for EUREF

IGE as a Analysis Centre

Following almost the same strategy used for EUREF, the IGE Analysis Centre is processing and Iberian Network with stations of the area which provide public data. These stations have not to be EPN stations. The name of this network is IBERRED. As a result of this process IGN is making a Time Series analysis of the coordinates for Monitoring and Geodynamical studies.

1.6 Maintenance of geodetic networks.

During these years the ROI maintenance that concerns to disappeared points due to different causes (public constructions, urbanizations and so on) has been carried out. New marks have been built and new coordinates of these ones have been computed.

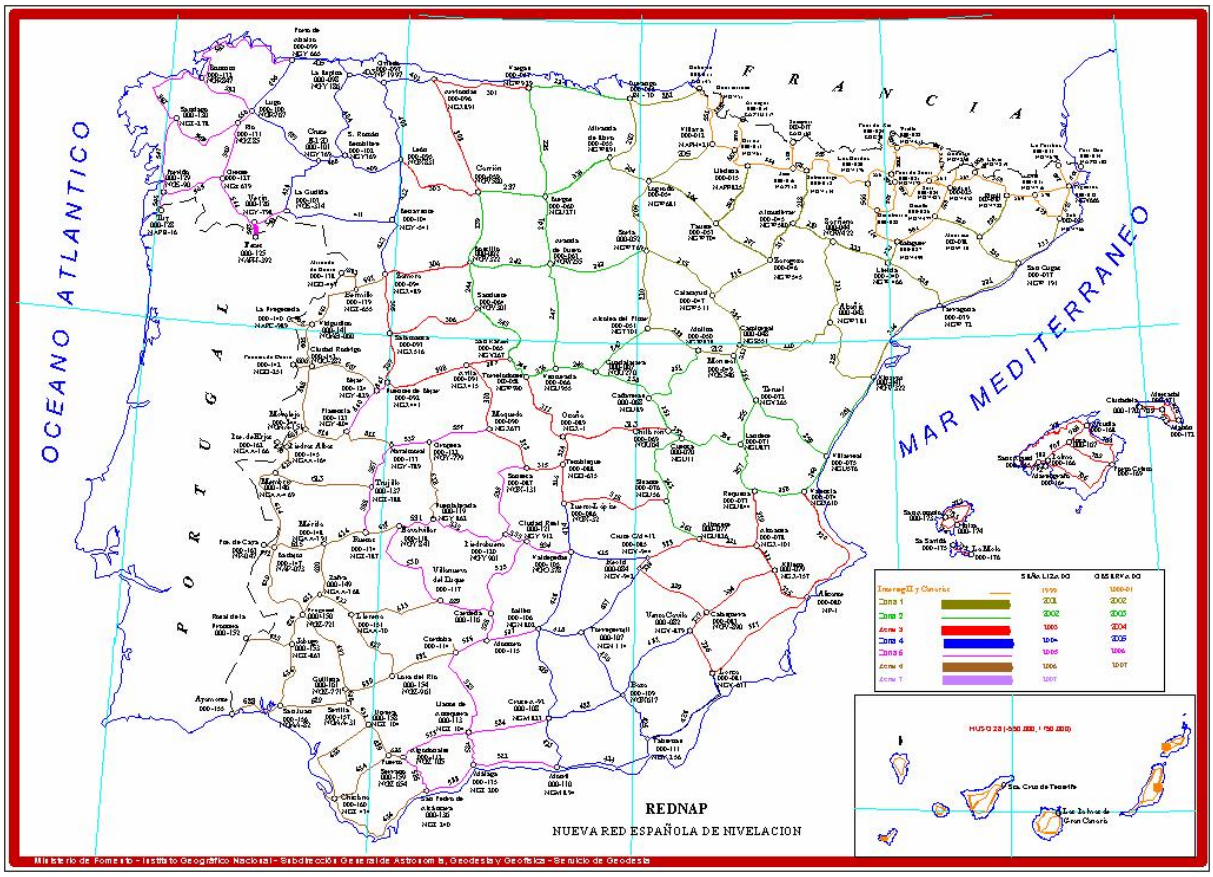
Some equipments of the ERGPS network have been replaced, communication and quality problems have been resolved and new locations and stations have been set during these four years.

2. New Spanish National High Precision Levelling Network (REDNAP)

The Instituto Geográfico Nacional of Spain (IGNE), by its Geodesy Department, is carrying out since 2001 the establishment of a New High Precision Levelling Network (REDNAP Project). In the period 2003/2007 this project has implemented 102 new levelling lines covering 7.900 kilometres in the northwest, centre and southeast part of Spain, 9.500 levelling marks have been monumented as well. Three observation campaigns have been carried out in 2004, 2005 and 2006. Currently, the last observation campaign in the Iberian Peninsula is being carried out.
The REDNAP Project has been expanded to the Balearic Islands in 2007 in order to complete the Spanish High Precision Levelling Network. This project will be definitely finished in 2008 covering the Spanish national territory, mainland and islands, with 257 high precision levelling lines, 18.200 kilometres and more than 20.000 marks.

Summary of REDNAP (2003/2007)

ZONE	MONUMENT DATE	OBSERVATION DATE	NUMBER OF LINES	**LENGTH (KMS)**
3	2003	2004	29	2400
4	2004	2005	25	2420
5	2005	2006	35	2700
6	2006	2007(in execution)	42	2800
7(Balearic)	2007**(in execution)**	2007/08(programmed)	15	600



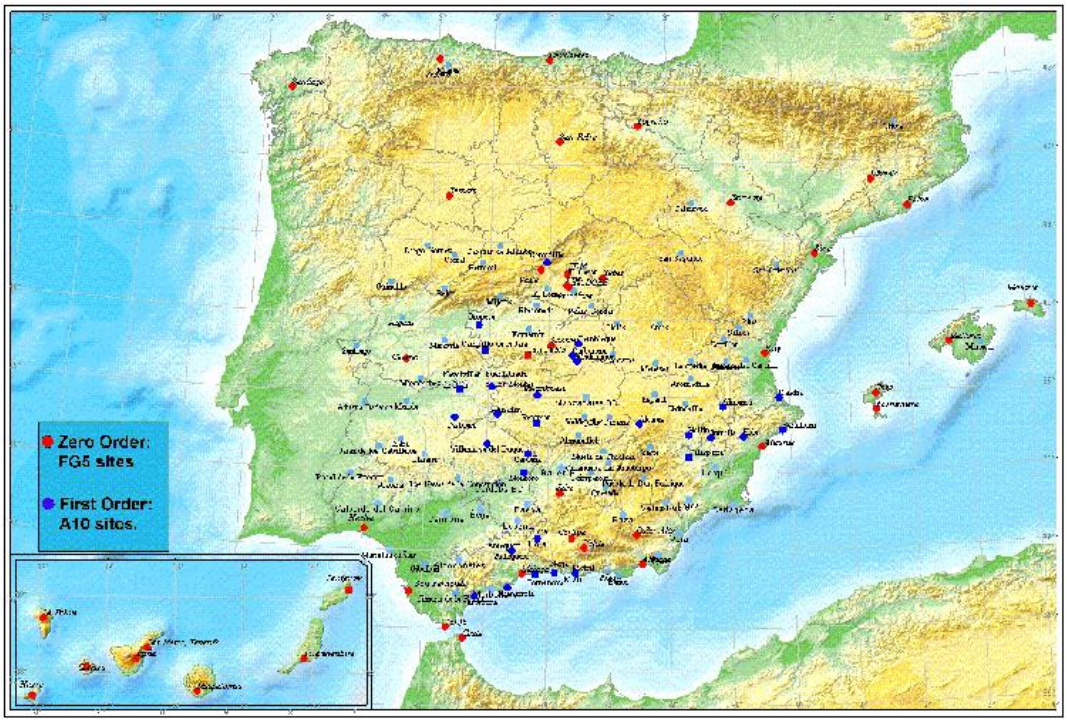
REDNAP Network

3. ABSOLUTE GRAVITY

The very first scientific task in Spain from the gravimetric point of view reported to the Int. Assoc. of Geodesy Commission was J. Barraquer´s work. His first measurements with Repsoldôs absolute pendulum were made in 1882 in the National Astronomic Observatory of Madrid, although he had performed some previous tests in 1877 in the old facilities of IGC. Eight years later, several gravimetrists of IGN carried out observations of the absolute gravity network. A new site was observed by P. Cebrián and F. de la Rica in Valladolid in 1901, which was never published before, possibly due to its higher standard error. Corrections were found by Helmert and measured by Kühnen and Furtwängler (1906), which refined Barraquer´s measurements, though, the deviations from actual values amount to 10 miliGal and more (Torge, 1989; Rodríguez, 2005).

A total of nine stations including Madrid was the very first absolute gravity set of points in Spain. The first relative measurements with Von Sterneck Pendula were performed by Dr. Oscar Hecker (Potsdam Geodetic Institute) in his travel through the Atlantic Ocean (Potsdam, Rio de Janeiro, Lisbon, Madrid) in 1901. The relative network observed by many other spanish gravimetrists (Sans Huelin, 1946) of around 210 stations were linked to Potsdam by Hecker´s value, allowing the first Bouguer and free air anomaly maps ever in Spain (1924). Between 1897 and 1989 no absolute gravity

measurement is reported in Spain.
Observations provided by LaCoste & Romberg gravity meters during the sixties and the early seventies, resulted in a new set of fundamental stations in Spain inside the IGSN71 frame, called RGFE73. The IGSN71 network (Morelli, 1974) allowed gravity values with mean errors around 0.025 miliGal at the best sites. This network along with its less accurate densification, named RGFE73, is still in use.
In the time period 1989-2003, Mäkinen and Vieira observed in Valle de los Caídos and Madrid with the JILAG-5 absolute gravimeter (Vieira, 2002). Owing to De Maria and Marson (1995, 1995a), Cerutti and De María (1992), some stations were observed by IMGC in Barcelona (Fabra Astronomical Observatory, 1995), Spanish Center for Metrology in Tres Cantos (Madrid, 1992) and Las Mesas Geophysical Observatory (Tenerife, Canary Islands, 1995) with the IMGC absolute gravimeter. Thanks to BKG, by means of the SELF I and II projects, some stations were observed and even repeated with FG5 absolute gravimeters : Valle de los Caídos (Finnish Geodetic Institute, FGI, and IAG); Tarifa, Ceuta, Alicante, San Fernando, Granada (Wilmes and Falk, 2003, BKG).
Absolute gravity stations are divided into two sub-networks (figure 1): the zero order network and the first order network.



Absolute gravity sites

3.1 Zero order network

More than 35 sites have been occupied from 2001 until 2006, including those of the intercomparisons for the zero order network, i.e. FG5 observations. Some sites have already been re-occupied, allowing thus the beginning of the time series. All results

must be considered in the frame of the international absolute intercomparisons and carefully observed in the future to detect outliers. All observation and processing protocols are similar to those performed in the above mentioned intercomparisons and the World Gravity Standards (Boedecker, 1988).

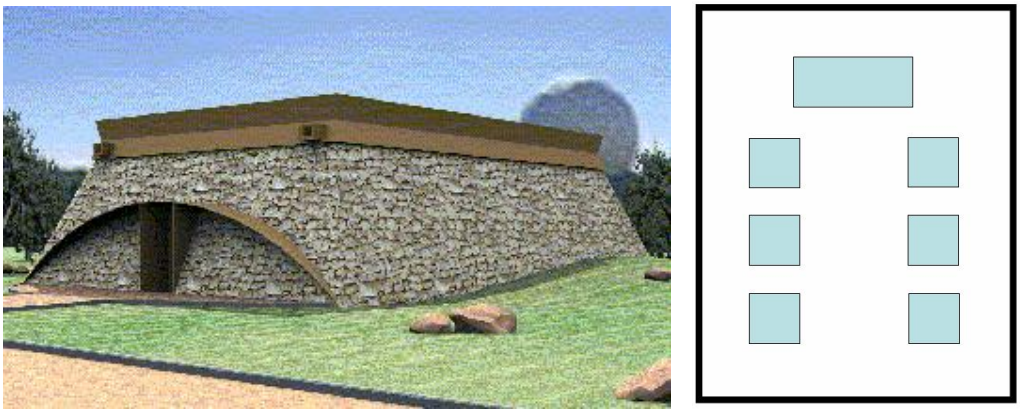
Most stations, placed in geophysical or astronomical observatories, have a strong well founded pier without any metallic reinforcement bar. Piers are usually connected to bedrock to reduce instrumental vibrations. Seismically quiet sites far from cultural and industrial noise bring up low scattered observations. In those cases where no such facilities were found, a special selection of old well founded buildings (abbeys, old churches, universities, etc) were chosen. Thus, examples such as Geophysical Observatory of Santiago de Compostela, Geophysical Observatory of Logroño, Geophysical Observatory of Málaga, Geophysical Observatory of Almería, Geophysical Observatory of San Pablo de los Montes (Toledo), El Miracle Cluster (Lleida), Astronomical Observatory of Fabra (Barcelona), Ebro Observatory (Tarragona), El Puig Monastery (Valencia), and Valle de los Caídos (IAGBN station) already observed, point up a quietness and very long permanence qualities.

The station Astronomical Observatory of Madrid is located in the library of the main facility building of "Observatorio Astronómico Nacional", inside the "Parque del Retiro" in Madrid. The measurement was made in the pillar where Mr. Joaquin Barraquer placed the Strasser clock for his 1882 absolute gravity determination, which is about 1 meter to the west of the pier where he made the measurements with the Repsold Pendulum. The station is placed on a granite outcrop around 1.8 m deep in the ground. There is a IGSN71 point next to these piers (MADRID-A).

Since 1933 the Gravity Laboratory of IGN in Madrid is a fundamental point, where an IGSN71 core station Madrid-C and absolute piers coexist in the same room.

The geological stability and low noise (far from big roads) of the San Pablo de los Montes and Sonseca sites in ñMontes de Toledoò, in the Sistema Central Mountain Range, allows to join geodetic, magnetic, seismological and gravity instruments in the same site. Two piers are set up to measure gravity.

Yebes Astronomical Observatory is a special facility for combining top quality techniques (VLBI, GPS and absolute gravity) also at the same site. The facility is supposed to have seven pillars for absolute gravity intercomparison and a superconducting gravity meter pier. The building is almost finished.



Project of Yebes absolute gravity site with seven piers.

An easily accessible eccentric at every station will be set up to facilitate direct value of gravity. Some eccentrics were already measured.
Before absolute measurements, true gravity gradient observations were made to introduce the best possible gradient in the absolute gravity formula and to translate the absolute value from effective height to the floor, see for instance Niebauer et al. (1989, 1995) and also Francis and Van Dam (2003). A LaCoste & Romberg, Model G, gravimeter with analogue feedback system was used to develop this task. At least 24 hours of measurements were made in every station to obtain the final absolute value, 24 set of a hundred drops per set, namely about 2400 drops. The starting fringe was 30 in all cases, and the number of fringes were 600, namely a million and a half time-distance pairs. To obtain the final results, the g software processing tool from Microgsolutions Inc. (Niebauer et al., 2002) has been employed.

3.2 First order network

Around forty (40) sites have been occupied with the A10 gravimeter as the first order network (figure 1). Most of these sites have also a concrete pier to obtain a good stability, sharing accelerometer sites. Also the main entrance of churches and cathedrals are stable buildings and considered as sites. Measurements of gradient were carried out to translate the 0.7 m nominal height value to the floor datum. All stations were processed identically as the zero order stations.
Gravity stations in Spain are then divided in two first classes:
CLASS A: absolute station with gravity rate
Precision ±1,1 microGal and accuracy ±3 microGal
CLASS B: absolute station without gravity rate

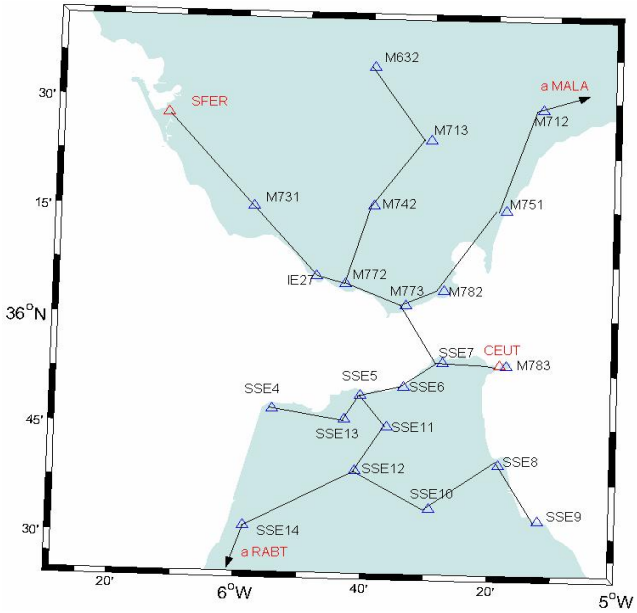
Subclass B1: Precision ±3 microGal and accuracy ±5 microGal

Subclass B2: Precision ±5 microGal and accuracy ±10 microGal

4. SPECIAL WORKS

4.1 Gibraltar Strait GPS Network (RGOG 2004)

The construction of permanent communication system between the African and European continents through Gibraltar Straits has been one of the objectives of the cooperation between Spain and Morocco in the last years. For the construction of this system of permanent communications the necessity of a geodynamic study of the area is obvious, since Gibraltar Strait in an area of confluence of different tectonic plates. The geodetic techniques have demonstrated to be essential for the accomplishment of this type of studies.



Geodynamical Gibraltar Strait Network (RGOG 2004)

In 2004 this collaboration was continued. It was agreed to make as GPS synchronized observation of whole network (both sides of the Strait) simultaneously for five days at interval of 8 hours per day . This set of points forms the Geodesic Network of Geodynamic Observations of the Straits of Gibraltar (RGOG). The net has a new configuration with respect to the observation of 1989, since it includes new points (in Morocco) that were not included in previous campaigns, because of the new name taken RGOG 2004. In October 2004 the Spanish and Moroccan national geodesic agencies observed a five days GPS campaign of 22 points.

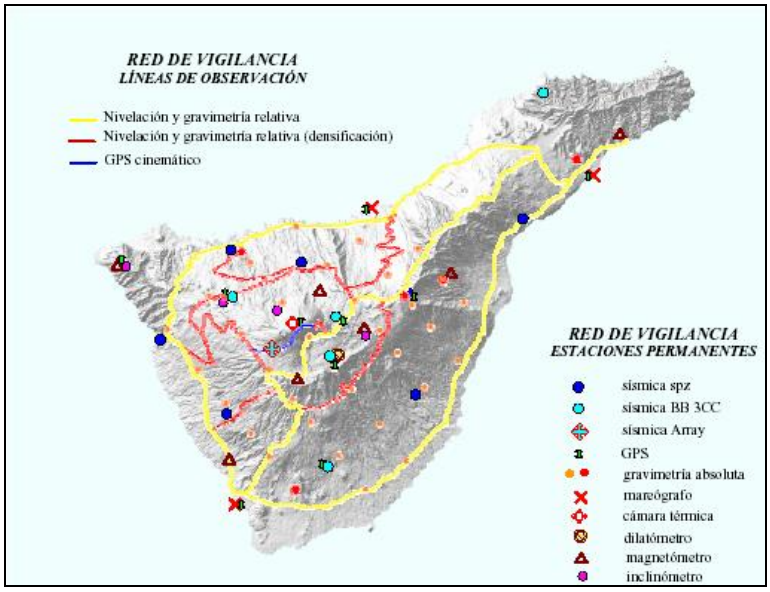
4.2 Tenerife Volcanic Monitoring System Project

Several seismic movements affected Tenerife Island, the biggest of the Canary Islands, year 2004. The Spanish Government decided to develop a Volcanic Monitoring System basic project. The development of this basic project is carrying out to observe, monitor and communicate possible volcanic activities in Tenerife Island and also to determinate associated risks.

In this basic project seismic, geodetic and geophysical data sub-systems and the broadcasting of these data have been taken into account to determine the instrumental

systems for observation and analysis of those phenomena linked to volcanic activity that could appear.

Next figure shows infrastructures, instrumentation and seismic, geodetic and geophysical facilities that have been projected to install in the next two years.



Tenerife Volcanic Monitoring System

4.3 Referencing of Space Tracking stations

Referencing of space tracking stations consists of the use of the more precise geodesic techniques in order to get the most exact definition of the space position of the axes of the antennas of these ones. In this type of work it is necessary to use classic geodesic instrumentation (theodolites) as well as of space geodesy instrumentation (GPS). Until this moment the IGN has collaborated in the referencing of stations for different institutions. On one hand with INTA-NASA in stations located in Maspalomas (Great Canary) and Robledo de Chavela (Madrid) and on the other hand with the European Space Agency (ESA) in the referencing of stations in Villafranca del Castillo (Madrid). In addition there is a continuous collaboration with the Astronomical observatory Nacional (OAN) in the referencing of its stations.

Four Space Tracking Antennas in Villafranca del Castillo were observed in 2003. The antennas that were observed are VIL-1, TS-1, MARECS and EXOSAT. At this work classic geodesic instrumentation (theodolites) like of space geodesy instruments(GPS) were used. 23 points place close the antennas, six or five of them around each one were observed with GPS. Afterwards, four marks (placed at both sides of each antenna) were observed from the GPS points with classic geodesic instrumentation (theodolites) in six different positions. Finally, the obtained set of coordinates for each antenna were adjusted with the least-squares algorithm in order to get the cross points between horizontal and vertical axes.

BIBLIOGRAPHY

David Riaño, Emilio Chuvieco, Sonia Condés, Javier González Matesanz. Generation of crown bulk density for Pinus sylsestris from LIDAR. 23rd EARSel Annual Symposium 2003. . Seleccionado como Special issue en Remote Sensing Environment. European Association of Remote Sensing Laboratories, Gent, Belgium, 77-81. 2-5 Junio 2003

González-Matesanz, F.J., Dalda-Mourón, *A.* Modelos De Transformación Entre Ed50 Y Etrs89. 5ª Setmana Geomàtica de Barcelona. Institut de Geomàtica, Barcelona, Program and Abstracts. 2003

J. Fernández, F. J. González-Matesanz, J. F. Prieto, G. Rodríguez-Velasco, A. Staller , A. Alonso-Medina, and M. Charco. GPS MONITORING IN THE N-W PART OF TENERIFE, CANARY ISLANDS. European Geophysical Society. American Geophysical Union of European Union of Geosciences Joint Assemby. EGS-AGU-EUG, Niza, Francia, . 6-10 Abril 2003

J. Fernández, G. Rodríguez-Velasco, J. González-Matesanz, J. F. Prieto, R. Romero, A. Staller, M. Charco, A. Alonso-Medina, T.-T. Y*u*. Geodetic monitoring system in Tenerife, Canary Islands, using InSAR and GPS. Strategy and results. Time-variable deformation and gravity fields: theory, observations and modelling. . International Association of Geodesy (IAG), Section IV: Theory and Methodology, Special Study Group 4.189: Dynamic theories of deformation and gravity fields, Casa de los Volcanes, Lanzarote, Canary Islands, Program and Abstracts, pag. 12. 18-21 Febrero 2003

J. Fernández, G. Rodríguez-Velasco, J. González-Matesanz, J. F. Prieto, R. Romero, A. Staller, M. Charco, A. Alonso-Medina, T.-T. Yu. Geodetic monitoring system in Tenerife, Canary Islands, using InSAR and GPS. Strategy and results. 2nd Meeting Special Study Group 4.189: Dynamic theories of deformation and gravity fields. International Association of Geodesy (IAG), Section IV: Theory and Methodology. Workshop: Time-variable deformation and gravity fields: theory, observations and modelling, Casa de los Volcanes, Lanzarote, Canary Islands, . 18-21 Febrero 2003

Weber, Georg, Gonzalez-Matesanz, *Javier*. EUREF-IP for Wireless GNSS/DGNSS,Example Implementation in Madrid. EUREF 2003 Symposium of the IAG Subcommission for Europe (EUREF). Subcomisión EUREF de la Asociación Geodésica Internacional para Europa, Toledo, Spain, Program and Abstracts. 4-7 Junio 2003

Fernández, J., González-Matesanz, Prieto, J.F., Rodríguez-Velasco, G., Staller, A., Alonso-Medina, A., *Charco, M*. Control con GPS de la zona noroeste de la isla de Tenerife. 4ª Asemblea Hispano Portuguesa de Geodesia y Geofisica. Comisión Nacional de Geodesia y Geofísica. Secçao Portuguesa das Unioes Internacionais Astronómica e Geodésica e Geofísica, Figueira da Foz, Portugal, Program and Abstracts pp. 531-532. 3 - 7 Febrero 2004

González-Matesanz, F.J, Quirós, R., Cano M., Dalda, *A.* Posicionamiento GPS en tiempo real a través de internet. EUREF-IP. Congreso nacional de Topografía y Cartografía Topcart 2004. Ilmo. Colegio oficial de ITT, Madrid, Program and abstracts. Noviembre 2004

González-Matesanz, F.J, Quirós, R., Cano M., Dalda, A. y Sanchez, J. El cambio de datum ED50-ETRS89. Métodos y resultados. Congreso nacional de

Topografía y Cartografía Topcart 2004. Ilmo. Colegio oficial de ITT, Madrid, Program and abstracts. Noviembre 2004

Priego, E., González-Matesanz, F.*J.* Catalogación de las estaciones de referencia GPS en España. Congreso nacional de Topografía y Cartografía Topcart 2004. Ilmo. Colegio oficial de ITT, Madrid, Program and abstracts. Noviembre 2004

Gonzalez-Matesanz, F.J., Quiros R., Cano, M. y Dalda, A. Euref-ip. towards an integrated GPS+internet positioning service. International Cartographic Conference. , A Coruña, Program and abstracts 44. Julio 9-16

Berné, J.L., Capilla, R., Cañas, A. Fernández, R., Gonzalez-Matesanz, F.J.,Malpica, J.*A.* Test de evaluación de transición de Datum en cartografía regional de Valencia. 5ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica. Comisión Nacional de Geodesia y Geofísica. Secçao Portuguesa das Unioes Internacionais Astronómica e Geodésica e Geofísica, Sevilla, . 30 de enero a 3 de febrero

Fernández, J., Yu, T.-T., Rodríguez-Velasco, G., Gonzalez-Matesanz, F.J., Romero, R., Rodríguez, G., Quirós, R., Dald*a, A., Aparicio, A., and Blanco, M.J.*, 2003. New Geodetic Monitoring System in the Volcanic Island of Tenerife, Canaries, Spain. Combination of InSAR and GPS Techniques. Journal Volcanology and Geothermal Research, 124/3-4, 241-253.

Fernández, J., F. J. González-Matesanz, J. F. Prieto, A. Staller, G. Rodríguez-Velasco, A. Alonso-Medina and M. Charco, 2004. GPS Monitoring in the N-W part of the Volcanic Island of Tenerife, Canaries, Spain. Strategy and results. Pure and Applied Geophysics, vol 161, nº 7, 1359-1377, DOI: 10.1007/s00024-004-2509-2. (también publicado en libro)

Fernández, J., Romero, R.; Carrasco, D., Tiampo, K.F., Rodríguez-Velasco, G., Aparicio, A., Araña, V., González-Matesanz, F.*J., 2005*. Detection of displacements in Tenerife Island, Canaries, using radar interferometry. Geophysical Journal International, 160, 33-45. doi: 10.1111/j.1365-246X.2005.02487.x.

Fernández, J., F. J. González-Matesanz, J. F. Prieto, A. Staller, G. Rodríguez-Velasco, A. Alonso-Medina and M. Charc*o,* 2004. GPS Monitoring in the N-W part of the Volcanic Island of Tenerife, Canaries, Spain. Strategy and results. ISBN 3-7643-7044-0. Birkhäuser Verlag, Basel-Boston-Berlin. Reprint de Pure and Applied Geophysics (PAGEOPH), vol 161 (2004), nº 7, 1359-1377

Gonzalez-Matesanz, F.J.,Malpica, J.A. Quasi-conformal mapping with genetic algorithms applied to coordinate transformations. Computer and Geosciences., Marzo 2006

González-Matesanz, F.J., Dalda, A. Malpica, J.A. A range of ed50-etrs89 datum transformation models tested on the Spanish geodetic network. Survey Review.2006

Quirós, R., Cano, M. A., Sobrino, J. A. S., Valdés, M.: ñNational Report of Spain: Spanish national Reference Station Network (ERGPS)ò. Mitteilungen des Bundesamtes für Kartographie und Geodäsie. Band 29. EUREF Publication No.12. Report on the Simposium of the IAG Subcomission for Europe (EUREF), held in Ponta Delgada 2002. Verlag des Bundesamtes für Kartographie und Geodäsie. Frankfurt am Main 2003. ISBN 3-89888-873-8 pp 290.

Quirós, R., Cano, M. A., Sobrino, J. A. S., Valdés, M.: ñNational Report of Spain: New Local Analysis Centre:IGEò. Mitteilungen des Bundesamtes für Kartographie und Geodäsie. Band 29. EUREF Publication No.12. Report on the Simposium of the IAG Subcomission for Europe (EUREF), held in Ponta

Delgada 2002. Verlag des Bundesamtes für Kartographie und Geodäsie. Frankfurt am Main 2003. ISBN 3-89888-873-8 pp 291.

Quirós, R., Barbadillo, A.., Cano, M. A., Sanz, M., Sobrino, J. A. S.: ñNational Report of Spain: REGENTE project finishedò. Mitteilungen des Bundesamtes für Kartographie und Geodäsie. Band 29. EUREF Publication No.12. Report on the Simposium of the IAG Subcomission for Europe (EUREF), held in Ponta Delgada 2002. Verlag des Bundesamtes für Kartographie und Geodäsie. Frankfurt am Main 2003. ISBN 3-89888-873-8 pp 292.

Quirós, R., Fraile, J., Bendala, F., Valdés, M., Sobrino, J. A. S.: ñNational Report of Spain: SERDAG Projectò. Mitteilungen des Bundesamtes für Kartographie und Geodäsie. Band 29. EUREF Publication No.12. Report on the Simposium of the IAG Subcomission for Europe (EUREF), held in Ponta Delgada 2002. Verlag des Bundesamtes für Kartographie und Geodäsie. Frankfurt am Main 2003. ISBN 3-89888-873-8 pp 293.

Barbadillo, A., De La Cruz, F., Quirós, R.: ñNational Report of Spain: REDNAP Projectò. Mitteilungen des Bundesamtes für Kartographie und Geodäsie. Band 29. EUREF Publication No.12. Report on the Simposium of the IAG Subcomission for Europe (EUREF), held in Ponta Delgada 2002. Verlag des Bundesamtes für Kartographie und Geodäsie. Frankfurt am Main 2003. ISBN 3-89888-873-8 pp 293.

Dalda, A., González-Matesanz, F. J.: ñNational Report of Spain: Development of the ED50-ETRS89 datum transitionò. Mitteilungen des Bundesamtes für Kartographie und Geodäsie. Band 29. EUREF Publication No.12. Report on the Simposium of the IAG Subcomission for Europe (EUREF), held in Ponta Delgada 2002. Verlag des Bundesamtes für Kartographie und Geodäsie. Frankfurt am Main 2003. ISBN 3-89888-873-8 pp 295.

Dalda, A., Rodríguez, E., Núñez E., Fernández M.: ñNational Report of Spain: Zero Order Gravity Network of Spainò. Mitteilungen des Bundesamtes für Kartographie und Geodäsie. Band 29. EUREF Publication No.12. Report on the Simposium of the IAG Subcomission for Europe (EUREF), held in Ponta Delgada 2002. Verlag des Bundesamtes für Kartographie und Geodäsie. Frankfurt am Main 2003. ISBN 3-89888-873-8 pp 296.

Quirós, R., Lozano, L., Cano, M. A., Sobrino, J. A. S., Valdés, M.: ñEstado actual del procesamiento de redes GPS en el IGNò. *4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Figueira da Foz (Portugal). 3-7 febrero 2004.

González-Matesanz, F. J., Weber, G., Celada, J., Dalda, A., Quirós, R.: ñEl proyecto EUREF-IP. Resultados con GPRSò. *4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Figueira da Foz (Portugal). 3-7 febrero 2004.

García-Cañada, L., Sevilla, M. J., Núñez, A., Cano, M. A.: ñEstado actual del procesamiento de redes GPS en el IGNò. *4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Figueira da Foz (Portugal). 3-7 febrero 2004.

Fernandez, J., González-Matesanz, Prieto, J. F., Rodríguez-Velasco, G., Staller, A., Alonso-Medina, A. Charco, M.: ñControl con GPS de la zona Noroeste de la isla de Tenerifeò. *4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Figueira da Foz (Portugal). 3-7 febrero 2004.

Celada, J., González-Matesanz, F. J., Dalda, A., Quirós, R., Vivas-White, P.: ñNueva web de cálculos geodésicos del Instituto Geográfico Nacionalò. *4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Figueira da Foz (Portugal). 3-7 febrero 2004.

González-Matesanz, F. J., Dalda, A., Quirós, R., Celada, J., Sobrino, J. A. S.: ñPredicción de diferencias entre ED50 y ETRS89ò. *4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Figueira da Foz (Portugal). 3-7 febrero 2004.

Sobrino, J. A. S. et al.: ñSpanish National Reportò. *EUREF 2004 Symposium*. Bratislava (Chequia). 2-6 June 2004.

Valdés, M. et al.: ñSpanish National Reportò. *EUREF 2005 Symposium*. Bratislava (Chequia). 1-4 June 2005.

Rodríguez Pujol, E., M. Fdez. Villalta, E. Núñez (2004) "Red gravimétrica absoluta de orden cero de España". IV Asamblea Hispano-Portuguesa de Geodesia y Geofísica: Comunicación. Febrero, Figueira da Foz (Portugal).

Rodríguez Pujol, E., M. Fdez. Villalta, E. Núñez (2004) "Red gravimétrica absoluta de primer orden de España". E. Rodríguez, M. Fdez. Villalta, E. Núñez. IV Asamblea Hispano-Portuguesa de Geodesia y Geofísica: Comunicación. Febrero, Figueira da Foz (Portugal).

Rodríguez Pujol, E., M. Fdez. Villalta, E. Núñez (2004) "Observaciones absolutas de la gravedad en el Pico Veleta (Granada)". E. Rodríguez, M. Fdez. Villalta, E. Núñez. IV Asamblea Hispano-Portuguesa de Geodesia y Geofísica: Comunicación. Febrero, Figueira da Foz (Portugal).

Rodríguez Pujol, E., M. Fdez. Villalta, E. Núñez (2004) "Resultados de Intercomparaciones de gravímetros absolutos". E. Rodríguez, M. Fdez. Villalta, E. Núñez. IV Asamblea Hispano-Portuguesa de Geodesia y Geofísica: Comunicación. Febrero, Figueira da Foz (Portugal).

Quirós, R., , Sobrino, J. A. S., Cano, M. A., Valdés, M.: ñNational Report of Spain: Spanish national GPS Reference Stations Network (ERGPS)ò. Mitteilungen des Bundesamtes für Kartographie und Geodäsie. Band 33. EUREF Publication No.13. Report on the Simposium of the IAG Subcomission for Europe (EUREF), held in Toledo 2003. Verlag des Bundesamtes für Kartographie und Geodäsie. Frankfurt am Main 2004. ISBN 3-89888-885-1 pp 283.

Barbadillo, A., De La Cruz, F., Quirós, R.: ñNational Report of Spain: REDNAP Projectò. Mitteilungen des Bundesamtes für Kartographie und Geodäsie. Band 33. EUREF Publication No.13. Report on the Simposium of the IAG Subcomission for Europe (EUREF), held in Toledo 2003. Verlag des Bundesamtes für Kartographie und Geodäsie. Frankfurt am Main 2004. ISBN 3-89888-885-1 pp 284.

Dalda, A., Rodríguez, E., Núñez E., Fernández M.: ñNational Report of Spain: Zero Order Absolute Gravity Network of Spainò. Mitteilungen des Bundesamtes für Kartographie und Geodäsie. Band 33. EUREF Publication No.13. Report on the Simposium of the IAG Subcomission for Europe (EUREF), held in Toledo 2003. Verlag des Bundesamtes für Kartographie und Geodäsie. Frankfurt am Main 2004. ISBN 3-89888-885-1 pp 285.

Dalda, A., González-Matesanz, F. J., Celada, J.: ñNational Report of Spain: RECORD (Radio Broadcasting of GPS Differential Correctionsò. Mitteilungen des Bundesamtes für Kartographie und Geodäsie. Band 33. EUREF Publication No.13. Report on the Simposium of the IAG Subcomission for Europe (EUREF), held in Toledo 2003. Verlag des Bundesamtes für Kartographie und Geodäsie. Frankfurt am Main 2004. ISBN 3-89888-885-1 pp 286.

Dalda, A., González-Matesanz, F. J.: ñNational Report of Spain: Development of the ED50-ETRS89 datum transitionò. Mitteilungen des Bundesamtes für Kartographie und Geodäsie. Band 33. EUREF Publication No.13. Report on the

Simposium of the IAG Subcomission for Europe (EUREF), held in Toledo 2003. Verlag des Bundesamtes für Kartographie und Geodäsie. Frankfurt am Main 2004. ISBN 3-89888-885-1 pp 289.

Valdés, M., Dalda, A., Quirós, R.: ñRed Geodésica de Observación Geodinámica del estrecho de Gibraltar 2004ò. 5ª *Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Sevilla (España). febrero 2006.CD ISBN 84-8320-373-1.

Rodríguez Pujol, E., Fdez. Villalta, M.: "Red de gravimetría absoluta en España". 5ª *Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Sevilla (España). febrero 2006.CD ISBN 84-8320-373-1.

Rodríguez Pujol, E., Fdez. Gil, A J.: "Determinaciones Absolutas de la Gravedad en Jaén". 5ª *Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Sevilla (España). febrero 2006.CD ISBN 84-8320-373-1.

Mena, J. B., Dalda, A.: ñDigitalización de datos antiguos registrados por el Mareógrafo de Alicanteò. 5ª *Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Sevilla (España). febrero 2006.CD ISBN 84-8320-373-1.

Barbadillo, A., De la Cruz, F.: ñNueva Red Española de Nivelación de Alta Precisión. Proyecto REDNAPò. 5ª *Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Sevilla (España). febrero 2006.CD ISBN 84-8320-373-1.

González-Matesanz, F. J., Malpica J. A. Dalda, A.: ñAplicación de los Algoritmos Genéticos en un problema de transformación de Sistemas de Referencia mediante polinomios conformes por trozosò. 5ª *Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Sevilla (España). febrero 2006.CD ISBN 84-8320-373-1.

Cano, M. A., Talaya, J., Termens, A., Quirós, R., Revuelta, L., Sobrino, J. A. S.: ñAjuste de la Red Geodésica de Orden Inferior R.O.I. de Cataluña en ETRS89ò. 5ª *Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Sevilla (España). febrero 2006.CD ISBN 84-8320-373-1.

García-Asenjo, L., González-Matesanz, Hernández, D..: ñCrs++ Software libre para la gestión de Sistemas de Referencia Coordenadosò. 5ª *Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. Sevilla (España). febrero 2006.CD ISBN 84-8320-373-1.

Quirós, R., Cano, M. A., Sobrino, J. A. S., Valdés, M.: ñEl Servidor FTP de la Red de Estaciones Permanentes del IGNò. Topografía y Cartografía. Band 29.Vol XIII-nº 128 Mayo-Junio 2005. ISSN 0212-9280 pp 42-46.

Rodríguez Pujol, E, Fernández de Villalta, M, Núñez Maderal (2003). ñRed gravimétrica de orden cero y primer orden en España., E. Actas de la 5ª Setmana de Geomática, Barcelona. 2003. En CD.

Rodríguez Pujol, E. (2004) "Absolute Gravity Network in Spain". Gravity, Geoid, and Satellite Missions (GGSM2004). Poster and paper in CD. September, Oporto (Portugal).

Rodríguez Pujol, E. (2005). ñMedidas gravimétricas en Madrid y en Españaò. Artículo de Divulgación. Anuario del Observatorio Astronómico 2005. Dirección del Instituto Geográfico Nacional. Ministerio de Fomento.

Rodríguez Pujol, E.(2005)."Absolute Gravity Network in Spain". *Física de la Tierra* 17, 147-163.

Rodríguez Pujol, E. (2005). "Absolute Gravity Network in Spain". EUREF Publication Symposium Viena. Poster and paper

6.- ROYAL INSTITUTE AND OBSERVATORY OF THE NAVY. (SAN FERNANDO)

REAL INSTITUTO Y OBSERVATORIO DE LA ARMADA (ROA).
Cecilio Pujazón s/n
11100 San Fernando (Cádiz). SPAIN.
PHONE: +34-956-599285.

Fax: +34-956-599366.
E_mail: jgarate@roa.es, mdavila@roa.es

The ñReal Instituto y Observatorio de la Armada en San Fernandoò (ROA), is a Navy Institution working on geodesy since its foundation on the mid XVIII century. Nowadays, the work on this area is mainly concentrated in Satellites Laser Ranging (SLR) and Global Positioning System (GPS) applications.

1. Satellites Laser Ranging (SLR).

Installed on the top of the main building, under a dome, ROA has a SLR station successively improved since 1968. During the period 2003-2006, the station has been upgraded in the following items:

. ÅMain and secondary mirrors were delivered to be recoated at Nice Observatory in February 2003. They were recovered in May 12th, but they should be sent again back to Nice, because some problems in the recoating. Finally they were successfully reinstalled in the beginning of September.
. ÅA complete refurbishment of the tracking station facilities was made during the summer of 2003.
. ÅRedesign and implement new electronic circuit boards.
. ÅA new CCD camera with light intensifier was located on the telescope in order to make easier the tracking of low/medium satellites.
. ÅA new continuous diaphragm was installed to replace the old one, allowing a more accurate satellite tracking.
. ÅThe old photomultiplier was decommissioned, because it was becoming worse. Since it is not as precise as the CSPAD detector, and it is not easy to find replacements, we decide to decommission it.
. ÅA new rack with the laser control system and the time measurement device was mounted. A set of three interval counters (SR620i) was installed in order to make a more accurate time measurements, allowing intercomparison among these devices.
. ÅOne of the counters was carried out to the Herstmonceaux SLR facility in the UK, in order to calibrate it against the set of counters of that station.
. ÅThe barometer was calibrated with respect a master which was delivered from the UK, and travelled around the SLR stations in Europe

The above mentioned modifications have been partially funded by the following research projects:

. Å ñDaylight tracking on artificial satellites by laser telemetryò (ESP2001-4514-PE), from the National Program for Space Research, óMinisterio de Ciencia y

Tecnologíaô of Spain.

. Å ñLaser Tracking on GNSS satellites (GPS, Galileoé)ò (ESP2004-4598), from the National Program for Space Research, ôMinisterio de Educación y Cienciaô of Spain.

A brief tracking statistics for the 2003-2006 period are:

2003:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Lageos 1	22	12			4	1			1	1	16	12
Lageos 2	17	1			7	6			1	0	4	7
Ajisai	26	12			53	28			3	14	48	31
Starlette	27	10			18	14			0	10	16	16
Topex	38	5			19	1			2	9	28	24
Stella	16	5			5	0			1	7	15	4
ERS2	18	7			24	16			1	6	9	12
Champ	0	0			2	0			0	0	2	3
Jason	19	1			9	0			1	3	9	11
GFO	7	3			12	12			0	7	16	8
BEC	28	8			15	2			4	7	31	20
Reflector	6	2			0	0			0	0	0	0
GRACE A	1	2			0	0			1	0	0	2
GRACE B	2	0			1	2			0	0	0	2
Meteor 3	0	0			2	2			0	0	0	0
Larets											5	6

Number of successful tracking in 2003

	1	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Lageos 1	7497	5242			934	106			104	26	3934	1372
Lageos 2	7051	690			3984	1663			317	0	871	1447
Ajisai	26847	8940			77121	25161			2739	7993	34141	31537
Starlette	9191	4099			4519	2519			0	2335	6205	4381
Topex	32258	6380			14014	860			1502	3521	19816	11220
Stella	6138	1833			1041	0			223	1569	5305	409
ERS2	4181	744			8436	4738			86	773	988	4365
Champ	0	0			109	0			0	0	215	100
Jason	7997	112			3680	0			364	870	2485	3677
GFO	1406	256			3004	4102			0	1814	2471	1503
BEC	21149	5081			7212	698			1647	3390	11613	12224
Reflector	296	81			0	0			0	0	0	0
GRACE A	40	347			0	0			896	0	0	105

GRACE B	284	0			145	664			0	0	0	71
Meteor 3	0	0			106	45			0	0	0	0
Larets											559	365

Number of successful echoes in 2003

2004:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Lageos 1	10	15	12	10	14	21	11	16	20	6	15	13
Lageos 2	13	18	11	7	0	1	11	7	23	16	16	5
Ajisai	22	52	27	7	54	12	42	48	24	24	63	9
Starlette	18	13	14	22	7	52	11	23	17	14	42	15
Topex	12	13	25	24	3	36	35	29	10	18	35	34
Stella	4	4	1	15	0	0	2	2	4	3	0	0
ERS2	7	7	7	9	25	33	31	28	19	12	13	21
Champ	1	1	1	3	1	7	2	2	9	0	3	1
Jason	6	5	18	20	3	26	22	24	3	7	30	33
GFO	3	8	0	3	12	14	0	1	24	7	10	11
BEC	9	30	16	27	5	59	21	30	30	15	44	13
GRACE A	1	7	0	0	2	10	9	1	0	1	3	6
GRACE B	2	5	1	1	5	9	8	1	0	1	7	8
Larets	6	4	3	7	9	11	10	14	10	6	8	18

Number of successful tracking in 2004.

	2	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Lageos 1	2381	7829	4612	1870	6306	6883	10947	16611	11509	3342	4331	38501
Lageos 2	5117	9644	7124	1370	0	1301	3535	5222	14254	6582	6129	965
Ajisai	20148	76301	43632	4987	142801	17288	77951	117467	15972	29728	82976	18224
Starlette	6022	5722	6510	12147	3682	15991	4117	9680	7362	7546	25031	3761
Topex	13361	13973	33581	31945	6183	54097	47286	33277	16168	18228	41450	40328
Stella	1722	1780	15	0	0	0	559	1452	1539	670	0	0
ERS2	2403	1389	918	2491	20045	29823	21322	16482	6767	2692	3537	7487
Champ	423	95	53	783	130	2591	835	368	3339	0	388	71
Jason	3685	2575	10972	14181	1580	21763	18910	21002	2924	1510	12349	17093
GFO	388	3502	0	2352	9253	10823	0	294	22672	1427	2509	4263
BEC	4864	27724	9912	27537	3698	65930	14727	31193	27979	13220	29937	13627

GRACE A	150	940	0	0	107	2422	3767	115	0	21	300	775
GRACE B	646	1413	21	109	759	2272	3485	90	0	22	804	1650
Larets	646	1313	632	1976	1772	2641	2003	3914	2249	983	2529	3559

Number of successful echoes in 2004.

2005:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Lageos 1	7	15	3	7	15	24	34	18	45	32	33	12
Lageos 2	4	17	1	23	30	14	10	0	20	18	39	20
Ajisai	37	68	7	55	44	10	63	29	21	30	41	6
Starlette	35	14	8	15	9	45	11	17	27	13	30	4
Topex	7	35	19	28	8	44	31	20	14	18	12	2
Stella	0	0	0	2	1	1	0	0	3	2	0	0
ERS2	18	18	3	23	23	31	27	19	28	16	8	8
Champ	2	0	0	1	4	0	0	0	5	6	0	1
Jason	4	24	15	23	3	34	26	16	3	22	14	12
GFO	8	22	5	12	11	2	2	4	26	9	10	1
BEC	30	16	17	7	39	25	32	27	20	36	11	22
GRACE A	1	0	0	1	3	6	0	0	5	3	3	0
GRACE B	2	0	1	2	10	5	0	0	7	6	1	2
Envisat	13	25	9	21	27	24	36	17	29	18	19	10
GP-B	2	2	0	12	7	0	5	0	15	6	10	3
Larets	12	16	7	13	12	13	16	7	17	8	12	8

Number of successful tracking in 2005.

	3	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Lageos 1	3088	5026	233	3304	11507	12164	33958	26022	64308	37345	25382	2113
Lageos 2	1163	3592	62	11845	20960	8003	4517	0	22887	18292	29512	9652
Ajisai	43493	124550	11769	97394	95068	6517	131558	49735	16511	30827	63864	8345
Starlette	16463	5022	3085	6596	5966	24163	4291	10062	16409	6121	17517	975
Topex	7319	35600	28352	41870	4246	64604	55592	34705	19419	16457	9649	1410
Stella	0	0	0	487	48	67	0	0	3717	992	0	0
ERS2	6029	6212	1321	14447	15650	23968	23167	12985	12638	5273	4452	2220
Champ	327	0	0	124	866	0	0	0	360	2003	0	185

Jason	766	8977	10758	20182	1617	26118	18787	11892	400	14093	3919	4458
GFO	10525	20812	1464	4541	6542	987	365	3692	18071	3556	4260	1730
BEC	26521	19128	6751	5987	45906	21191	36895	24411	13358	29585	6810	21414
GRACE A	251	0	0	181	1425	2453	0	0	1027	598	825	0
GRACE B	1448	0	481	372	3101	1966	0	0	1104	2207	334	276
Envisat	4595	6677	3914	12787	2279	19443	27562	13079	16271	8682	8002	2817
GP-B	270	175	0	2910	1984	0	2498	0	4543	1082	4014	2226
Larets	3257	3941	1294	2375	3112	4175	6018	1641	6612	1694	2364	2096

Number of successful echoes in 2005.

2006:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Lageos 1	10	15	21	18	16	7	3	4	4	2	13	13
Lageos 2	10	8	2	1	13	16	29	27	16	5	4	5
Ajisai	29	28	2	36	30	14	59	22	10	50	29	26
Starlette	19	4	6	19	9	25	3	38	24	15	50	13
Stella	0	0	0	0	0	0	0	0	1	0	3	1
ERS2	5	5	9	20	21	22	29	26	19	23	16	19
Champ	1	6	0	1	2	7	0	1	3	7	8	0
Jason	5	7	13	11	14	17	30	6	8	22	13	9
GFO	7	8	6	3	0	1	8	28	11	8	12	18
BEC	2	21	24	13	39	9	4	4	35	16	37	22
GRACE A	0	0	3	5	3	0	1	7	5	6	2	1
GRACE B	0	0	1	4	3	0	4	8	7	8	3	3
Envisat	7	10	11	18	24	23	27	30	16	19	21	21
GP-B	0	2	0	8	14	0	0	0	0	0	0	0
Larets	3	5	6	8	6	9	17	20	13	17	12	9

Number of successful tracking in 2006.

	4	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Lageos 1	2441	3453	14401	17162	20144	5465	474	2940	3535	725	13166	5377
Lageos 2	2369	1340	837	17	11317	8718	45381	47652	10618	8817	571	1150
Ajisai	49782	35024	536	55190	47191	18000	165899	63391	9591	102968	61671	32684
Starlette	9789	2454	1911	11013	5983	12035	1158	27799	11228	11712	39176	5397
Stella	0	0	0	0	0	0	0	0	389	0	319	1433

ERS2	2658	1383	3264	8825	14463	15281	22996	23511	8649	18997	8949	7168
Champ	54	1203	113	30	237	2558	0	131	408	1256	3334	0
Jason	266	3190	4453	11804	12918	9958	41760	11709	2857	23258	8546	6976
GFO	4100	2423	2555	1352	0	45	6453	28403	3883	6108	7740	10972
BEC	318	12540	32901	9870	45311	7587	51246	3545	36603	16629	52044	23846
GRACE A	0	0	614	2176	1156	0	74	2089	664	2930	849	83
GRACE B	0	0	63	1137	821	0	869	1596	1818	2302	815	434
Envisat	2553	3655	3350	10160	15365	19765	27621	27693	6285	10938	12984	10402
GP-B	0	70	0	2932	9967	0	0	0	0	0	0	0
Larets	1609	788	2585	2002	1771	3872	3762	5869	2769	5152	3836	2726

Number of successful echoes in 2006.

On the other hand, since June 7th, 2004, until June 11th, ROA organized the 14th LASER RANGING WORKSHOP, held in San Fernando. About 120 people involved in the International Laser Ranging Service attended the meeting. A proceedings volume was issued, including the main topics developed during the workshop. Presentations shown at the workshop, as well as papers related, are available through the ILRS web page (ilrs.gsfc.nasa.gov)

2. GPS geodetic activity.

During this period ROA has organized several field surveys, in the Andalusian Region in order to complete the GPS Geodetic Network, getting data files at Cordoba, Castillo de Segura, Malaga and Almeria. The set of data files is going to be used in the development of a Ph. D. which is scheduled to be presented during the year 2007.

The Cuateneo Network, installed by the Catalonian Cartograpich Institute, and the University of Barcelona was also revisited in 2006. ñCuateneo-2006ò GPS episodic survey was organized by the San Fernando Observatory in collaboration with the University of Barcelona, covering the Cuateneo GPS Network at Murcia and Almeria provinces. We had the support of University of Cadiz students to perform the observations at field. The survey was carried out in September 2006, and was funded by the ó*Ministerio de Educación y Ciencia*ô of Spain through the action CGL2004-21666-E

Furthermore some new Continuous GPS stations were added to the ROA CGPS Geodetic Network. In the beginning of 2003 a new CGPS was installed at Alboran Island, and, in February 2005, another CGPS was installed at Velez de la Gomera, in the Northern African Coast. The aim was the densification of the Observatory GPS permanent network with geodynamic purposes.

The Observatory has also participated in the EU funded researching Project ESEAS-RI, devoted to implement the infrastructure to study the Mean Sea Level evolution around

the European Coasts. The main idea of the GPS contribution was to decontaminate tide gauge measurements from tectonic effects on their bench marks. Data analysis of a set of CGPS stations all around the European coast were carried out. Vertical displacements were obtained, and their trends were applied on tide gauge records. In the same project frame, a new CGPS was installed in Ceuta in order to implement the Dual- CGPS concept. The idea is to compare CGPS data records from the equipment collocated with the tide gauge, with those recorded at a CGPS located in the main land. In this way one could get local effects on the CGPS located on the piers, and so make corrections over these effects.

In June 2003, a Jason satellite radar altimeter calibration field survey was performed at the surroundings of Ibiza Island. It was an indirect calibration, by making GPS measurements of the sea level, while sailing in the neighbourhood of a satellite cross track. In this way comparison between the mean sea level we got for the area, and altimetry measurements made from the satellite radar are availables.

All the GPS data coming both the field campaings and permanent stations, are processed by using the GIPSY-OASIS II software (Jet Propulsion Lab.).

The above mentioned GPS activities have been funded by the following research projects:

. Å ñAutomatic Geophysical Stationò (MN-8302), Spanish Defence Ministry Research programs.
. Å ñEarthquakes and Crustal Deformation at Southern Spain: Seiemic Hazard Applicationsò (REM2000-0777-C02-02), from the National Program for Space Research, óMinisterio de Ciencia y Tecnologíaô of Spain.
. Å ñEscenarios realistas de riesgo sismico en Españaò (REN2003-05178-C03-02), from the National Program for Research, óMinisterio de Ciencia y Tecnologíaô of Spain.

3. Publications:

Gárate, J.; Martín Davila, J. La Geodesia Espacial, una herramienta de futuro. óRevista Española de Físicaô vol. 17, 33--38 Real Sociedad Española de Física. Facultad de Ciencias Físicas. Universidad Complutense de Madrid. Madrid Spain.

Martinez Benjamin, J.J.; Gonzalez, S.; Nuñez, A.; Bullí, F.; Lopez-Marco, J ;Martín Davila, J.; Garate, J. et al (2004) Ibiza Absolute Calibration Expeiment: Survey and Preliminary Results. óMarine Geodesyô vol. 27, 657--681 Taylor & Francis. Filadelfia (USA)

Martinez Benjamin, J.J.; Martinez, M.; Ortiz, M.A.; Rodríguez, G.; Martín Davila, J.; Garate, J. et al (2005). Calibration Altimeter Sites at Cape Bagur and Ibiza Island. óFísica de la Tierraô vol. 17, 33--45 Universidad Complutense de Madrid. Madrid Spain.

Khazaradze, G., Suriñach, E., Gárate, J., and Davila, J. M. (2005): Crustal Deformation in Eastern Betics, Spain . óTerra Nostraô vol.5 n.1 64ð 65. Madrid Spain**.**

Martín Davila, J.; Gárate, J.; Pazos, A.; Catalán, M. (2006): La Geofísica en el Real Instituto y Observatorio de la Armada en San Fernando. ôFísica de la Tierraô vol. 18, 119--135 Universidad Complutense de Madrid. Madrid Spain.

Gárate, J., Martín Davila, J., Suriñach, E., Berrocoso, M., Pérez-Peña, A.., Talaya, J., (2003) CUATENEO Network: preliminary results after first reobservation. *European Geophysical Society. XXVi General Assembly* Nice (France)

Martínez-Benjamín, J. J., Martínez, M., Núñez. A., Ortiz, M. A., Talaya, J., Perez, B., Martín Davila, J., Gárate, J., Vigo-Aguiar, M. I., Rodríguez, G. (2003) JASON 1 CALVAL 2003 Campaign at the Ibiza Island area.. *European Geophysical Society. XXVi General Assembly* Nice (France)

Gárate, J., Martín Davila, J., García Silva, C. (2004) Contribución del Observatorio de San Fernando al proyecto europeo ESEAS-RI.. *4ª ASAMBLEA HISPANO-PORTUGUESA DE GEODESIA Y GEOFÍSICA* Figueira da Foz (Portugal)

Gárate, J., Martín Davila, J., Berrocoso, M., Pérez-Peña, A. (2004) Red Geodinámica del Observatorio de San Fernando: Resultados preliminares a partir de campañas episódicas. *4ª ASAMBLEA HISPANO-PORTUGUESA DE GEODESIA Y GEOFÍSICA* Figueira da Foz (Portugal)

Gárate, J., Martín Davila, J., Berrocoso, M. (2004) Series temporales para las estaciones GPS del Observatorio de la Armada en San Fernando. *4ª ASAMBLEA HISPANO-PORTUGUESA DE GEODESIA Y GEOFÍSICA* Figueira da Foz (Portugal)

Gárate, J. Martín Davila, J., Berrocoso, M., Pérez-Peña, A., Garcia Silva, C. (2004) Time series for Southern Spain ï Northern Africa GPS permanent Network. *European Geosciences Union. 1st General Assembly* Nice(France)

Martínez Benjamin, J.J., Martín Davila, J., Gárate, J., Bonnefond, P., Rodriguez, G,, Pérez, B., Ortiz Castellon, M.A., Talaya, J., Gonzalez, S., Nuñez, A. (2004) IBIZA 2003 Jason-1 IBIZA 2003 Campaign and Preliminary Results. *European Geosciences Union. 1st General Assembly* Nice(France)

Gárate, J. Martín Davila., J. Quijano. M., Belza, C. (2004) San Fernando SLR: status and future objectives. *14th International Workshop on Laser Ranging* San Fernando (Spain)

Vigo-Aguiar, I., Ferrándiz, J., Gárate, J., Martín Dávila,J., García D. (2004) Determination of the Site Position at the SLR Tracking Station (7824). *14th International Workshop on Laser Ranging* San Fernando (Spain)

Gárate, J. Martín Davila., J. (2004) San Fernando Observatory GPS network: time series. *XII Asamblea General. Proyecto WEGENER* Tangier (Morocco)

Martín Davila., J.; Guitart, A.; Palomo, C.; Carbó, A.; Catalán, M.; Villarubia, J.; Acosta, J.; Muñoz Martín, A.; Marín, J.A.; Herranz, P.;Gárate, J.; Muñoz, A.; Gómez, M.;J de Andrés.J.R. (2004) Spanish Economic Exclusive Zone (ZEEE) Project: Almost 10 years of marine systematic surveys at Valencia Trough and Balearic Sea (Western Mediterranean), Canary Islands and Bank of Galicia (NW Iberian Peninsula). *XII Asamblea General. Proyecto WEGENER* Tangier (Morocco)

Khazaradze, G.; Suriñach,E.; Gárate, J. Martín Davila., J., Fleta,J.; Goula, X.; Soro, M. Térmens, A. Giménez, J. (2004) Present-day Crustal Deformation in Eastern Betics (SE Spain) inferred from two observations of the CuaTeNeo GPS network. *XII Asamblea General. Proyecto WEGENER* Tangier (Morocco)

Gárate, J. Martín Davila., J. Garcia Silva,C. (2004) ROA Preliminary Results for the ESEAS GPS Network. *Workshop on Observing and Understanding Sea Level Variations.* Malta (Malta)

Khazaradze, G., Suriñach, E., Gárate, J., and Davila, J. M. (2005) Active deformation in eastern Betics (SE Spain) inferred from GPS measurements and numerical modelling. *European Geosciences Union General Assembly* Wien (Austria)

Gárate, J.; Fernandes, R.M.S.; Bos, M.S. (2006) Efectos de la Carga de Marea Oceánica en la Costa Atlántica de la Península Ibérica.. *5ª ASAMBLEA HISPANO-PORTUGUESA DE GEODESIA Y GEOFÍSICA* Seville (Spain)

Gárate, J.; Martín Davila, J.; Garcia Silva, C.; Perez Peña, A (2006) Análisis de Series Temporales efectuado por el ROA en el marco del proyecto ESEAS-RI. *5ª ASAMBLEA HISPANO-PORTUGUESA DE GEODESIA Y GEOFÍSICA* Seville (Spain)

Berrocoso,M.; Fernandez-Bruna,D.; Fernandez-Prada, J.A.; Gárate, J.; Garcia Silva, C.; Gil, A. ; et al. (2006) La red Andaluza de posicionamiento. *5ª ASAMBLEA HISPANO-PORTUGUESA DE GEODESIA Y GEOFÍSICA* Seville (Spain)

Gárate, J.; Martín Davila, J.; Perez Peña, A. (2006) Plate Boundary Deformation at the Strait of Gibraltar Area from GPS episodic surveys and CGPS: preliminary results. *European Geosciences Union General Assembly* Wien (Austria)

Berrocoso, M.; Paez, R.; Sanchez-Alzola, A.; Perez-Pena, A.; Hermosilla, A.; Redondo, M.; Gárate, J. (2006) A Permanent GPS Network for Andalusia (Spain). *XIII Assembly of the WEGENER project*. Nice (France)

NATIONAL REPORT ON GEOMAGNETISM AND AERONOMY
FOR

2003 - 2007

Dr. Alicia García
IAGA National Correspondent of Spain

This report outlines the progress reached in Spain during the period 2003-2007 in Geomagnetism and Aeronomy.

Paleomagnetism

Paleomagnetism Commission has been created inside the Geological Society of Spain, being the most recent of their commissions. Initiatives for this commission started in 2001, having place its definitive structure during the IV Spanish Geological Assembly in 2004 (Zaragoza, Spain). As part of its activities, Paleomagnetism Commission organizes the meeting on MAGnetism of IBERia (MAGIBER). This congress rounds up paleomagnetic scientists working on Iberian Plate environ, from geological, archaeological, urban and biological points of view.

MAGIBER III (2004): Celebrated in Zaragoza as part of the IV Spanish Geological Assembly (July, 12^{th} to 15^{th}), with 19 presentations and a round table. The main aspects of discussion were:

- Revision of the published dataset with special attention to the quality criteria defined by Van der Voo (1993).
- Critical evaluation of existing data specially those referring to:
    - Possible remagnetizations
    - Possible block rotations/thrusts
- Creation of a paleomagnetic database of Iberia
- Discussion on Iberia evolution from paleomagnetic data/Euler poles obtained from the study of oceanic magnetic anomalies.
- Definition of the main research trends, coordination and methodological approaches of future paleomagnetic studies.
- Valuation of the coordination between the Paleomagnetic Commission and MAGIBER WG.

MAGIBER IV (2006): Celebrated in Vigo (Galicia, Spain; September, 28th and 29th) by the University of Vigo, the University of Coimbra (Portugal) and the Geological Society of Spain. The main topics of this congress were: Paleomagnetism, Magnetostratigraphy, Environmental Magnetism, Archaeomagnetism, and Geomagnetism with 31 Spanish and Portuguese contributions.

Special Pub. ñMAGIBER I: Paleomagnetismo en la Península Ibéricaò (2006). M. Calvo; M. Garcés; C. Gomes; J.C. Larrasoaña; E. Pueyo and J.J. Villalaín (scientific editors). University of Burgos: 134 pp.

Asamblea Hispano - Lusa de Geodesia y Geofísica

This meeting is the forum for Portuguese and Spanish researchers to present and discuss the recent scientific investigations carried out in the field of Geodesy and Geophysics. Biannually celebrated since 1998, it is alternatively organized by Spain and Portugal. The Scientific Sessions of this meeting follows the IUGG Scientific structure (Astronomy and Geodesy, Volcanology, etc.) as well as Applied Geophysics. The Geomagnetism and Aeronomy Session tries to gather the advances in those issues related to the measurement and study of the Earth Magnetic Field and its variations, as well as to the processes in the medium and high atmosphere through which solar emissions interact with our planet:

Secular and Paleosecular variations, Main field origin, techniques of analysis of the Geomagnetic field, magnetic anomalies and magnetic properties of rocks, magnetic surveys at local, regional and continental scales, inversion of magnetic data, processing and modelling techniques, Electromagnetic Induction, Paleomagnetism, inversion of Earth Magnetic field, Magnetostratigraphy, Archaeomagnetism, Environmental Magnetism, Magnetic Anisotropy of rocks, Magnetospheric phenomena, Solar wind, Interplanetary Magnetic field and Magnetic and Ionospheric Observatories. The Session also includes aspects as Dynamics and Aeronomy in medium-high Atmosphere, Ionospheric disturbances and variations, models and experimental results, Ionosphere - Neutral Atmosphere coupling, Total Electron Content of the Ionosphere, Ionospheric variations caused by magnetic and solar activity, and Ionospheric prediction. Finally, Satellite magnetic measurements and Planetary Magnetism are also considered.

IV Asamblea Hispano ï Lusa de Geodesia y Geofísica (Figueira da Foz, Portugal; February, 2004): 18 oral and 5 poster communications were presented in the Session of Geomagnetism and Aeronomy. As well, members of the Section presented 20 communications in other Sessions of this Assembly.

V Asamblea Hispano - Lusa de Geodesia y Geofísica (Sevilla, Spain; January 30th - February 3rd, 2006): 18 oral and 7 poster communications were presented in the Session of Geomagnetism and Aeronomy. As well, members of the Section presented 22 communications in other Sessions of this Assembly.

International Workshop ñChallenges for Geomagnetism, Aeronomy and Seismology in the XXI Centuryò on the occasion of the Centennial of Ebro Observatory (Roquetes, Tarragona, Spain; September 28th - October 1st, 2004). The Workshop was thought to address the following questions:

- Is the observation of geophysical parameters still necessary? When will we have enough information?
- From where and how should the new observations be done?
- To what extent are our models reflecting the reality? In which way can they be improved?
- Frontier and multidisciplinary topics including Geomagnetism, Aeronomy and Seismology

With 74 participants from 14 countries, the meeting was structured on 12 invited lectures with discussion. All the contributions were presented on poster (50).

X IAGA General Assembly (Toulouse, France; July 18th - 29th, 2005)

25 contributions, with Spanish co-authors, presented in six different sessions. 30 Spanish participants, 1 Spanish Convenor (GAV02, Div. 5). Assistance to ñNational Delegates Meetingsò and to ñMagnetic Observatoriesò, ñModellingò and ñInternational Geomagnetic Year (IGY)+50ò specific meetings.

Workshop IRI2005

Celebrated at Roquetes, Tortosa and Horta de Sant Joan (Tarragona, Spain; June 27th ï July 1st; 2005). The ñInternational Reference Ionosphereò (IRI) is an international project promoted by ñCommittee on Space Researchò (COSPAR) and ñInternational Union of Radio Scienceò (URSI). These organizations formed a Working Group (IRIWG) to produce an empirical standard model of the terrestrial ionosphere, based on all available data sources (ground-based, satellites, rockets, etc.). Several steadily

improved editions of the model have been released. For given location, time and date, IRI describes the electron density, electron temperature, ion temperature, and ion composition in the altitude range from about 50 km to about 2000 km; and also the electron content. It provides monthly averages in the non-auroral ionosphere for magnetically quiet conditions. The model is continuously updated according to the availability of new data, research and validation results. These updates are prepared yearly, especially during IRI Workshops as the one it was organized, and during the COSPAR general assemblies. Several extensions are planned, including models for the ion drift, description of the auroral and polar ionosphere, and improved consideration of magnetic storm effects. More than 40 international researchers participated with more than 60 contributions. Some selected contributions will be published in a special issue of *Advances in Space Research*, Elsevier Ed., *(guest editors* D. Bilitza, B. Beinisch and D. Altadill) and coordinated by Ebro Observatory.

XVIII International Workshop *ñElectromagnetic Induction in the Earthò* (IAGA, WG I-2). Celebrated in El Vendrell (Tarragona, Spain; September 19th ï 22nd; 2006). Organized by the Dep. of Geodynamics and Geophysics (University of Barcelona). 270 participants from 43 countries and 315 contributions.

Other recent activities

Marine Magnetic survey on the North of Tenerife Island and Aeromagnetic flight over Tenerife Island (Canary Islands, Spain).

After an increase of seismic activity, with events concentrated in a new region of Tenerife I., detected in 2004, the Spanish Ministry of Education and Science promoted a research project in order to get a better understanding of the situation, its origin and possible temporal evolution. The TEGETEIDE project, coordinated by A. Garcia (Dep. of Volcanology, CSIC, Madrid), have been developed in 2005-2006 with more than 100 researchers from several countries. Between other activities, some magnetic studies have been carried out: A Marine Magnetic survey, developed by Royal Institute and Observatory of Spanish Army (ROA), and an Aeromagnetic Flight, in collaboration with the INGV (Rome, Italy) and University of Burgos (Spain). At this moment, the first anomaly maps are in edition and will be presented in the next IUGG meeting in Perugia. Besides that, a volcanomagnetic network has been designed, deployed and operated at Tenerife I. from June 2005.

COST 296. The Spanish Institute of Aerospatiale Techniques (INTA) and Ebro Observatory are very active groups of COST 296: *Mitigation of Ionospheric Effects on Radio Systems* (MIERS). The Spanish contribution to the *International Heliospheric Year* (2007) web is coordinated by Ebro Observatory. Also in COST 296, the *European Digital Upper Atmosphere Server (DIAS)* EU-Project is being developed by a team of several Spanish Institutions. The main aim of DIAS project is to offer an information system of the Ionosphere dynamics to contribute to guarantee the communications via satellite. The official presentation of DIAS project to civil and military communities has been organized by INTA last February.

Workshop on Geomagnetic Observatory Instruments, Data Acquisition and Processing (IAGA) 2004, 2006. Assistance of Spanish Geographic Institute (IGN) and Ebro Observatory.

During the EGU 2006 General Assembly celebration, ROA was integrated to the WDMAM, assigning it the Atlantic sector to generate the integral marine magnetic anomaly map. Besides that, ROA is a member of the INTERMAGNET-World Geomagnetic Observatories- since July, 2006.

Some sheets of the Magnetic Anomaly Maps (1:200.000) of the Exclusive Economic Zone have been published by the Spanish Oceanographic Institute and ROA.

The Spanish Geographic Institute has published in 2006 the ñMapas geomagnéticos de España (España peninsular e Islas Baleares) Época 2005.0".

Thanks are due to the different Groups which provided the information outlined in this report.

Alicia. García
IAGA National Correspondent

MUSEO NACIONAL DE CIENCIAS NATURALES (csic)
Grupo de Geomagnetismo
José Gutiérrez Abascal, 2
28006, MADRID, SPAIN.
Tf: 34-91-4111328
Fax: 34-91-5644740

1. AREAS OF RESEARCH

- Volcanomagnetism. Magnetic networks for volcano monitoring.
- Design of new magnetic sensors.
- Structural models from aeromagnetic and marine magnetic data.
- Correlations between seismic, electromagnetic and magnetic anomalies in active volcanic areas.

2. SCIENTIFIC PROJECTS

- e-Ruption: A Satellite Telecommunication and Internet-Based seismic Monitoring System for Volcanic Forecasting and Risk Management. European Union. Main Researcher of CSIC (Spain): A. García. 2002-2004

- Monitoring of volcanic activity in Timanfaya volcano (Lanzarote, Canary I.). Correlations between temperature variations, seismic activity and electromagnetic perturbations. Spanish Ministry of Science and Technology. Main Researcher: R. Ortiz (CSIC). 2002-2005

- Volcanological Research in Timanfaya National Park (Lanzarote, Canary I.) (MMA-112/2003). Spanish Ministry of Environment. Main Researcher: Alicia García (CSIC). 2004-2006.

- Local Organizing Committee of the XXVII Annual meeting of the Seismic Phenomena associated with Volcanic activity Working Group (ESC-IASPEI) (CGL2004-20453-E). Spanish Ministry of Education and Science. Main Researcher: Alicia García (CSIC). 2005-2006.

- Geophysical and Geodetic Techniques to study Teide - Pico Viejo complex active volcanic area (TEGETEIDE) (CGL2004-21643E). Spanish Ministry of Education and Science. Main Researcher: Alicia García (CSIC). 2005-2006.

- Volcano-Tectonic activity of Deception I. and its surroundings (Antarctica) (VOLTEDEC) (CGL2005-07589-C03-01/ANT). Spanish Ministry of Education and Science. Main Researcher: Manuel Berrocoso (Cadiz Univ.). 2005-2008.

- New Methodologies for studying and modelling sismo-volcanic activity and local deformation at Teide volcano (METOTEIDE) (CGL2005-25066-E). Spanish Ministry of Education and Science. Main Researcher: Alicia García (CSIC). 2006-2007

- Aeromagnetic survey of Deception I. active volcano (Antarctica) (CGL2006-27065-E/ANT). Spanish Ministry of Education and Science. Main Researcher: Alicia García (CSIC). 2007-2009

3. PUBLICATIONS

Amado M., P.; A. Aparicio; A. García (2006). Relaciones tectónica-volcanismo del rift de Santiago (Tenerife, España). Boletín de la Real Sociedad Española de Historia Natural. Sección Geológica. Vol.: 101 (1-4): 97-104

Berrocoso, M.; A. Fernández-Ros, C. Torrecillas, J. M. Enríquez de Salamanca, M. E. Ramírez, A. Pérez-Peña, M. J. González, R. Páez, Y. Jiménez, A. García-García, M. Tárraga, F. García- García. (2005). Geodetic Researches in Deception Island. In: "Antactica-Contributions to Global Earth Sciences". Springer Verlag: 389- 394

Berrocoso, M.; A. García, J. Martín-Dávila, M. Catalán- Mogollón, M. Astiz, M. E. Ramírez, C. Torrecillas, J. M. Enríquez-Salamanca. (2005) Geodynamical studies in Deception Island: DECVOL and GEODEC Projects. In: "Antactica-Contributions to Global Earth Sciences". Springer Verlag: 281-286

Blanco-Montenegro, I.; G. Montesinos, F.; García, A.; Vieira, R.; Villalaín J.J. (2005) Paleomagnetic determinations on Lanzarote from magnetic and gravity anomalies: Implications for the early history of the Canary Islands. Journal of Geophysical Research. Vol. 110: B12102-B12111

Garcia, A.; Vila, J.; Ortiz, R.; Macià, R.; Sleeman, R.; Marrero, JM.; Sanchez, N.; Tarraga, M.; Correig, AM. (2006). Monitoring the reawakening of Canary Islandsô Teide volcano. EOS. Vol. 87. no. 6: 61-72

Gottsmann, J.; L. Wooller, J. Marti, J. Fernandez, A. Camacho, P. Gonzalez, A. Garcia & H. Rymer (2006). New evidence of the rewakening of Teide volcano. Geophysical Research Letters. Vol. 33, L20311, doi:10.1029/2006GL027523

Ortiz, R.; Moreno, H.; García, A.; Fuentealba, G.; Astiz, M.; Peña, P.; Sánchez, N.; Tárraga, M. (2003). Villarrica volcano (Chile): Characteristics of the volcanic tremor and forecasting of small explosions by means of a material failure method. Journal Geothermal and Volcanological Research. Vol. 269:1-13

Paredes, C.; Perez-Lopez,R.; Giner-Robles, JL.; De la Vega, R.; Garcia Garcia, A.; Gumiel, P. (2006). Distribución espacial y zonificacion tectonica de morfolineamientos en la isla Decepcion (Shetland del Sur, Antartida). Geogaceta. Vol. 39:75-78

Ruiz, J.; J.A. Alvarez-Gómez, R. Tejero, N. Sánchez, Heat flow and thickness of a convective ice shell on Europa for grain size-dependent rheologies, *Icarus* (2007), doi: 10.1016/j.icarus.2007.03.015

Sánchez Jiménez, N. (2003). Estructura gravimétrica y magnética de la corteza del Suroeste Peninsular (Zona Surportuguesa y Zona de Ossa-Morena). Ed. Complutense, Col. Tesis Doctorales CD-ROM. 243 pp.

Sánchez, N.; A. García, S. Marsal, M. Tárraga, B. Casas and F. García. Red Volcanomagnética del Teide-VOLMAGTEGETEIDE. Proceedings de la 5ª Asamblea Hispano-Lusa de Geodesia y Geofísica. Sesión Geomagnetismo y Aeronomía. Public. Elctr. Ministerio de Medio Ambiente ISBN: 84-8320-373-1. 2006.

Tárraga, M.; Carniel, R.; Ortiz, R.; García, A.; Moreno, H (2006) A dynamical analysis of the seismic activity of Villarrica volcano (Chile) during September-October 2000. Chaos, Solitons and Fractals. doi:10.1016/j.chaos.2006.10.062

Tárraga, M.; Carniel, R.;Ortiz, R.;Marrero J.M.; García, A. (2006) On the predictability of volcano-tectonic events by low frequency seismic noise analysis at Teide-Pico Viejo volcanic complex, Canary Islands. Natural Hazards and Earth System Sciences. Vol. 6: 365-376

Tárraga, M.; R. Carniel, R. Ortiz, A. García. Failure Forecast Method as a possible solution to the problem of forecasting reawakening of dormant volcanoes. In: Caldera Volcanism: analysis, modelling and response, Developments in Volcanology. Gottsmann, J & Marti, J (eds). Elsevier. (in press)

Tejero, R.; Gómez Ortiz, D.; Sánchez Jiménez, N.; Rey Moral, C. (2004). In: Tejero R. and Fernández-Gianotti, J. (Eds.) (2004). CD-Rom annex to ñGeología de Españaò. In: ñGeología de Españaò (J. A. Vera, Ed.), SGE-IGME, Madrid.

Torrecillas, C.; M. Berrocoso, A. García. (2005). Multidisciplinary Scientific Information Support System (SIMAC) for Deception Island. In: "Antactica-Contributions to Global Earth Sciences". Springer Verlag: 395- 400

INSTITUTO GEOGRÁFICO NACIONAL
General Ibáñez Ibero, 3
28003, MADRID. SPAIN.
Tf: + 34 91-5979521
Fax: + 34 91-5979616

1. AREAS OF RESEARCH

- Magnetic Observatories.
- Spanish repeat station program - (Mainland, Balearic Islands and Canary Archipelago).
- Geomagnetic maps - all components and secular variation.
- Geomagnetic annuaries.
- Aeromagnetism - confection and interpretation.

2. SCIENTIFIC PROJECTS

- Collaboration since 1997, of the IGN´s magnetic observatories in the INTERMAGNET project. The data of San Pablo de los Montes (SPT) and Güimar (GUI) observatories (minute by minute) are send to the Intermagnet project: (1998, 1999, 2000 already sent, recorded in CD).
- Complementary development of the software for San Pablo de los Montes, Güimar and Geomagnetic Central of Madrid.
- Collaboration in the OERSTED Project.
- Collaboration in the MagNetE (MagneticRepeat Stations in Europe) project. Previous studies for the localization of sites for variometric stations.
- Airbone magnetic survey of the Gulf of Cadiz (2005). Merging the data with the airmagnetic adjacent surveys (Iberian Peninsula and Alboran sea). Preliminary interpretations.

3. PUBLICATIONS

- Mapas GeoMagnéticos (Península e Islas Baleares) Epoca 2005.0; IGN, 2006.
- Anuarios de Geomagnetismo de San Pablo de los Montes y Güimar (2001, 2002, 2003)
- Anuarios de Geomagnetismo, Observatorios de San Pablo y Güímar. Años (2001, 2002, 2003)

INSTITUTO NACIONAL DE TÉCNICA AEROESPACIAL
Estación de Sondeos Atmosféricos ñEl Arenosilloò
21130, MAZAGÓN (Huelva). SPAIN
Tf: +34 959 208 855
Fax: +34 959 208 857

1. AREAS OF RESEARCH

- Evolution of the ozone total content, aerosol, and ultraviolet radiation study in middle latitude, using Dobson spectrophotometer, CIMEL, Brewer spectrophotometer and Yankee radiometer. Tropospheric ozone study in Andalusian Region.

- Evolution of the lower and upper ionosphere study in middle latitude, using Digisonde 256 and Absorption Meter A3 and following the ITU recommendations, the European Spatial Agency (ESA) and the Action COST296.

- Prediction of ionospheric parameters for channel characterization with HF technology: ñModelling and stability of non-linear systems based on fuzzy-logic applied to the use of the ionosphere as an HF communication channel". ñMeasuring and processing of atmospheric parameters for modelling and forecast in the high ionosphereò. (Joint workgroup with Dpto. Sistemas Informáticos y Automática de Sistemas e Ingeniería Eléctrica Huelva University).

- Ionospheric Parameter Measures and Data Base Creation. International Campaigns Participation (ITU-R 222 1/3).

- Effects of the Ionosphere over Satellite - Satellite and Satellite Earth Links (ITU-R 226 2/3). Electronic Density Profiles applications calculated from Ionospheric Parameters obtained with the Digisonde 256, for validation of measures of the Total Electron Content (TEC) provided by GNSS (Global Navigation Satellite Systems).

- Variability in the Ionosphere associated to irregular events produced in the Sun-Earth system. (Geomagnetic Storms, Solar Flares, seismicity,...), and his application to ionospheric forecast.

2. SCIENTIFIC PROJECTS

- Project COST271 of UE ñEffects of the upper atmosphere on terrestrial and Earth-space communicationsò. From 2000-2004.

  - WP1.2.- Real-time satellite and terrestrial measurements for now casting, forecasting and warning purposes.
  - WP2.1.- Plasma Effects on GNSS applications.

- Spanish Project CICYT (BTE 2000-0825): ñIonospheric variability; interaction between neutral and ionised atmosphere. Ionospheric model over Iberian Peninsula INTA (el Arenosillo)- Observatorio del Ebro. From 2001-2004

– Project COST 296 MIERS of UE: ñMitigation of ionospheric effects on radio systemò, From 2005-2009,(joint workgroup with Dpto. Sistemas Informáticos y Automática de Sistemas e Ingeniería Eléctrica Huelva University)

  - WP 1.1 Near Earth Space Plasma Monitoring
  - WP 1.2 Data ingestion and assimilation in ionospheric models
  - WP 1.3 Near-Earth space plasma modeling and forecasting
  - WP 1.4 Climate of the upper atmosphere
  - WP 2.2 HF/MF Communication

– DIAS (European Digital Upper Atmosphere Server): Neuro-Fuzzy techniques for modelling and forecasting in the ionospheric region. Analysis and diffusion of real-time and corrected ionospheric data obtained with the Digisonde DGS 256. From 2005-2007 (joint Dpto. Sistemas Informáticos y Automática de Sistemas e Ingeniería Eléctrica Huelva University)

3. DOCTORAL THESIS

– Diego Marín., ñLong-term changes in the Ionosphere and their relation with the Geomagnetic Activityò. Codirected by Dr. Benito A. de la Morena (INTA) and Prof. Dr. Miguel Herraiz (Complutense University), included in the PhD Programme of the Departamento de Geofísica, Universidad Complutense, Madrid, 2003.

4. PUBLICATIONS

– G. Miró, S.M. Radicella, M. Herraiz, B.A. De la Morena ñCaracterización del canal ionosférico para un enlace INTA El Arenosillo-Observatorio del Ebroò. III Asamblea Hispano-Lusa de Geodesia y Geofísica. Valencia, 4-8 Febrero, 2002. Proceedings book. ISBN 84-9705-297-8). Edited 2003

– A.V. Mikhailov, B.A. De la Morena. ñLong-term of foE and geomagnetic activity variations.ò Annales Geophysicae, V. 21, Pg. 751-760, 2003

– E. Kaziminovsky, M. Herraíz, B.A. De la Morena ñEffects on the Ionosphere due to phenomena occurring below itò. Surveys in Geophysics 24: 139-184, 2003. Kluwer Academic Publications.

– Benito A. De la Morena, Nicolás Mélida ñThe Atmospheric Sounding Station -El Arenosillo-ò, INAG Bulletin 64, 2003.

– D. Buresova, T. Sindelarova, D. Altadill, M. Mosert, N. Melida, B.A. de la Morena. ñMonthly foF2 variation over Europeò. IRI TFA, Trieste, Italy, 2004 (proceedings)

– N. Mélida, J.M. Andújar, B.A. de la Morena y D. Marín. ñElaboration of a short term prediction system using neurofuzzy techniques: first resultsò. 24th Course of the International School of Geophysics on ñIonospheric Physics and Applications: Present and Futureò, Erice, Italy, Sept.24-29th 2004. (proceedings)

– J. M.Andújar, D. Marín, N. Mélida, B.A. de la Morena, J.M. Córdoba. ñTécnicas neuroborrosas aplicadas al modelado y predicción de la frecuencia crítica de la capa F2ò. V Asamblea Hispano-Portuguesa de Geodesia y Geofísica, Sevilla, España, January 30th ï February 3rd, 2006. ISBN 84-8320-373-1

INSTITUTE OF EARTH SCIENCES JAUME ALMERA
Paleomagnetic Laboratory University of Barcelona-CSIC
Martí i Franquès s/n
08028 Barcelona
www.ub.paleomag

1. AREAS OF RESEARCH

- Calibration of Geologic Time Scales
- Magnetostratigraphy applied to Basin infill chronology and chronological constraints to thrust kinematics along active basin margins.
- Magnetotectonics applied to 3D structural modelling in fold and thrust belts.
- Magnetic remanence acquisition in sedimentary rocks
- Remagnetisations as a record of fluid migration in sedimentary basins.
- Applications of rock magnetic anisotropy to geological processes.
- Rock magnetic properties and diagenetic processes

2. SCIENTIFIC PROJECTS

- Geological and Geophysical survey of the northern Iberian Margin: integrated study of sedimentary basins and geodynamic evolution of the Gulf of Biscay and the Pyrenean orogenic belt (2002-2005)

- Ocean Drilling Program Leg 209: Drilling Mantle Peridotites of the Mid-Atlantic Ridge between14º N and 16ºN. 2003-2004

- Ocean Drilling Program Leg 204: Hidrate Ridge 2003-2004

- Tectonic evolution of Tenerife (TECTOTENE) 2004-2006

- Magnetostratigraphy and Astrochronology of the Miocene of the Ebro Basin (2004-2005)

- Continental Chronology of the Cenozoic Basins of NE Spain (2005-2007)

- Searching for Homonoid Origins Initiative

- Neogene tectonic and sedimentary evolution of the Zagros Fold and thrust belt (2004-2007)

2. PUBLICATIONS

- Agustí, J; Sanz de Siria, Garcés, M. Explaining the end of the hominoid experiment in Europe. Journal of Human Evolution, 45, 2, pp. 145-153, 2003

- Beamud, E; Garcés, M; Cabrera, L; Muñoz, J.A; Almar, Y. A new Middle to Late Eocene continental chronostratigraphy from NE Spain. Earth and Planetary Science

Letters, 216, 4, pp. 501-514, 2003

- Larrasoaña, J.C; Parés, J.M; Pueyo, E.L. Stable Eocene magnetization carried by magnetite and iron sulphides in marine mals (Pamplona-Arguis Formation, Southern Pyrenees, Northern Spain). Stud. Geophys. Geod. , 47, pp. 237-254, 2003

- Larrasoaña, J.C; Parés, J.M; del Valle, J; Millán, H. Triassic paleomagnetism from the Western Pyrenees revisited: implications for the Iberian-Eurasian Mesozoic plate boundary. Tectonophysics, 362, pp. 161-182, 2003

- Larrasoaña, J.C; Parés, J.M; Millán, H. del Valle, J; Pueyo, E.L. Paleomagnetic, structural and stratigraphic constraints on transverse fault kinematics during basin inversion: The Pamplona fault (Pyrenees, north Spain) Tectonics, 22, nº 6, 1071, 2003

- Homke, S; Vergés, J; Garcés, M; Emami, H; Karpuz, R. Magnetostratigraphy of Miocene-Pliocene Zagros foreland deposits in the front of the Push-e Kush Arc (Lurestan province, Iran). Earth and Planetary Science Letters, 225, 3-4, pp.397-410, 2004

- Pérez-Rivarés, F.J; Garcés, M; Arenas, C; Pardo, G. Magnetostratigraphy of the Miocene continental deposits of the Montes de Castejón (central Ebro basin, Spain): geochronological and paleoenvironmental implications. Geologica Acta, 2, nº 3, pp. 221-234, 2004

- Larrasoaña, J.C; Pueyo, E; Parés, J.M. An integrated AMS, structural, palaeo- and rock-magnetic study of Eocene marine marls from the Jaca-Pamplona basin (Pyrenees, N Spain); new insights into the timing of magnetic fabrics acquisition in weakly deformed mudrocks. in: Martín-Hernández, F; Lünenburg, C. M; Aubourg, C. and Jackson, M. (eds.) - Magnetic Fabric: Methods and Applications. Geological Society , London, Spec. Publ. 238, 127-143. 2004

- Jones, M.A; Heller, P.L; Roca, E; Garcés, M; Cabrera, L. Time lag of syntectonic sedimentation across an alluvial basin, theory and examples from the Ebro Basin, Spain. Basin Research, 489-506. 2004

- Krijgsman, W. and Garcés, M. Palaeomagnetic constraints on the geodynamic evolution of the Gibraltar arc. Terranova, 16, pp. 281-287. 2004

- Kelemen, P.B; Kikawa, E; Miller, D.J; et al Proceedings ODP, Initial Reports 209 : College Station TX (Ocean Drilling Program). 2004

- Agustí, J; Garcés, M; Krijgsman, W. Evidence for African-Iberian exchanges during the Messinian in the Spanish Mammalian record. Palaeogeography Palaeoclimatology Palaeoecology 238, pp. 5-14. 2006

- Agustí, J; Oms, O; Furió, M; Pérez-Vila, M.J; Roca, E. The Messinian terrestrial record in the Pyrenees: The case of Can Vilella (Cerdanya Basin). Palaeogeography Palaeoclimatology Palaeoecology 238 (1-4) pp. 179-189. 2006

- Krijgsman, W., Leewis, M.E., Garcés, M., Kouwenhoven, T.J., Kuiper, K.F., Sierro, F.J., Tectonic control for evaporite formation in the Eastern Betics. Sedimentary Geology 188.189, pp. 155-170. 2006

- Kuiper, K.; Krijgsman, W.; Garcés, M. Revised isotopic (40Ar/39Ar) age for the lamproite volcano of Cabezos Negros, Fortuna Basin (Eastern Betics, SE Spain) Palaeogeography Palaeoclimatology Palaeoecology 238, pp. 53-63. 2006

- Larrasoaña, J.C., Murelaga, X., Garcés, M. Magnetobiochronology of Lower Miocene (Ramblian) continental sediments from the Tudela Formation (western Ebro basin, Spain). Earth and Planetary Science Letters 243, pp. 409-423. 2006

- Larrasoaña, J.C; Roberts, A.P; Hayes, A; Wehausen, R; Rohling, E. Detecting missing beats in the Mediterranean climate rhythm from magnetic identification of oxidized sapropels (Ocean Drilling Program Leg 160). Physics of the Earth and Planetary Interiors 156, pp. 283-293. 2006

- Musgrave, R., Bangs, P., Larrasoaña, J.C., Gràcia, E., Hollamby, J., Vega, M.E. Rise of the base of the gas hydrate zone since the last glacial recorded by rock magnetism. Geology 34, pp. 117-120. 2006

- Smith, B; M. E. M. Derder, B. Henry, B. Bayou, A. K. Yelles, H. Djellit, M. Amenna, M. Garces, E. Beamud, J. P. Callot, R. Eschard, A. Chambers, T. Aifa, R. Ait Ouali and H. Gandriche, Relative importance of the Hercynian and post-Jurassic tectonic phases in the Saharan platform: a palaeomagnetic study of Jurassic sills in the Reggane Basin (Algeria). Geophysical Journal International 167, pp. 380-396. 2006

OBSERVATORI DE LôEBRE. CSIC ï UNIVERSITAT RAMON LLULL
Horta Alta, 38
43520 ROQUETES (Tarragona). SPAIN.
Tf.: 34-977-500511
Fax.: 34-977-504660

1. AREAS OF RESEARCH

- Regional modelling of the magnetic field, its secular variation, and the equivalent ionospheric currents responsible of some geomagnetic variations, using spherical cap harmonic analysis.
- Geomagnetic observatories: Instrumentation, practise and analysis.
- Rapid magnetic variations.
- Geomagnetic field studies on the South Shetland Islands and Antarctic Peninsula region.
- Monitoring of the main ionospheric parameters obtained by vertical sounding and its variability.
- Study of the dynamic coupling of the mesosphere-thermosphere-ionosphere by tides and planetary waves.
- Study of the solar and geomagnetic forcing on the ionosphere.

2. SCIENTIFIC PROJECTS

- Effects of the upper atmosphere on terrestrial and Earth-Space communications. COST 271. (EACOS), Main Investigator: B. Zolesi.

- Solar-Terrestrial and Geophysical Studies in Antarctica from geomagnetic and GPS Data. REN2000-0833-C02-01/ANT, Main Investigator: J.M. Torta.

- Ionospheric variability; interaction between the neutral atmosphere and the ionized atmosphere. Ionospheric model above the Iberian Peninsula. BTE2000-0825, Main Investigator: D. Altadill.

- Solar, meteorological and anthropogenic effects on the ionosphere. 2003CZ0007, Main Investigator: J. Lastovicka, D. Altadill

- Studies and modelling for the evaluation of radio-communication systems. 2003PL0005, Main Investigator: D. Altadill, I. Stanislawska

- Investigation of regional scale atmospheric motions and their influence on the mesosphere/thermosphere/ionosphere region. INTAS 30-51-6425, Main Investigator: M.G. Shepherd

- Characterization and modelling of the ionospheric channel in Antarctica. Analysis of the ionospheric activity. REN2003-08376-C02-02, Main Investigator: J.M. Torta

- Geophysical and Geodesic techniques for the study of the Teide active volcanic area. CGL2004-21643E, Main Investigator: A.García

- Meteorological, Geomagnetic and Solar Influences on the Ionosphere. 2004CZ0002, Main Investigator: D. Altadill, J. Lastovicka

- Maintenance of the historical series of geomagnetism and ionospheric soundings at the Antarctic Spanish Base. CGL2005-24190-E/ANT, Main Investigator: J.M. Torta

- Mitigation of Ionospheric Effects on Radio Systems. COST296-MIERS, Main Investigator: L.R. Cander, A. Bourdillon

- Monitoring and characterization of the geomagnetic and ionospheric variability at Livingston Island by using advanced instrumental techniques and advanced data analysis techniques. CGL2006-12437-C02-02/ANT, Main Investigator: J.M. Torta

3. DOCTORAL THESIS

- Gaya-Piqué, L., Analysis of the Geomagnetic field in Antarctica from near-surface and satellite data, Observatori de lôEbre, 2004

4. PUBLICATIONS

- I. Blanco-Montenegro, J. M. Torta, A. García, V. Araña. Analysis and modelling of the aeromagnetic anomalies of Gran Canaria (Canary Islands), Earth Planet. Sci. Lett., 206, Nº 3-4, 601-616, 2003.

- Boska, J., P. Sauli, D. Altadill, G. Solé, L.F. Alberca. Diurnal variation of the gravity wave activity at midlatitudes of the ionospheric F region, Studia Geophysica et Geodaetica, Vol. 47, 579-586, 2003.

- Apostolov, E.M., D. Altadill. Fourfold solar cycle variation of the geomagnetic 13.5-day periodicity power and longevity, Bulgarian Geophysical Journal, 29, No 1-4, 3-12, 2003.

- De Santis A., Gaya-Piqué L.R., Dominici A. Meloni A., Torta J.M., Tozzi R.. ITalian Geomagnetic Reference Field (ITGRF): update for 2000 and secular variation model up to 2005 by autoregressive forecasting, Annals of Geophysics, Vol. 46, No 3, 491-500, 2003.

- Altadill, D., E. M. Apostolov, Ch. Jacobi, N. J. Mitchell. Six-day westward propagating wave in the maximum electron density of the ionosphere, Annales Geophysicae, Vol. 21, 1577-1588, 2003.

- Altadill, D., E.M. Apostolov. Time and scale size of planetary wave signatures in the ionospheric F-region. Role of geomagnetic activity and Mesosphere/Lower Thermosphere winds, J. Geophys. Research, Vol. 108(A11), 1403, doi:10.1029/2003JA010015, 2003.

- J. M. Torta. Una visión sobre el estado actual de la investigación en

Geomagnetismo, Revista de Física, vol. 17, Nº 6, 47-51, 2003.

- S. Marsal, J.M. Torta, L. Gaya-Piqué, J. J. Curto, E. Sanclement, J.G. Solé, D. Altadill, A. Ugalde, A. De Santis, E. M. Apostolov, L.F. Alberca, A. García. Boletín del Observatorio del Ebro. Observaciones Geomagnéticas de la Isla de Livingston, antártida. 2002 y campaña 2002-2003. Boletín del Observatorio del Ebro. ISSN 1579-8313, 2003.

- B. Duka, L. R. Gaya-Piqué, A. De Santis, S. Bushati, M. Chiappini,and G. Dominici. A geomagnetic reference model for Albania, Southern Italy and the Ionian Sea from 1990 to 2005, Annals of Geophysics 47, N.5, 1609-1615, 2004.

- Kim H.R., Gaya-Piqué L.R., von Frese R.R.B., Taylor P.T., and Kim J.W. Champ Magnetic anomalies of the Antarctic Crust. In REIGBER, C., LUHR, H., SCHWINTZER, P. & WICKERT, J., eds. Earth Observation with CHAMP. Results from three years in orbit. Berlin: Springer-Verlag, 261-266. 2004.

- De Santis, A., R. Tozzi, L.R. Gaya-Piqué. Information content and K-entropy of the present geomagnetic field, Earth and Planetary science Letters, Vol. 218 (3-4), 269-275, 2004.

- Altadill, D., E. M. Apostolov, J. Boska, J. Lastoviska, and P. Sauli. Planetary and gravity wave signatures in the F-region ionosphere with impact to radio propagation predictions and variability, Annals of Geophysics, Supp. Vol. 47, No. 2/3, 1109-1119, 2004.

- Buresova, D., D. Altadill, M. Mosert, and G. Miró. Predicted and Measured Bottomside F-region Electron Density and Variability of the D1 Parameter under Quiet and Disturbed Condition over Europe, Advances in Space Research, Vol. 34, No. 9, 1973 - 1981, 2004.

- Apostolov, E.M., D. Altadill, M. Todorova. The 22-year cycle in the geomagnetic 27-day recurrences reflecting on the F2-layer ionization, Ann. Geophysicae, 22, 1171-1176, 2004.

- Gaya-Piqué, L.R., De Santis, A., J. M. Torta. Use of Champ Magnetic Data to Improve the Antarctic Geomagnetic Reference Model, in REIGBER, C., LUHR, H., SCHWINTZER, P. & WICKERT, J., eds. Earth Observation with CHAMP. Results from three years in orbit. Berlin: Springer-Verlag, 317-322. 2004.

- Jakowski, N., K. Tsybulya, J. Mielich, A. Belehaki, D. Altadill, J. C. Jodogne, and B. Zolesi. Validation of GPS radio occultation results onboard CHAMP by vertical sounding observations in Europe, in REIGBER, C., LUHR, H., SCHWINTZER, P. & WICKERT, J., eds. Earth Observation with CHAMP. Results from three years in orbit. Berlin: Springer-verlag, 447-452 (2004).

- Observatorio del Ebro. Boletín del Observatorio del Ebro. Magnetismo. Observatorio Gemagnético del Ebro 2000-2001-2002-2003. Observatorio Geomagnético de Livingston 2003 y campaña 2003-2004, Boletín del Observatorio del Ebro. ISSN 1579-4032, 2004.

- D. Altadill, J. Germán Solé. Boletín del Observatorio del Ebro. Ionosfera. 1988, 2002 y 2003, Boletín del Observatorio del Ebro. ISSN 1577-0044, 2004.

- Bianchi, C., D. Altadill. Ionospheric Doppler measurements By means of HF-Radars techniques, Annals of Geophysics Vol. 48 N. 6, 989-993, 2005.

- J. Batlló, A. Roca-Rosell. L'any dels Observatoris, Revista de Física, Vol. 3 núm. 9, 44-50, 2005.

- E. Blanch, D. Altadill, J. Boska, M. Hernández-Pajares. November 2003 event: effects on the Earth ionosphere observed from ground-based ionosonde and GPS data, Annales Geophysicae, 23, 3027-3034, 2005.

- Curto, J.J., Batlló, J., Blanch, E., Gaya, Ll., Marsal, S., Sanclement, E., Seguí, J., Solé, J., Torta, J. Ugalde, A. Observatori de l'Ebre: Activitat divulgativa i pedagògica, Actas del VII Simposium sobre la enseñanza de las Ciencias Naturales, separata, pag 11-19, Tortosa, 2005 ISBN: 84-609-4577-4

- Amory-Mazaudier, C., Kobea, A.T., Vila,P. Achy-Seka, A., Blanch,E., Boka, K., Bouvet, J., Cécile, J-F., Cohen, Y., Curto, J.J., Duchan, M.,Doumouya, V., Fambitacoye, O, Farges, T., Goutelard, C. Guisso, E., Hanbaba, R., y 14 más. On equatorial geophysics studies: a review on the IGRGEA results during the last decade, J. Atmos. and Solar-Terrestrial Physics, 67, 301-313, 2005.

- D. Altadill and J. Batlló. Report of the Local Organizing Committee, International Reference Ionosphere News, Vol. 12, nº. 1, 2, 3, p.17-20, September 2005

- Batlló, J., Arrazola, D., Ugalde A. Using Magnetograms for Earthquake Magnitude Evaluation, EOS, Vol. 86, No. 48, 498, 2005.

- Curto, J.J., Blanch, E., Vallès, M. Visita a l'Observatori de l'Ebre amb interpretació de registres geofísics, Actas del VII Simposium sobre la enseñanza de las Ciencias Naturales, pag 361-366, Tortosa, 2005 ISBN: 84-609-4577-4

- Observatori de l'Ebre. Boletín del Observatorio del Ebro. Observaciones geomagnéticas en la isla Livingston - Antártida. 2004. Roquetes: Observatori de lôEbre, 2005. <http://www.obsebre.es/php/geomagnetisme/boletin_livingston.php> ISSN 1885-9712

- Observatori de l'Ebre. Boletín del Observatorio del Ebro. Observaciones geomagnéticas. 2004. Roquetes: Observatori de lôEbre, 2005. <http://www.obsebre.es/php/geomagnetisme/boletin_ebre.php> ISSN 1885-9704

- Observatori de l'Ebre. Boletín del Observatorio del Ebro. Observaciones ionosféricas. 2004. Roquetes: Observatori de lôEbre, 2005. <http://www.obsebre.es/php/ionosfera/boletin_ionosfera.php> ISSN 1885-9674

- Batlló, J. Catálogo - Inventario de Magnetómetros Españoles, Instituto Geográfico Nacional, 305 pp., ISBN 84-9810-728-8, Madrid, 2005.

- Curto, J.J. , Cardús, J.O., Alberca, L.F., Blanch, E. Contribución del Observatorio del Ebro al Servicio Internacional de Variaciones Magnéticas Rápidas de la IAGA, Física de la Tierra, 18, 47-68, 2006.

- Sauli, P., P. Abry, D. Altadill, J. Boska. Detection of the wave-like structures in the F-region electron density: Two station measurements, Studia Geophysica et Geodaetica, Vol. 50, No. 1, 131-146, 2006. DOI: 10.1007/s11200-006-0007-y

- Curto, J.J., B. Heilig, M. Piñol. Modeling the Geomagnetic Effects Caused by the Solar Eclipse of 11 August 1999, Journal of Geophysical Research, 111, A07312,doi:10,1029/2005JA011499, 2006.

- Gaya-Piqué, L.R., Ravat, D., De Santis, A., Torta, J.M. New Model Alternatives for Improving the Representation of the Core Magnetic Field of Antarctica, Antarctic Science, 18 (1), 101ï 109, DOI: 10.1017/S0954102006000095, 2006.

- Vázquez M., Vaquero, J.M., Curto, J.J. On the connection between solar activity and low latitude aurorae in the period 1715-1860, Solar Physics, 238 (2):405-420, 2006.

- A. Meloni, L.R. Gaya-Piqué, P. de Michelis, A. De Santis. Some recent characteristics of geomagnetic secular variation in Antarctica, Antarctica: Contributions to global earth sciences. Springer-Verlag, Berlin Heidelberg New York, pp 375ï 380 (2006)

- Torta, J.M., L.R. Gaya-Piqué, A. De Santis. Spherical Cap Harmonic Analysis of the Geomagnetic Field with Application for Aeronautical Mapping, In Rasson, J.L. and Delipetrov, T., Eds., Geomagnetics for aeronautical safety: a case study in and around the Balkans. NATO security through Science series-C, 291-307 (2006)

- Observatori de l'Ebre. Boletín del Observatorio del Ebro. Observaciones geomagnéticas. 2005. Roquetes: Observatori de lôEbre, 2006. <http://www.obsebre.es/php/geomagnetisme/boletin_ebre.php> ISSN 1885-9704

- Observatori de l'Ebre. Boletín del Observatorio del Ebro. Observaciones geomagnéticas en la isla Livingston - Antártida. 2005, Roquetes: Observatori de lôEbre, 2006. <http://www.obsebre.es/php/geomagnetisme/boletin_livingston.php> ISSN 1885-9712

- Observatori de l'Ebre. Boletín del Observatorio del Ebro. Observaciones ionosféricas. 2005. Roquetes: Observatori de lôEbre, 2006. <http://www.obsebre.es/php/ionosfera/boletin_ionosfera.php> ISSN 1885-9674

- Santiago Marsal, J. Miquel Torta. Análisis de los errores del magnetómetro DIflux. Aplicación al Observatorio geomagnético de Isla Livingston (Antártida). Proceedings de la 5ª Asamblea Hispano-Lusa de Geodesia y Geofísica. Sesión Geomagnetismo y Aeronomía. Public. Elctr. Ministerio de Medio Ambiente ISBN: 84-8320-373-1. 2006.

- J. J. Curto, N. Devanthéry. Caracterización de los fenómenos SSC en el Observatorio del Ebro. Proceedings de la 5ª Asamblea Hispano-Lusa de Geodesia y Geofísica. Sesión Geomagnetismo y Aeronomía. Public. Elctr. Ministerio de Medio Ambiente ISBN: 84-8320-373-1. 2006.

- J. G. Solé, L. F. Alberca, D. Altadill, E. M. Apostolov, C. Bianchi, E. Blanch, J. J. Curto, A. De Santis, L. R. Gaya, S. Marsal, J. L. Pijoan and J. M. Torta. Estación ionosférica en la BAE. Resultados preliminaries. Proceedings de la 5ª Asamblea Hispano-Lusa de Geodesia y Geofísica. Sesión Geomagnetismo y Aeronomía. Public. Elctr. Ministerio de Medio Ambiente ISBN: 84-8320-373-1. 2006.

- Nieves Sánchez, Alicia García, Santiago Marsal, Marta Tárraga, Benito Casas y Francisco García. Red Volcanomagnética del Teide-VOLMAGTEGETEIDE. Proceedings de la 5ª Asamblea Hispano-Lusa de Geodesia y Geofísica. Sesión Geomagnetismo y Aeronomía. Public. Elctr. Ministerio de Medio Ambiente ISBN: 84-8320-373-1. 2006.

- Batlló, J.; Arrazola, D. y Ugalde, A. Determinación de la magnitud de terremotos mediante el uso de magnetogramas. Proceedings de la 5ª Asamblea Hispano-Lusa de Geodesia y Geofísica. Sesión Sismotectónica e Ingeniería Sísmica. Public. Elctr. Ministerio de Medio Ambiente ISBN: 84-8320-373-1. 2006.

REAL INSTITUTO Y OBSERVATORIO DE LA ARMADA (ROA).
Cecilio Pujazón s/n
11100 SAN FERNANDO (Cádiz). SPAIN.
Phone: +34-956-599285.
Fax: +34-956-599366.

1. AREAS OF RESEARCH

- Magnetic observatory.
- Periodic Bulletins.
- Secular variation.
- Field and marine surveys.
- Magnetic anomalies.
- Development of magnetic equipment.
- Tectonics. Geodynamics.

2. SCIENTIFIC PROGRAMS

ñStudy of the structure and geodynamic of NE Caribbean plate boundary: ROAôs contributionò [GEOPRICO-ROA; REN2002-12855-E/MAR**]**
This study pursues the following aim, which is to study the cortical, and upper mantle structure southward of La Española and Puerto Rico Islands area, as well as the transition zone at NE of Puerto Rico and Lesser Antilles island chain. Two sub-programmes were carried out: Seismic (leaded by the Complutense University of Madrid, UCM,- Geophysics Dpt.), Potential field and Bathymetry (leaded by UCM, Geodynamics Dpt). ROA Geophysical Dept. participated in both sub-programmes, being the responsible institution in the geomagnetic and on-board seismic activities. A 20 day geophysical cruise was carried out during March-April 2005. Actually all the above-acquired information is being analyzed and interpreted.

ñAutomatic Geophysical stationò (MN-8302).
The main objective of this project, funded by the Spanish Defense Ministry, is to develop an automatic station able to acquire and transmit several geophysical parameters from different geomagnetic, seismic and meteorological sensors. In the geomagnetic side, those sensors could be installed at a fixed point on land or on a mobile platform for marine surveys. Under this project, a three components variographic station has been developed, based on fluxgate sensors, and tested at remote sites controlled by radio/phone modem.

ñSpanish Exclusive Economic Zone Projectò (SEEZ).
The SEEZ Project has as main aims: the establishment of the Spanish Exclusive Economic Zone cartography; and the acquisition of geophysical parameters, which characterize its marine soil and subsoil.
Due to the extension of the SEEZ (more than 1.2 million square kilometers) and its inherent complexity, it was essential to fix a framework for any exploration program to take place. It has been decided to developed it during one month every year (without any defined end as of yet), mainly using the Spanish Research Vessel "Hespérides" as scientific platform.

The project kicked-off on July 1995. During the period 1995-1997, February 1999 and February 2002, five one-month surveys were carried out at Balearic sea and Gulf of Valencia. All these data have already been reduced and stored as database. Six maps [scale of 1:200.000], and another of the whole area [scale of 1:500.000] have been published.
From 1998-2000 three one-month surveys were carried out at Canary archipelago. It was necessary to perform two additional campaigns: October 2001 and October 2002, in order to end with the survey area. All these data have already been reduced and stored as database. Eight maps [scale of 1:200.000], and another of the whole Canary archipelago area, has already been published.
From August 2001 to 2006, three one-month geophysical surveys were carried out at Galicia Bank (NW Iberia Peninsula).

Tenerife 2005 [**TEGETEIDE CGL2004-21643-E**].
From April 2004 onward, the pattern of seismic activity at Tenerife Island suffered a significant change. From then onwards, and during nearly one year and a half, it was characterized by the occurrence of swarms, tremors and volcano-tectonic earthquakes, which were concentrated in the North and NW part of the island. In order to detect possible changes in its magmatic status, and its possible relationship with the anomalous seismicity, a multi-disciplinary study was promoted and leaded by National Natural Science Museum. Within this activities, ROA performed on January 2005, a marine magnetic surveying in the north of Tenerife by using a patrol boat, from the Spanish navy, as scientific platform. This cruise was partially funded by the Spanish Navy and the Spanish Ministry of Science and Education.

New geomagnetic observatory
On October 2004 it started the operation of the new geomagnetic observatory. This observatory located nearly 60 km NE from San Fernando, is composed of three small wooden huts: one absolute house, one variation room and an additional hut which is in charge of the electric power distribution, as well as the acquisition processes. This observatory is wireless connected (by GPRS data transfer) to the Geophysical Dept. at ROA.
Concerning instrumentation, it uses a MAG01H declinometer/inclinometer with a theodolite model YOM MG2KP as absolute standard, a suspended three component fluxgate sensor (from the Danish Meteorological Institute) as variometer, and as continuously recording scalar magnetometer it uses a GEOMAG SM90R Overhauser effect proton magnetometer. On July 2006 this magnetic station was formally considered an INTERMAGNET Magnetic Observatory.

World Digital Magnetic Anomaly Map
From April 2006 onward, ROA is participating in the compilation of the *World Digital Magnetic Anomaly Map* at the scale 1: 50.000.000. Particularly on the marine magnetic anomalies working group.

3. PUBLICATIONS

- Geophysical Annals: Seismic, Geomagnetic and Meteorological Observations. Real Instituto y Observatorio de la Armada. 2003, 2004, 2005 and 2006. Edited by Spanish Defense Ministry.

- M. Catalán, J. Martín Davila & ZEE Working Group: ñA magnetic anomaly study offshore the Canary Archipelagoò. Marine Geophysical Research. Vol. 24, 2003, pp. 129-148.

- A. Muñoz, M. Catalán, J. Martín Davila & A. Carbó: ñUpper crustal structure of Decepion Island area (Bransfield Strait, Antarctica) from gravimetric and magnetic modellingò. Antarctic Science, 2005, pp. 213-224.

- M. Catalán, L.M. Agudo & A. Muñoz: ñSecular magnetic variation controlled by the use of crossover análisis on Bransfield Strait [Western Antarctica]ò. Geophysical Journal International, 2006, pp. 73-86.

- IEO-IHM-ROA, 2006: Zona Económica Exclusiva, Hojas C1 and C4, Mapas de anomalías geomagnéticas (1:200.000). Edited by Ministerio de Defensa ï Real Instituto y Observatorio de la Armada. N.I.P.O.: 076-06-134-2.

- IEO-IHM-ROA, 2006: Zona Económica Exclusiva, Hojas C2, C6, C7 and C9, Mapas de anomalías geomagnéticas (1:200.000). Edited by Ministerio de Defensa ï Real Instituto y Observatorio de la Armada. N.I.P.O.: 076-05-178-7.

- Grupo de Trabajo ZEE, 2006: Mapa General de Anomalías Magnéticas. Islas Canarias. (1:500.000). Edited by Ministerio de Defensa ï Real Instituto y Observatorio de la Armada. N.I.P.O.: 076-04-150-5

UNIVERSIDAD COMPLUTENSE DE MADRID
Paleomagnetism Group
Departamento de Física de la Tierra
Facultad de Ciencias Físicas
28040 MADRID. SPAIN
Tf: + 34 91-3945190
Fax: + 34 91-3944398

1. AREAS OF RESEARCH

- Archaeomagnetism.
- Modelling of the past geomagnetic field in Europe (last 3000 years).
- Environmental magnetism.
- Jurassic and Triassic magnetostratigraphy
- Mesozoic evolution of Iberia from palaeomagnetic data.
- Magnetic properties of extraterrestrial material.
- Magnetic characterization of Great Impacts (K-T boundary)
- Paleomagnetic rotations and crustal deformation in Iberia.
- Remagnetization processes in limestones.

2. SCIENTIFIC PROJECTS

- Estudio de la Variación Secular del Campo Magnético Terrestre en Iberia durante los últimos 10.000 años a partir de datos paleomagnéticos CGL2005-00211/BTE. Ministerio de Educación y Ciencia. 2005-2008. Investigador Principal: M.L. Osete
- Archeomagnetic applications for the rescue of cultural heritage (AARCH). HPRN-CT-2002-00219. UNIÓN EUROPEA. 2002-2005. I.P. M.L. Osete. Coordinadora C. Batt (Univ. Bradford).
- Grupo Paleomagnetismo 910396. Entidad financiadora: Comunidad Autónoma de Madrid-UCM. 2005-:2006. Investigador Principal: M.L. Osete
- Sala Apantallada Magnéticamente UCMA05-33-036. Ministerio de Educación y Ciencia (Convocatoria Infraestructura científica). 2005-2007. Investigador Principal: M.L. Osete
- SERVICIO DE PALEOMAGNETISMO UCOM03-33-016. Ministerio de Eduación y Ciencia (Convocatoria de Infraestructura Científica (FEDER). 2003-2006
- Descripción y origen de las reimanaciones de sedimentos mesozoicos de Iberia (Cordilleras Béticas y Sistema Ibérico). Implicaciones tectónicas BTE2002-00854. MCYT. 2003-2006. Investigador Principal: M.L. Osete.
- Estudio Paleomagnético del Norte de Marruecos PR27/05-1396-BSCH. BSCH-UCM. 2005-2006. Investigador Principal: V.C. Ruiz Martínez.

3. PUBLICATIONS

- Gómez-Paccard, M.; Lanos, Ph., Chauvin, A.; McInstosh, G., Osete, M.L.; Catanzariti, G.; Ruiz-Martínez, V.C.; Núñez, J.I. The first Archaeomagnetic secular variation curve for the Iberian Peninsula. Comparison with other data from Western Europe and with global geomagnetic field models. *Geochemistry, Geophysics, Geosystem*, V7, N2, 1-20 (Q12001, doi:10.1029/2006GC001476). 2006

- Gómez-Paccard, M.; Catanzariti, G; Ruiz-Martínez, V.C.; McInstosh, G., Núñez, J.I; Osete, M.L.; Lanos, Ph., Chauvin, A.;.Tarling, D.H. Beranl.Casasola, D., Tiritó, J. and archeological working group (A. Sáez-Espligares, I. García-Villanueva, J.A. Gisbert-Santonja, M.A. Hervás, P. Jiménez-Castillo, M. Mesquida-García, I. Navarro, M. Orfilia-Pons, I. Ramírez-gonzález, M. Retuerce, D. Urbina and C. Urquijo). A catalogue of Spanish archaeomagnetic data. Geophysical Journal International, 166, 1125- 1143. 2006.

- Palencia Ortas, A. , ML Osete , R. Vegas y P. Silva. Paleomagnetic study of the Messejana- Plasencia dyke (Portugal and Spain): A lower jurassic paleopole for the Iberian Plate. Tectonophysics, 420, 455-472. 2006.

- Ruiz-Martínez, V.C., F. Martín-Hernández, G. McIntosh, A. Palencia-Ortas, J.J. Villalaín, M.L. Osete. Título: Magnetic signature of the orbital-scale forced Cenomanian/Turonian (~94 Ma) marine transgressive sedimentation in the Tarfaya coastal basin (Morocco): Preliminary results. proceedings de la 5ª Asamblea Hispano-Lusa de Geodesia y Geofísica. Sesión Geomagnetismo y Aeronomía. Public. Elctr. Ministerio de Medio Ambiente ISBN: 84-8320-373-1. 2006.

- Pavón-Carrasco, F.J., V.C. Ruíz-Martínez, G. Catanzariti, R. Montes-López y A. Villa-Valdés, Estudio Arqueomagnetíco de seis estructuras en el Chao Samartín, Asturias. proceedings de la 5ª Asamblea Hispano-Lusa de Geodesia y Geofísica. Sesión Geomagnetismo y Aeronomía. Public. Elctr. Ministerio de Medio Ambiente ISBN: 84-8320-373-1. 2006.

- Marín, V.M. y F.J. Pavón-Carrasco, 2006. Modelización Isopórica del Campo Geomagnético para la época 2005.0. Península e Islas Baleares. proceedings de la 5ª Asamblea Hispano-Lusa de Geodesia y Geofísica. Sesión Geomagnetismo y Aeronomía. Public. Elctr. Ministerio de Medio Ambiente ISBN: 84-8320-373-1. 2006.

- Osete, M.L. and A. Palencia Ortas. Polos Paleomagnéticos de Iberia de los últimos 300 millones de años. Física de la Tierra. Vol.18, 157-181. 2006

- Gómez-Paccard, M.; McIntosh, G.; Villasante, V.; Osete, M.L.; Rodriguez-Fernández, J. and Gómez-Sal, J.C. Low-temperature and high magnetic field measurements of atmospheric particulate matter. Journal of Magnetism and Magnetic Materials, 272-276P3, 2420-2421. 2004.

- Heslop, D, McIntosh, G_& Dekkers, MJ. Using time- and temperature-dependent Preisach models to investigate the limitations of modelling isothermal remanent

magnetisation acquisition curves with cumulative log Gaussian functions. Geophys. J. Int., 157, 55-63. 2004.

- Osete, M.L.; Villalaín, J.J.; Palencia, A.; Osete, C.; Sandoval, J. y García-Dueñas, V. New Palaeomagnetic data from the Betic Cordillera. Constrains on the timing and the geographical distribution of tectonic rotations in southern Spain. Pure and Applied Geophysics, v. 161, 701-722. 2004.

- Villasante Marcos, V., Osete, M.L., Martínez Ruiz, F., Urrutia Fucugauchi, and J., Lamolda, M.A. Propiedades magnéticas en varias secciones del límite Cretácico-Terciario. Geotemas, vol. 6 (4), 351-354. 2004

- Ruiz-Martínez V.C. and M.L.Osete. Dispersión del campo magnético terrestre obtenida a partir de remanencias primarias en lavas. Geotemas, vol. 6 (4), 335-339. 2004.

- Villalaín, J.J., V.C. Ruiz-Martínez, D. Rey, M.L. Osete y C.Caballero. Interpretación tectónica de la remagnetización terciaria del segmento Sur de la Sierra Madre Oriental Mexicana. Geotemas, Vol. 6 (4), 347-350. 2004.

- Palencia, A.; Osete, M.L.; Maceira, M.; Villalaín, y Vegas, R. Estudio paleomagnético del dique de Messejana-Plasencia. Geotemas. Vol. 6(4), 315-318. 2004.

- Hounslow, M.W. and McIntosh, G. Magnetostratigraphy of the Sherwood Sandstone Group (lower and middle Triassic), south Devon, U.K.: detailed correlation of the marine and non-marine Anisian. Palaeo. Palaeo. Palaeo., 193, 2, 325-348. 2003.

- Rochette, P.; Sagnotti, L.; Bourot-Denise, M.; Consolmagno, G.; Folco, L. ; Osete, M.L. and Pesonen, L. Magnetic Classification of Stony Metorites: 1. Ordinary Chondrites. Meteorics and Planetary Sciences, 38, nr 2, 251-268, 2003.

- Sagnotti, L.; Rochette, P.; Jackson, M.; Vadeboin, F.; Dinarés-Turell, J.; Winkler, A. and the Mag-Net Science Team (B. Maher, E. Moreno, M. Hanesch, R. Scholger, R. Jude, J. Shaw, G. McIntosh, M.L. Osete, J. Matzka, N. Petersen, J.C. Larrasoaña, M. OôReagan, A. Roberts, T. Mullander, C. Peters, K. Mohamed, D. Rey, J. Hannam, F. Heller, T. Frederichs and U. Bleil). Interlaboratory calibration of low-field magnetic and anhysteretic susceptibility measurements. Physics of the Earth and Planetary Interiors, 138, 25-38, 2003

- Villasante-Marcos, V. ; Osete, M.L. ; Gervilla, F. Y García-Dueñas, V. Palaeomagnetic study of the Ronda Peridotites (Betic Cordillera, southern Spain). Tectonophysics, 377, 119-141. 2003.

- Bógalo, M.F.; Heller, F.; Villalaín, J.J.; Calvo, M.; Osete, M.L. y A. Pérez-González. Propuesta metodológica para la caracterización de la mineralogía magnética en estudios paleoambientales. Aplicación al yacimiento de Atapuerca. Geogaceta. Vol. 34, 107-110. 2003

UNIVERSIDAD COMPLUTENSE DE MADRID
Group of Ionosphere and Global Positioning
Departamento de Geofísica y Meteorología
Facultad de Ciencias Físicas
28040 Madrid, SPAIN
Phone: + 34 91 394 4391
Fax: + 34 91 394 4398

1. AREAS OF RESEARCH

- Evaluation and improvement of 3D ionospheric and plasmaspheric electron density models
- Study of Ionospheric bubbles and their effect on electromagnetic waves transmission.
- Application of GPS techniques to local ground deformations in tectonically active areas.
- Ionospheric model validation and reconstruction by VTEC data ingestion.

2. SCIENTIFIC PROJECTS

- Effects of the Upper Atmosphere on terrestrial and Earth-Space Communications. COST271. 2000-2004. Main Investigator: B. Zolesi

- The atmospheric influence on the near-Earth space**,** NATO Collaborative Linkage Grant, PST, CLG 978486. 2002 ï 2003. Main Investigator: M. Herraiz.

- Mitigation of Ionospheric Effects on Radio Systems (MIERS)ò. COST296. 2005-2008. Main Investigator: A. Bourdillon

- A study of the effect of the modernized GPS and the European project Galileo in the precise positioning. Spanish Ministry of Education and Science. ESP2005-01997. 2005-2008. Main Investigator: M. C. Lacy

- Contribution to the study of several present geophysical problems concerning Ionosphere and Seismology, Spanish Ministry of Education and Science.CGL2004-23600.2005-2006. Main Investigator: M. Herraiz

- Mitigation of Ionospheric Effects on Radio Systems (MIERS). COST296. 2005-2008. Main Investigator: A. Bourdillon

- Positioning and Navigation based on GNSS Permanent Networks with RTK applications. Spanish Ministry of Education and Science. REN 2006/01975. 2006-2009. Main Investigator: A. Gil

3. DOCTORAL THESIS

- Mohíno, E. Analysis and mitigation of ionospheric biases in global navigation satellite systems with single frequency receivers (European Thesis), 2005
- Cueto, M. Evaluation and improvement of 3D ionospheric and plasmaspheric electron density models, (European Thesis). 2005

4. PUBLICATIONS

- Cueto, M., D. McKnight, M. Herraiz, 2003, ñTérminos solares y lunares de las variaciones geomagnéticas diarias en la Península Ibéricaò, Actas de la 3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica, Valencia 4-8 Febrero, 2002, 657-661. ISBN 84-9705-298-6.

- Miró, G., S. Radicella, M. Herraiz, B.A. De La Morena, 2003, ñCaracterización del canal ionosférico para un enlace INTA El Arenosillo- Observatorio del Ebroò, Actas de la 3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica, Valencia 4-8 Febrero, 2002, 675-678. ISBN 84-9705-298-6.

- Farelo, A. F., M. Herraiz, A. Mikhailov, 2003, ñMorfología global de incrementos nocturnos de NmF2ò, 2003, Actas de la 3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica, Valencia 4-8 Febrero, 2002, 698-702. ISBN 84-9705-298-6.

- Mohíno, E., M. Herraiz, E. Kazimirovsky, 2003, ñPresencia de oscilaciones de casi-dos días en las variaciones temporales de foF2 sobre el suroeste de España. Análisis de ondículasò, Actas de la 3ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica, Valencia 4-8 Febrero, 2002, 706-710. ISBN 84-9705-298-6.

- Cueto, M., D. McKnight, M. Herraiz, 2003, ñDaily geomagnetic variations on the Iberian Peninsulaò, Geophysical J. Int., 152, 113-123.

- Kazimirovsky, E. M. Herraiz, B.A. De la Morena, 2003, ñEffects on the ionosphere due to phenomena occurring below itò, Surveys Geophys, 24, 139-184.

- Mohíno, E. M. Herraiz, E. Kazimirovsky, 2003, ñApplication of wavelet analysis to quasi-two day oscillation occurrence in the time variations of foF2ò, Int. J. Geom. Aeronomy, 4, 3, 1-6.

- Blázquez, E.B., A.J.Gil , G. Rodríguez-Caderot, M. C de Lacy, J.J. Ruiz, 2003, ñANDALUSGEOID2002: The new gravimetric geoid model of Andalusioa (Southern Spain)ò, Studia Geophysica & Geodaetica, 47, 511-520.

- Cueto, M. N. Jakowsky, T. Tsybulya, S.M. Radicella, M. Herraiz, ñNeQuick y Técnica de Radio-Ocultación Ionosférica: Comparación de perfiles de densidad electrónicaò. Actas de la 4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica, Figueira da Foz, Portugal, 3-7 febrero, 2004, 483-484.

- Mohíno, E., M. Gende, C. Brunini, M. Herraiz, S. Radicella, ñComparación de tres modelos ionosféricos sobre Europaò. Actas de la 4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica, Figueira da Foz, Portugal, 3-7 febrero, 2004, 449-450.

- Belinskaya, A.Ju., G.V. Vergasova , E.S: Kazimirovsky, E. Mohino, M. Herraiz, 2004, ñOn the regional behavior features of the Total Ozone Contentò, Solar-Terrestrial Physics, Publishing House of the Russian Academy of Sciences, Siberian Department, 4, 117, 58-63 (In Russian with English abstract).

- Cueto, M., P. Coïsson, S. M. Radicella, L. Ciraolo, F. Azpilicueta, G. Miro Amarante, K. Alazo, C. Brunini and M. Herraiz, 2004**,** ñTopside modification of NeQuick using Gallagher plasmaspheric modelò. Proceedings of the International Beacon Satellite Symposium, Trieste, 18-22 October, 2004.

- Jakowski, N., K, Tsybulya, S.M. Radicella, M. Cueto, M. Herraiz, 2004, òComparison of Electron Density Data with NeQuick Modelò, in *Earth Observation with CHAMP: Results from three Years in Orbit*, Ch. Reigber, H. Lühr, P. Schwintzer, J. Wickert (Eds.), Springer, Berlin, 483-488.

- Cueto, M., P. Coïsson, S. M. Radicella, L. Ciraolo and M. Herraiz, 2004, ñIncluding the Gallagher plasmaspheric model in the NeQuick ionospheric modelò, Bulgarian Geophysical Journal, 30, 1-4.

- Peláez, J., A. J. Gil, J. Álvarez, D. López, E. Núñez, A. Rodríguez, G. Rodríguez-Caderot, 2004, ñTwo checking astrogeodetic geoid profiles in southern Spainò, Proceedings 4ª Asamblea Hispano-Portuguesa de Geodesia y Geofisica, 1, 553-554.

- Lacy, M. C. De, F. Sansò, G. Rodríguez-Caderot, A. J. Gil, 2004, ñPrecise Point Positioning using undiferenced GPS observationsò, Proceedings 4ª Asamblea Hispano-Portuguesa de Geodesia y Geofisica, 1, 507-508.

- Mansilla, G., M. Mosert, R. Ezquer, G. Miro Amarante, 2004, ñVariability of Ionospheric Parameters During Geomagnetic Storms at A Middle Latitude Station. Comparisons With IRI Modelò. *Advances in Space Research*, 34(9), pp. 1907-1913.

- Miró Amarante, G., M. Cueto Santamaría, M. Mosert, S. M. Radicella, R. Ezquer, 2004, ñDay-to-day changes in experimental electron density profiles and their implications to IRI modelò. *Advances in Space Research*, 34(9), pp. 1878-1886.

- Miró Amarante, G., S. M. Radicella, B. Nava, P. Coisson, 2005, óValidation of a method for ionospheric electron density reconstruction by means of vertical incidence data during quiet and storms periodsò, *Annals of Geophysics*, Vol. 48, N.2, pp. 321-326.

- Miró Amarante, G., M. L. Zhang, S. M. Radicella, 2005, ñIonogram inversion F1 layer treatment effect in raytracingò, *Annals of Geophysics*, 48, 3, 483-489.

- Lacy, M. C. De, F. Sansò, A. J. Gil, G. Rodríguez-Caderot. ñA Method for the Ionospheric Delay Estimation and Interpolation in a Local GPS Networkò. Studia Geophysica & Geodaetica, Vol. 49, pp. 63-84, 2005.

- Gende, M., E. Mohíno, C. Brunini, S.M. Radicella, M. Herraiz, 2005, ñIonospheric biases correction for coordinates derived from GPSò, Annals of Geophysics, 48, 439-444.

- Mohíno, E., M. Gende, C. Brunini, M. Herraiz, 2005, ñSGOG: Simulated GPS Observation Generatorò, GPS Solutions, 9, 250-254, DOI: 10.1007/s10291-005-001-9, 2005.

- Herraiz, M., E. Kazimirovski, 2006, ñEn torno a las influencias externas sobre el sistema ionosfera-atmósferaò en Física de la Tierra, 18, 97-118, Universidad Complutense de Madrid, ISSN 0214-4557.

- Rodríguez-Caderot, G., de Lacy, M. C, Gil, A. J., Blázquez, B., 2006, ñComparing Recent Geopotential Models in Andalusia (Southern Spain)ò, Studia Geophysica & Geodaetica, 50, 619-631.

- Alfaro, P., Estevez, A., Blázquez, B. , Borque, M. J., Garrido, M. S., Gil, A. J., de Lacy, C., Ruiz, A., Jiménez, J., Molina, S., Rodríguez-Caderot, G., Ruiz Morales, M., Sanz de Galdeano, C., 2006, ñGeodetic Control of the Present Tectonics Deformation of the Betic Cordillers (Spain)ò, International Association of Geodesy Symposia, 131, 209-216.

UNIVERSIDAD DE BURGOS
Laboratorio de Paleomagnetismo
Departamento de Física
Escuela Politécnica Superior
Avenida de Cantabria, s/n
09006 Burgos
Tel: + 34 947 25 8978
Fax: + 34 947 259349

1. RESEARCH AREAS

- Paleomagnetism applied to tectonic problems
- Paleomagnetism applied to archaeologic problems
- Paleointensity
- Environmental magnetism
- Magnetic anomalies and crustal structure
- Analogue modelling and tectonics

2. SCIENTIFIC PROJECTS

- Project REN2000-0833-C02-01/ANT funded by the Spanish Ministry of Science and Technology (18.446.400 Pta): Estudios solar-terrestres y geofísicos en la Antártida a partir de datos geomagnéticos y de GPS. (2003-2005). Project leader: J. Miquel Torta Margalef.
-
- Project BTE2001-0634 funded by the Spanish Ministry of Science and Technology (102.172 ú): Controles tectónicos sobre la transferencia de masas a través de la Litosfera. (2002-2004). Project leader: José María Tubía Martínez.
-
- Project BTE2002-04168 funded by the Spanish Ministry of Science and Technology (54050 ú): Evolución tectono-termal de las cuencas ibéricas. Aplicación al NE peninsular (Cordillera Ibérica y Pirineo meridional). Subproyecto: Estudio Paleomagnético y magnético de las cuencas mesozoicas y terciarias del NE peninsular (2002-2005). Project leader: Juan José Villalaín Santamaría.
-
- Project BTE2002-00854 funded by the Spanish Ministry of Science and Technology (139600 ú): Descripción y Origen de las Reimanaciones de Sedimentos Mesozoicos de Iberia (Cordilleras Béticas y Sistema Ibérico). Implicaciones Tectónicas (2003-2005). Project leader: María Luisa Osete López.
-
- Project BU30/04 funded by Junta de Castilla y León (9100 ú): Estudio de las remagnetizaciones de la Cordillera Ibérica y su aplicación a la evolución de las cuencas mesozoicas. Paleomagnetismo y magnetismo de rocas. (2004-2005). Project leader: Juan José Villalaín Santamaría.
-
- Project BU30/04 funded by Junta de Castilla y León (24050 ú): Determinación del valor absoluto de la paleointensidad. Variaciones de la intensidad del campo

magnético terrestre de diferente escala: momento paleomagnético dipolar, transiciones de polaridad y variación secular. (2003-2005). Project leader: Manuel Calvo Rathert.

–

– Project CGL206-02524 funded by the Spanish Ministry of Science and Technology (60500 ú): Estudio de las remagnetizaciones en las cuencas mesozoicas Ibéricas y Vasco-Cantábricas. Paleomagnetismo, magnetismo de las rocas e implicaciones tectónicas. (2006-2009). Project leader: Juan José Villalaín Santamaría.

–

– Project BU028-A06 funded by Junta de Castilla y León (16300 ú): Análisis del registro magnético en materiales pleistocenos y holocenos de interés arqueológico (2006-2008). Project leader: Manuel Calvo Rathert.

–

– Project BU003B06 funded by Junta de Castilla y León (8500 ú): Estructura cortical de islas volcánicas a partir de la modelización e interpretación de anomalías aeromagnéticas y paleomagnetismo. Aplicación a las islas canarias de Fuerteventura y El Hierro (2006-2007). Project leader: Isabel Blanco Montenegro

–

– Project BU002B06 funded by Junta de Castilla y León (11000 ú): Influencia de la geometría de estructuras extensionales en la inversión tectónica de la cuenca de Cameros (Cordillera Ibérica). Integración de datos paleomagnéticos y modelización analógica (2006-2007). Project leader: Ruth Soto Marín

3. PUBLICATIONS

– Blanco-Montenegro, J. M. Torta, A. García, V. Araña. Analysis and modelling of the aeromagnetic anomalies of Gran Canaria (Canary Islands). *Earth and Planetary Science Letters*, 206, 601- 616. 2003

– Blanco, J.M. Torta, A. García y V. Araña. Estructura cortical de Gran Canaria a partir de datos aeromagnéticos. En: Actas de la III Asamblea Hispano-Portuguesa de Geodesia y Geofísica. ISBN: 84-9705-297-8. Editorial de la Universidad Politécnica de Valencia, Valencia, 2003, pp. 760-765 (tomo II). 2003

– M.F. Bógalo, F. Heller, J.J. Villalaín, M. Calvo, M.L. Osete y A. Pérez-González. Propuesta metodológica para la caracterización de la mineralogía magnética en estudios paleoambientales. Aplicación al yacimiento de Atapuerca. *Geogaceta*, 34, 107-110. 2003

– J. J. Villalaín, G. Fernández-González, A. M. Casas, A. Gil-Imaz. Evidence of a Cretaceous remagnetization in the Cameros Basin (North Spain): implications for basin geometry. *Tectonophysics*, 377 (1-2), 101-117. 2003

– Osete, M.L., Villalaín, J.J., Palencia, A., Osete, C., Sandoval, J. y García, V. New palaeomagnetic data from the Betic Cordillera. Constrains on the timing and the

geographical distribution of tectonic rotations in southern Spain. *Pure and Applied Geophysics*, 161, pp. 701-722. 2004

- T. Román, A. Casas, B. Oliva, C. Liesa y R. Soto. Fábrica magnética del Plutón de Millares (Pirineo central, Huesca), GEOTEMAS, 6(3), 331-334. 2004

- R. Soto, A. Casas-Sainz y F. Storti Influencia de la geometría del backstop en el orógeno pirenaico. Modelización analógica. GEOTEMAS, 6(3), 113-116. 2004

- R. Soto, A. Casas-Sainz, F. Storti, F. Rossetti y C. Faccenna. Flujo de material dúctil relacionado con carga diferencial de los materiales de cobertera. GEOTEMAS, 6(3), 109-112. 2004

- R. Soto, J. Martinod, R. Riquelme, G. Hérail y L. Audin. Tectónica reciente del sistema de fallas de Domeyko, Salar de Punta Negra (antearco Andes Centrales, norte Chile). GEOTEMAS, 6(3), 99-102. 2004

- J.J. Villalaín, V.V. Ruiz, D. Rey, M.L. Osete y C. Caballero. Interpretación tectónica de la remagnetización terciaria del segmento Sur de la Sierra Madre Oriental Mexicana. *GEOTEMAS*, 6(4), 347-350. 2004

- Blanco-Montenegro, F.G. Montesinos, A. García, R. Vieira, and J.J. Villalaín. Paleomagnetic determinations on Lanzarote from magnetic and gravity anomalies: implications for the early history of the Canary Islands. *Journal of Geophysical Research*, vol. 110, B12102, doi: 10.1029/2005JB003668. 2005

- A.M. Casas, R. Soto-Marín, A. González and J.J. Villalaín. Folded onlap geometries: implications for recognition of syn-sedimentary folds. *Journal of Structural Geology*, vol. 27, 1644-1657. 2005

- R. De Ritis, I. Blanco-Montenegro, G. Ventura, and M. Chiappini. Aeromagnetic data provide new insights on the volcanism and tectonics of Vulcano island and offshore areas (southern Tyrrhenian Sea, Italy). *Geophysical Research Letters*, vol. 32, L15305, doi: 10.1029/2005GL023465. 2005

- Goguichaichvili, B. Henry, L. Alva-Valdivia, J. Rosas-Elguera, J. Urrutia-Fucugauchi, M. Rodríguez Ceja y M. Calvo- Rathert. Paleomagnetism of Ar-Ar Evidences for the Matuyama-Brunhes transition precursor and a fully reversed dated lava flows from the Cerobuco-San Pedro Volcanic Field (Western Mexico): geomagnetic event in the Brunhes Chron. *Journal of Geophysical Research*, vol. 110, No. B8, B08203, doi:10.1029/2005JB003641. 2005

- Gómez, B., Carrancho, A., García, S., Garrido, D., Riba, D., y Sala, R. La Jueria, un nou jaciment del pleistocè en la vall mitjana del Ter. *Quadern de Treball de l´Associació Arqueològica de Girona*, 13, 41-52. 2005

- R. Soto, J. Martinod, R. Riquelme, G. Hérail and L. Audin. Using geomorphological markers to discriminate Neogene tectonic activity in the Precordillera of North Chilean forearc (24-25ºS). *Tectonophysics*, vol.411, 41-55. 2005

- Antolín, B. Román, T., Casas, A., Gil-Peña, I., Oliva, B. y Soto, R., Fábrica magnética del plutón de Marimanha (Pirineo Central), Geogaceta, vol. 39, 23-26. 2006

- Bógalo, M.F., M. Calvo, Villalaín, J.J., Fernández, G. and Pérez, A. Environmental magnetism study from Galería cave, in the Atapuerca palaeo-archaeological site. En: Publicación especial. MAGIBER I: Paleomagnetismo en la Península Ibérica. Editor(es): M. Garcés, C. Gomes, J.C. Larrasoaña, E. Pueyo, J.J. Villalaín y M. Calvo. Edit. Universidad de Burgos, pp. 71-75. 2006

- M. Calvo, Cuevas, J., Tubía, J.M., Aranguren, A. y Goguitchaichvili, A. Resultados paleomagnéticos preliminaries en rocas volcánicas cretácicas del Arco Vasco. En: Publicación especial. MAGIBER I: Paleomagnetismo en la Península Ibérica. Editor (es): M. Calvo, M. Garcés, C. Gomes, J.C. Larrasoaña, E. Pueyo y J.J. Villalaín. Edit. Universidad de Burgos, pp 33-38. 2006

- M. Calvo, Prévot, M. y Perrin, M. ¿Por qué las determinaciones de la paleointensidad pueden resultar fallidas? Algunas respuestas obtenidas en coladas históricas del Etna. En: Publicación especial. MAGIBER I: Paleomagnetismo en la Península Ibérica. Editor(es): M. Garcés, C. Gomes, J.C. Larrasoaña, E. Pueyo, J.J. Villalaín y M. Calvo. Edit. Universidad de Burgos, pp. 113-118. 2006

- M. Calvo, Tubía, J.M., Cuevas, J. and Aranguren, A. Paleomagnetismo en diques máficos del Oligoceno-Mioceno inferior de Málaga. En: Publicación especial. *MAGIBER I: Paleomagnetismo en la Península Ibérica.* Editor(es): M. Garcés, C. Gomes, J.C. Larrasoaña, E. Pueyo, J.J. Villalaín y M. Calvo. Edit. Universidad de Burgos, pp. 19-23. 2006

- M. Garcés, C. Gomes, J.C. Larrasoaña, E. Pueyo, J.J. Villalaín y M. Calvo. (Editores), *MAGIBER I: Paleomagnetismo en la Península Ibérica.* Editorial de la Universidad de Burgos, 134 pp. 2006

- Mata, M.P., Villalaín, J.J. y Casas, A.M. Mineralogía magnética en rocas mesozoicas remagnetizadas de la Cordillera Ibérica (Sinclinal de Villavelayo-Sierra de la Demanda), *Macla*, vol. 6, 301-306. 2006

- Nicolosi, I. Blanco-Montenegro, A. Pignatelli, M. Chiappini. Estimating the magnetization direction of crustal structures by means of an equivalent source algorithm, *Physics of the Earth and Planetary Interiors*, vol. 155, 163-169. 2006

- Rodríguez-Ceja, M.; Goguichaichvili, A., Calvo-Rathert, M., Morales-Contreras, J., Alva-Valdivia, L., Rosas-Elguera, J., Urrutia-Fucugauchi, J. and Delgado-Granados, H. Paleomagnetism of the Pleistocene Tequila Volcanic Field (Western Mexico). Earth Planets Space, Vol. 58 (No. 10), 1349-1358. 2006

- Román-Berdiel, T., Casas, A. M., Oliva-Urcia, B., Pueyo, E.L., Liesa, C., Soto, R. The Variscan Millares granite (central Pyrenees): Pluton emplacement in a T fracture of a dextral shear zone, *Geodinamica Acta* 19 (3-4), 197-211. 2006

- Soto, R., Storti, F., Casas-Sainz, A. Impact of backstop thickness lateral variations on the tectonic architecture of orogens: insights from sandbox analogue modelling and application to the Pyrenees, *Tectonics*, vol. 25, TC2005, doi: 10.1029/2004TC001693. 2006

- Soto, R., Casas-Sainz, A. M., Pueyo, E.L., Along-strike variation of orogenic wedges associated with vertical-axis rotations, Journal of Geophysical Research, vol. 111, B10402, doi:10.1029/2005JB004201. 2006

UNIVERSITAT DE BARCELONA
Departament de Geodinàmica i Geofísica
Martí Franquès s/n
08028 Barcelona. SPAIN
Tf: + 34 93 4024273 /21376
Fax: + 34 93 4021340

1. AREAS OF RESEARCH (concerning geomagnetism and geoelectricity)

- Magnetotelluric surveys: Regional studies
- Electromagnetic methods applied to Hydrogeology

2. SCIENTIFIC PROJECTS

- Desarrollo de los métodos de exploración electromagnética y su aplicación a los recursos naturales. Funding Agency: MCTE - Ministerio de Ciencia y Tecnología. (2002-2007).

- Innovación del método magnetotelúrico y su implementación a diferentes escalas: aplicación a la caracterización geoeléctrica de la litosfera de la Cordillera Bética. PNRN - CICYT - (2006 -2009)

- Tomografía geoeléctrica: desarrollo para la caracterización de acuíferos (REN2002-04538-C02-01) Funding Agency: MCTE - Ministerio de Ciencia y Tecnología. (2002-2005).

3. DOCTORAL THESIS

- Martí, A., A Magnetotelluric Investigation for Geoelectrical Dimensionality and Study of the Central Betic Cristal Structure, University of Barcelona, Barcelona, 2006.

- Arango, C., Estudio Magnetotelúrico de la zona de Lluchmajor (Mallorca): Avances en el proceso de datos y modelo 3D, University of Barcelona, Barcelona. 2005

- Gabàs, A., Nous aspectes metodològics en lœxploració elèctrica i electromagnètica, University of Barcelona, Barcelona, 2003.

4. PUBLICATIONS

– Ledo, J., 2-D versus 3-D magnetotelluric data interpretation, Surveys in Geophysics, 26 DOI: 10.1007/s10712-005-1757-8, 2005.

– Ledo, J. and Jones, A.G., Temperature of the upper mantel beneath the Intermontane Belt, northern Canadian Cordillera, determined from combining mineral composition, electrical conductivity laboratory studies and magnetotelluric field

observations, *Earth and Planetary Science Letters*, 236, 258-268, 2005

- Jones, A.G., J. Ledo and I.J. Ferguson.Electromagnetic images of the Trans-Hudson orogen: The North American Central Plains anomaly revealed. *Canadian Journal of Earth Sciences*, 42 457-478, 2005

- Jones, A.G., J. Ledo, I.J. Ferguson, N. Grant, G.W. McNeice, J. Spratt, C. Farquharson, B. Roberts, G. Wennberg, L. Wolynec, and X. Wu. A 1600-km-long magnetotelluric transect from the Archean to the Tertiary: SNORCLE MT Overview. *Canadian Journal of Earth Sciences*. 42, 1257-1275, 2005

- Falgàs, E., Ledo, J.J., Teixidó, T., Gabàs, A., Ribera, F., Arango, C., Queralt, P., Plata, J.L., Rubio, F., Peña, J. A., Martí, A. and Marcuello, A. Geophysical characterization of a Mediterranean costal aquifer: Baixa Tordera fluvial deltaic aquifer unit. *Groundwater and saline intrusion*, 15, 395-404, 2005.

- Martí, A., Queralt, P, Jones, A. G., and Ledo, J.J. Improving Bahr's invariant parameters using the WAL approach. *Geophysical Journal Internacional*, 163 38-41, 2005.

- Unsworth, M.J., A.G. Jones, W. Wei, G. Marquis, S. Gokarn, J.E. Spratt, and the INDEPTH-MT team. Crustal rheology of the Himalaya and Southern Tibet inferred from magnetotelluric data. *Nature*, 438 78- 81, 2005

- Marcuello, A., Queralt, P., Ledo, J. Applications of dispersion relations to the geomagnetic transfer function. *Physics of the Earth and Planetary Interiors*, 150. 2005.

- Ledo, J., Jones, A., Ferguson, I.J., Wolyneck, L. Lithospheric structure of the Yukon, Northern Canadian Cordillera. *Journal of Geophysical Research*, 109, B04410, doi:10.1029/2003JB002516, 2004

- A. Martí, P. Queralt and E. Roca. Geoelectric dimensionality in complex geologic areas. Application to the Betic Chain, Geophysical Journal International (2004), 157, 961-974.

UNIVERSITAT POLITÈCNICA DE CATALUNYA
Group of Astronony and Geomatics (gAGE/UPC)
Jordi Girona, 1-3. Módulo C-3, Campus Nord
08034 BARCELONA. SPAIN
Tf: +34 93 401 6029
Fax: +34 93 401 5981

1. AREAS OF RESEARCH

- Ionospheric determination with GNSS data
- Ionospheric tomography
- Precise GNSS navigation
- New tools for assesing Satellite Based Augmentation Systems

2. SCIENTIFIC PROJECTS

- Improvement of GNSS real-time ionospheric models (WARTK)
- Characterization of Medium Scale Travelling Ionospheric Disturbances (MSTID)
- MSTID real-time modelling
- Characterization of large ionospheric storms

3. PUBLICATIONS

- Manuel Hernández-Pajares, J. Miguel Juan Zornoza, Jaume Sanz, Medium Scale Traveling Disturbances Affecting GPS Measurements: Spatial and Temporal Análisis. Journal of Geophysical Research, doi:10.1029/2005JA011471 Vol. 111, A07- S11, 2006.

- Manuel Hernández-Pajares, J. Miguel Juan Zornoza, Jaume Sanz Subirana and Santiago Soley, ESTB performance under the October 30th 2003 geomagnetic super storm. Space Communications, Vol. 20, 7-16, 2005/2006

- Manuel Hernández-Pajares, J. Miguel Juan Zornoza, Jaume Sanz Subirana, Richard Farnworth, and Santiago Soley, EGNOS Test Bed Ionospheric Corrections Under the October and November 2003 Storms, IEEE Transactions on Geoscience and Remote Sensing, Vol. 43(10), 2283-2293, 2005

- Hernandez-Pajares M., J.M. Juan, J. Sanz. GPS data processing: code and phase. Algorithms, tecniques and recipes. Editorial: gAGE/UPC, ISBN 84-932230-5-0, 1-318, Barcelona, Spain, 2005

- R. Orús, M. Hernández-Pajares, J.M. Juan , J. Sanz, Improvement of global ionospheric VTEC maps by using kriging interpolation technique. Journal of Atmospheric and Solar-Terrestrial Physics, Vol. 67, 1598-1609, 2005

- Garcia-Fernandez M, Hernandez-Pajares M, Juan JM, Sanz J, Performance of the improved Abel transform to estimate electron density profiles from GPS occultation data. GPS Solutions, Vol. 9(2), 105-110, 2005

- Hernández-Pajares M., J.M. Juan, J. Sanz, O.Colombo. Feasibility of Wide-Area Subdecimeter Navigation With GALILEO and Modernized GPS. IEEE Transactions on Geoscience and Remote Sensing, Vol. 41(9), 2128-2131, 2003

- Hernández-Pajares M., J.M. Juan, J. Sanz, O.Colombo. Impact of real-time ionospheric determination on improving precise navigation with GALILEO and next-generation GPS. Navigation, Vol. 50(3), 205-218, 2003

- Garcia-Fernandez M., M. Hernandez-Pajares, J.M. Juan, J. Sanz, Improvement of ionospheric electron density estimation with GPSMET occultations using Abel inversion and VTEC information. Journal of Geophysical Research - Space Physics, Vol. 108(A9), 1338, 2003JA009952, 2003

- Garcia-Fernandez M., M. Hernandez-Pajares, M. Juan, J. Sanz, R. Orus, P. Coisson, B. Nava, S.M. Radicella, Combining Ionosonde with ground GPS data for Electron Density Estimation. Journal of Atmospheric and Solar-Terrestrial Physics, Vol. 65, 683-691, 2003

- Orús R., M. Hernández-Pajares M., J.M. Juan, J. Sanz, and M. Garcia-Fernandez, Validation of the GPS TEC maps with TOPEX data. Advances in Space Research, 2003

- Orús R., M. Hernández-Pajares, J.M. Juan, J. Sanz and M. García, Performance of different TEC models to provide ionospheric corrections, Journal of Atmospheric and Solar Terrestrial Physics, Vol. 64 No.18, 2055-2062, 2003

4. PATENTS:

- M. Hernández-Pajares, J.M. Juan, J. Sanz. Correction procedure of Travelling Ionospheric Disturbances in satellite based navigation and in GNSS receiver positioning. Reference number: P200602498 Country of priority: España, Sept 2006, Owner Institution: Technical University of Catalonia (UPC)

- M. Hernández-Pajares, J.M. Juan, J. Sanz. Procedure of Autonomous Determination of GNSS Receiver Orientation with a single antenna, using its Ionospheric Information. Reference number: P200402947 Country of priority: España, Dic 2004, Owner Institution: Technical University of Catalonia (UPC)

REPORT OF ACTIVITIES OF THE HYDROLOGY SECTION OF THE SPANISH COMMISSION OF GEODESY AND GEOPHYSICS, FOR THE 2003-2006 PERIOD.

INTRODUCTION

The Hydrology Section is part of the Spanish Commission of Geodesy and Geophysics, created by the Ministerial Order of March 25th 1999 (B.O.E. 3-04-1999), and is constituted by ten members, renewable every four years in its 50%. These members come from spanishô research, development and even Hydrology management areas, that, as in its surrounding countries are quite extensive; and include university departments, research centres, official organisms dedicated to hydrologic experimentation, projects lead by the Administration, with scientific commissions for their monitoring due to its relevance, and obviously, the own Administration through means of its specific research programs. The Hydrology Section has its own activities, but also attempts to track developments on hydrologic research performed in the country, which is quite difficult and complex given the circumstances of the stated subject. In this report, the Sectionôs self management during the indicated period is firstly reviewed; to afterwars glance at the hydrologic research in our country that, even though incomplete, tries to illustrate anyway its the state-of-the-art through the 2003-2006 period.as well as the relationship between the members and the Section.

ACTIVITIES OF THE HYDROLOGY SECTION OF THE SPANISH COMMISSION OF GEODESY AND GEOPHYSICS

Year 2003

During this year the Hydrology Section Statutes were elaborated, fulfilling the established regulation at the Order of Creation of the Spanish Commission of Geodesy and Geophysics, which forced a number of contacts between its members.

The Hydrology Section was actively involved on the organization of the Hydrology Session of the 4th Portuguese-Hispanic Assembly of Geodesy and Geophysics, foreseen for February 2004, in Figueira da Foz (Portugal), especially Professors Dr. A. Sauquillo and Dr. E. Custodio who are part of the Scientific Commission. The possibility of publishing a selection of works, presented at the mentioned 4th Assembly, in journals, with a wide diffusion within the national scientific scope, as *Ingeniería del Agua*, *Boletín Geológico Minero* o *Ingeniería Civil*, was considered.

The Hydrology Section began to work on the development of a data bank about the state-of-the-art in terms of Hydrology during the last years in Spain.

Year 2004

During the year 2004 the Statutes of the Hydrology Section were approved. In addition to the regular contacts and meetings amongst the HS members, in order to treat different subjects in relation to the Section, a mandatory encounter with occasion of the 4th Portuguese-Hispanic Assembly of Geodesy and Geophysics was held in Figueira da Foz

(Portugal) from 3rd to 7th February 2004.

The Assembly included two sessions about Hydrology, on February the 6th and the 7th. In addition to Professors Dr. A. Sahuquillo and Dr. E. Custodio, who are members of the Scientific Commission, Dr. F. Francés and Dr. J. Samper (Secretary of the Section, at that moment) participated as moderators. 20 communications were presented (12 oral communications and 8 posters), 17 of them were produced in Spain. All the communications were published at the 4th Assembly Minutes and, a selection of them was published in a special issue of the journal *Boletín Geológico y Minero* (*Geologic and Mining bulletin)* of the IGME (Geologic and Mining Institute of Spain).

The Section continued with the development of the data bank of the state-of-the-art.

Year 2005

In February 2005, four years after the first Hydrology Section was constituted, 50% of its members were renewed, in accordance with the Order of Creation of the Spanish Commission of Geodesy and Geophysics. The new Section comprised the following members: Dr. T. Estrela; Dr. F. Gallart; Dr. J. J López; Dr. J. Mas-Pla; Dr. M. Manzano; Dr. J. Á. Mintegui; Dr. Antonio Pulido Bosch; Dr. D. Sempere; Dr J. Roldán Cañas and Dr. F. Villaroya.

In June 2005, Dr. J. Á. Mintegui and Dr. M. Manzano, members of the new Section, were commissioned to represent the Hydrology Section at the preparation of the 5th Portuguese-Hispanic Assembly of Geodesy and Geophysics, which would be held in Seville at the beginning of 2006. The correspondence between the members of the new Section was increasing in activity, at the same time that the preparation of Seville Assembly and creation of Section Director Body were progressing. The new Section was very active on the preparation of the 5th Assembly.

Year 2006

Simultaneously with the 5th Portuguese Hispanic Assembly of Geodesy and Geophysics of Seville, the Hydrology Section held its mandatory meeting in January 31st 2006, in which not only the Section issues were discussed, but also commented the performance at the Assembly of the Hydrology session, and Dr. J. Á. Mintegui and Dr. M. Manzano were respectively proposed for the Sectionôs President and Secretary positions, proposal that rose to the Commission Plenary Session, and was ratified at the session of March 6th, 2006.

In the above mentioned 5th Assembly, held in Seville between January 30th and February 3rd, Dr. J. Á. Mintegui and Dr. M. Manzano, members of the Hydrology Section, were part of its Scientific Commission, plus Dr. J. Mas-Pla (member of the Section as well) and Dr. J. C. Robredo acted as moderators at that session. Altogether, 19 communications were presented (13 oral communications and 6 posters), and the Spanish participation was the biggest one, with 18 communications. The Assembly Organizing Committee published, on March 2007, a CD-ROM (ISBN: 84-8320-373-1), that included the communications that were presented and accepted; amongst them, 12 communications came from the Hydrology Section.

The Hydrology Section managed together with the journal *Ingeniería del Agua*, which holds a wide and recognized national scientific scope, the publication of the communications presented in the Hydrology session, at the mentioned 5th Assembly, complying the scientific conditions established by the journal. At this moment, one is working on the preparation of an ordinary issue of this journal, including the selected communications.

In October 2006, the Hydrology Section Representative of the IAHS was changed; Dr. M. Manzano was proposed for this position, which was communicated to the Association Representative, Dr. P. Hubert. The contacts between the members of the Section were numerous along the year. The preparation of the data bank of the state-of-the-art was started again.

BRIEF OVERVIEW OF THE INVESTIGATION ON HYDROLOGY MATTERS IN SPAIN DURING THE 2003-06 PERIOD

A summary of works performed by the Hydrology Section during the 2003-06 period is listed below, with the purpose of generating a data bank of the state-of-the-art of the Hydrology activity in Spain. At this point, it should be clarified that what is displayed here is incomplete, due to the amplitude of the area in which the Hydrology in our country is developed, reason why it is only possible to cover a first approach to it, following the line established at the introduction of the present report. Two aspects are approached: A) participation of Spanish investigatorsô papers in journals of international reference, distinguishing thematically, either surface Hydrology or ground Hydrology, and highlighting their source, and B) other subjects related to research, its financing, and divulgation, as well as important projects of hydrologic nature, reports, books etc., all of them of National relevance, and related to the participation of Hydrology Section members.

A-1) Related to surface Hydrology, Spanish investigators have participated, during the period 2003-06, at least in the following journals with an international scope: 34 papers in *Journal of Hydrology*, 25 papers in *Agricultural Water Management* and 4 papers in *Advances in Water Resources*. Published works sources are: 1) University Departments, 2) C.S.I.C. (Superior Council of Scientific Researches) Research Centres, which works at national level, but operate through the different Spanish Autonomic Communities and 3) Agrarian Research centres from different Autonomic Communities. According to the first group, the mentioned Departments belong to the following Universities: Alcalá de Henares, Almería, Barcelona, Castilla-La Mancha, Complutense de Madrid, Córdoba, Girona, Granada, La Laguna, Lleida, Málaga, Politécnica de Cataluña, Politécnica de Cartagena, Politécnica de Madrid, Politécnica de Valencia, Pública de Navarra, Oviedo, Salamanca, Santiago de Compostela and Valencia. Amongst the centres of C.S.I.C. we can list those of: Almeria, Barcelona, Córdoba, Madrid, Murcia, Seville and Zaragoza, and related to the Agrarian Research centres, those of: Aragón (Zaragoza), the Canary Islands (La Laguna, Tenerife) and Castilla-La Mancha (Albacete). The members of the Hydrology Section, Dr. J. J. López, Dr. A. Pulido and Dr. D. Sempere are listed amongst the authors of the papers. Other collaborations have been made by the Section members, such as Dr. J. J. López and F. Gallart, in journals as: *Catena; Earth Surface Processes and Landforms; International Journal of Sediment Research* y *Transactions on Geoscience and Remote Sensing*. Moreover, it should be said that there are further

associations grouping Surface Hydrology researchers, such as the Forest Hydrology Section of the Spanish Forest Sciences Society.

A-2) In relation to ground Hydrology, in Spain there are between 400 and 500 investigators from different scientific origins (mainly Geology, but also Engineering (Mining, Civil Engineering, Agronomy), and other scientific degrees - Biology, Pharmacy, Environmentalists- and humanistic approach related to legislation matters (Economy, Law) that are dedicated to the investigation of different aspects (technical, scientific, economic, and legal) of ground Hydrology. These investigators serve: 1) on university departments (there are very active research groups on ground Hydrology and Hydrogeology, almost in every school of Civil Engineering (Mining and Civil Engineering) -Catalonia, Valencia, Madrid, Corunna, Oviedo, Cantabria and Cartagena-, as well as in almost every Sciences faculty - Geologic, Experimental, Environmental, University Institutes and Polytechnic Schools throughout the country of the country - Granada, Almeria, Malaga, Jaén, Huelva, Alcala de Henares, Madrid, Castilla-La Mancha, Salamanca, Corunna, Oviedo, Cantabria, Bilbao, Zaragoza, Barcelona, Girona, Castellón, Valencia, Alicante, Illes Balears, Gran Canaria); 2) on different OPIs (*Organismo Público de Investigación;* Public Research Organism) of National relevance (C.S.I.C., I.G.M.E., C.E.D.E.X.) and 3) on different State Administration Organisms (Ministry of Environment) and Autonomic Communities (Environment, Agriculture, and Water Councils).

Most of these professionals share a strong scientific activity that is shown through their publications (both national and international) and through an extraordinary participation in scientific meetings (national and international congresses, symposiums, and courses). Publications published in international journals during the 2003-2006 period mainly come from university or mixed research groups, university-OPIs, and they are more than a hundred. Amongst foreign publications mostly frequented by the Spanish investigators, we could list: *Journal of Hydrology*, *Hydrogeology Journal*, *Science of the Total Environment*, *Water Resources Research*, *Advances in Water Resources*, *Journal of Fluid Mechanic*, *Ground Water; Journal of Contaminant Hydrology*, *Vadose Zone Journal*, *Water Policy*. All the members of the Hydrology Section whose professional field is ground Hydrology (Dr. F. Villarroya, Dr. A. Pulido, Dr. J. Mas-Pla and Dr. M. Manzano) had several papers published in some of these journals during the indicated period.

The intense activity of the Spanish hydro geologists is reflected on several national and international, professional ground waters organizations and associations, that annually organize, altogether, between 2 and 5 national and international events (congresses, symposiums, and seminaries) with a great call power. Outstanding contributions have been published in international journals of Hispanic scope: *Boletín Geológico y Minero (Geologic and Mining bulletin)*, of the IGME; *Geológica Acta*, of the CSIC-UB; *Tecnología del Agua (Water Technology)*; *Hidrología y Recursos Hidráulicos (Hydrology and Hydraulic Resources*), and books of great diffusion in Latin America: special volumes or specific issues, such as *Hidrogeología y Aguas Subterráneas* (*Hydrogeology and Ground Water)* published by the IGME. In this context, it should be highlighted that the previous President of the Hydrology Section and eminent Hydrogeologist, Dr. E. Custodio, was president of the IAH between 2001 and 2005. These organizations, and some of their contributions, are listed below:

1) The Spanish group of the International Association of Hydro-Geologists (IAH-GE), of which Dr. F. Villarroya was president (1987-1994), also member of the Hydrology Section.

2) The Iberian group of Hydrogeology of Rocas Duras, of the IAH-GE, of which F. Villarroya is founder, and coordinator since 1996, not only organize annually between 1 and 3 symposiums and conferences in Spain, generally of international level, but also has been collaborating for years in the implementation of other IAH National Groups in Latin America (Argentina, Colombia, Ecuador), supporting the activities organized by these groups. Several current (Dr. A. Pulido and Dr. M. Manzano), and former members of the last Hydrology Section Board (Dr. A. Sauquillo, Dr. E. Custodio and Dr. F. J. Samper) often collaborate with the IAH Argentine National Group, international UNESCO Water Management programs and projects (International Hydrologic Program), as well as with the International Atomic Energy Agency (Isotopic Hydrology Section).

3) The Spanish Hydrogeologist Association (AEH), of which its more relevant periodical activity is the organization of the Spanish Hydrogeology Symposium every 2-3 years. Last edition (8^{th} Symposium) was held in Zaragoza, in October 2004. Presented works are always edited in the publication *Hidrogeología y Recursos Hidráulicos (Hydrogeology and Hydraulic Resources)*, that already reaches its 27^{th} volume.

Publications with the scientific contributions of the events organized by the IAH-GE and the AEH have a wide diffusion and strong repercussion amongst the Latin American hydrogeology community. All the members of this Hydrology Section specialized on ground hydrology periodically deliver contributions to the congresses organized by both associations.

4) The Hydrogeology and Ground Water Unit of the IGME is also very active as events organizer (individually or coordinated with other associations), as well as in the publication edition and its diffusion amongst the Latin American hydrogeology community. Their last events have been: *International Symposium on Sustainable Ground Water Management* (*Simposio Internacional sobre el Uso Sostenible de las Aguas Subterráneas,* ISGWAS), co-organized with the Spanish Sciences Royal Academy and the National Groundwater Association (January, 2006); *International Technology Congress on the inflow of seawater in coastal aquifers; Mediterranean countries* (TIAC'03), in March 2003; and *Workshop on the Implementation of Water Framework Directive. Ground Water*; co organized with the Hydraulic Works and Water Quality General Direction (November, 2003). The IGME also provides guardianship to other associations, as the *Club del Agua Subterránea* (*Ground Water Club)* and the *Specialized Water Group of the Mining Engineers National Association*.

B) Research work in Spain is still financed mainly through means of public funds, nevertheless private financing is currently increasing. Regarding ground Hydrology, the public financing is chanelled fundamentally in two ways: 1) In National projects instance, through the CICYT (National Agency that coordinates the research activity in Spain), and through equivalent agencies from each Autonomic Community. 2) In the case of International projects, basically through the European Union funds and in a smaller proportion, UNESCO, World Bank and Spanish Agency of International

Cooperation funds (Agencia Española de Cooperación Internacional, AECI). In some cases, the Administration collaborates directly through an OPI, such as IGME or CEDEX. Regarding surface Hydrology, the financing sources are most of the times the same, but in the case of the OPIs (CEDEX, INIA).

Despite the absence of definitive data, it has been verified that the number of participations of Spanish investigators on the Hydrology matter (surface and ground Hydrology) in projects financed by the European Union, has been growing during the last years, and has reached an excellent status. All members of the Hydrology Section (either surface or ground Hydrology) participate in some European project. For instance, the hydro geology researchers of the Section (Dr. A. Pulido, Dr. F. Villarroya, Dr. J. Mas-Pla, and Dr. M. Manzano), have participated in seven of these projects in the 2003-06 period, as well as in others financed by international organisms, such as UNESCO (IGCP 448: *World Correlation of Karst Geology and Its Relevant Ecosystem* and IGCP 519: *Coastal Integrated management of aquifers in Iberian America);* World Bank *(Sustainable Management of the Water-bearing System Guaraní)* and the International Atomic Energy Agency (*Coordinated Research Project for Isotopic techniques assessment of hydrological processes in wetlands*).

B-1) An important project, both due to its by its budget and its environmental nature, linked with Hydrologic matters (surface and ground Hydrology), and currently in execution in Spain, is: *Hydric Regeneration Of The Catchment And Channels Flowing To The Salt Marshes Of The National Park Of Doñana Project*, known as *Project Doñana 2005*. It accounts with a General Coordinator, who at the present time would be Mr. H. Castro, Senior Official Employee of the Andalusian Autonomic Government, an Executive Committee, and a Scientific Committee. The executive responsibility falls on the Hydrographical Confederation of the Guadalquivir River, acting as Delegate Engineer, Mr. B. Bayán; in addition, the Committee is also integrated by other organisms related with Doñana, such as C.S.I.C. Regarding the Scientific Committee, it is represented by investigators from every scope, C.S.I.C., Technical Departments from different Universities and Administration Technical Services. The members of the Hydrology Section, Dr. M. Manzano and Dr. J. A. Mintegui belong to this last Committee. In this Project exists an implication of the research element, both during its execution and further monitoring; this is carried out by specific projects, linked to the fundaments of Project Doñana 2005, which are coordinated by the mentioned Scientific Committee. A synthesis that represents the space of Doñana and its regeneration project is gathered in the publication *Doñana: Water and Biosphere* (2006), pp. 355, published by the Ministry of Environment, Hydrographical Confederation of the Guadalquivir River, Doñana 2005, UNESCO, Government of Andalusia and MAB. Moreover, *Doñana Project* 2005 has generated several technical and scientist publications.

B-2) In order to attend drought problems and water needs, which are subjects of primal relevance for Mediterranean countries, as Spain is, at the present situation, but also in the context of the climate change; the Ministry of Environment has developed and published a Report titled: ñ*La sequía en España: Directrices para minimizar su impacto***ò** *(The drought in Spain: Directives to diminish its impact)*, pp.314, edited by a Committee of Experts, on which Dr. J. Roldan, member of the Hydrology Section serves.

B-3) The National Hydrologic Plan of 2001, which was later modified by a RD. (2004)

and finally set out with the Law 11/2005 of June 22nd (Official State Bulletin of 23-06-2005). The member of the Hydrology Section, Dr. T. Estrela, from its outstanding position within the Ministry of Environment, has been a highly qualified technician in the management of this Plan.

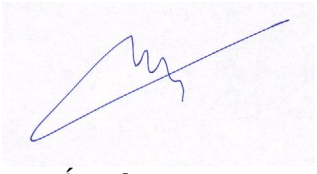
B-4) In the context of the new European Water Directives (EU Water Framework Directive, and Ground Water Directive), several members of the Section have been directly involved in tasks of contribution to the text in the rough draft phase and further divulgation, once approved. Dr. E. Custodio (former president of this Section) and Dr. M. Manzano participated in the rough draft of the Ground Water Directive, through European project *BaSeLiNe* (1999-2003), and two books, one published by Blackwell (Ed. Mike Edmunds) and another one by the European Commission (Ed. P. Quevauvillier) that, in spite of being written in 2006, will see the light in a short period. Also, the *Generalitat de Catalunya* (Autonomic Government of Catalonia) has published ñ*La Directiva Marco del Agua en Catalunya: Conceptos, retos y expectativas en la gestión de los recursos hídricos***ò** *(The Water Framework Directive in Catalonia: Concepts, challenges and expectations on water resources management)*, pp. 144, on which Dr. J. Mas-Pla, member of the Hydrology Section, has collaborated.

In order to draw attention and divulgate throughout the country the Water Framework Directive, and to generate a social conscience on the actual need of new lines of water management, one has to emphasize the efforts of the *Foundation for a New Culture of Water*, constituted mainly by investigators and university professors.

C) One concludes indicating the commitment acquired by the members of the Hydrology Section, to do whatever is possible for them to incorporate young Spanish investigators to the Hydrology field, through the Assemblies promoted by the Spanish Commission of Geodesy and Geophysics.

Madrid 20, April, 2007

Marisol Manzano
Secretary of Hydrology Section



Juan Ángel Mintegui
President of Hydrology Section

National Report on Physical Oceanography
2003-2007

1. Introduction.

The Spanish oceanographic community, which research scope is within IUGG frame, keeps increasing steadily in membership and activities. Members included in the Oceanographic section mailing list amount to 224, research projects occupy a wide gamut of interests, and publications cover an extensive range of subjects, including, both projects and publications, many interdisciplinary themes. There has been an increase in activities related to climate, ecosystem approach and the implementation of ocean observing systems.

In this report the main research areas and objectives of the different Spanish institutions, which have answered to the questionnaire sent around, are briefly described. Main projects and publications are listed in sections 3 and 4, respectively.

2. Institutions.

Centro de Estudios de Puertos y Costas, (belonging to the Centro de Estudios y Experimentación de Obras Públicas, CEDEX)
Antonio López 81,
28026 Madrid
España
Tfno. 91-3357600
Fax 91-3357601
http://www.cedex.es/ingles/puertos/presentacion.html

CEDEX, in particular mainly its Harbour and Coasts Centre, studies and activities are related to the coastal zone: v.g., field and modelling studies on coastal currents before and after harbour new developments, variation of the layouts and profiles of coastal currents near coasts, analysis and deposition of dredged materials, fluent jet dispersion by currents of restoration of beaches and coastal defence maintaining criteria of environmental sustainability. Wave measurements all along the Spanish coast, currently promoted and in conjunction with Puertos del Estado, are done and gives a wide Data Bank Base to engineering projects. It also carries out activities to advice and assess national administrative institutions in case of of accidental oil spilling and marine contamination. Numerical models are used take steps to minimize negative environmental impact.

Centro Internacional de Investigación de Recursos Costeros(CIIRC).
(International Centre for Coastal Resources Research)
c/ Jordi Girona, 1-3
Campus Nord-UPC, módulo D-1
08034 Barcelona
Tfno.: 93 280 6400
Fax: 93 280 6019
E-mail: agustin.arcilla@upc.edu
Web: http://www.upc.edu/ciirc

The International Centre for Coastal Resources Research (CIIRC) is an international research centre created in 1993 but that started its activity in 1994. It was established as a public consortium by the Generalitat de Catalunya government and the Universitat Politècnica de Catalunya, with the support of the United Nations Environment Programme (UNEP). The main aim of CIIRC is the research on coastal resources with emphasis at the different time and space scales that appear while solving conflicts and to make general predictions on the coastal zone.

CIIRC centres its activity in five strategic research fields: Maritime climate in the coastal zone and continental shelf, Hydrodynamics of coastal and estuarine zones, Sedimentary transport and coastal morphodynamics, Engineering and physical oceanography either in the coastal zone or the continental shelf and Integrated coastal management. These research fields have been developed actively during the last decade with abundant basic and applied research projects, resulting in the production of abundant publications, and the development of numerical models. During the last decade CIIRC has developed numerical tools applied to the operational prediction of wave and current fields associated to a certain wind field, within a research project financed by the Servei Meteorològic de Catalunya and that, based on annual agreements, has materialized into an operative prediction system of the wave climate and meteo-oceanography at the Catalan coast.

Institut de Ciències del Mar (ICM-CMIMA)
Passeig Marítim de la Barceloneta 37-49
08003 BARCELONA
España
Tel: 93 2309512
Fax:93 2309555
http://www.icm.csic.es/geo/gof/|

CMIMA belongs to the ñConsejo Superior de Investigación Científica. The Physical Oceanography Department (Departament dôOceanografia Física, DOF) specific areas of research are: Geophysical fluids theory (lage-scale circulation boundary currents, thermocline circulation, potential vorticity, beta effect on the vorticity equation, quasigeostrophic and semi-geostrophic balances, etc.); mesoscale dynamics (rontal regions, vortices, coastal upwelling, etc.); descriptive oceanography; numerical modeling of geophysical fluids; analysis of remote sensing data (multifractal methods for color, temperature and altimetry data, maximum singularity method, estimates of surface velocities, surface velocity probability density function, pattern recognition and tracking, etc.); physical-biological interactions (nutrient fluxes, primary production, remineralization, biogeochemical fluxes, etc.); climate change (long-time series, thermohaline circulation, deep and intermediate waters, southern ocean, biogeochemical cycles, idealized models of climate change, glacial-interglacial cycles, etc.) and interdisciplinary oceanography (operational oceanography, toxic algae, etc.). DOF also carries out teaching and training tasks, participating in two master-doctoral programs with Universitat Politècnica de Catalunya and Universidad de Las Palmas de Gran Canaria.

Instituto Español de Oceanografía (IEO)

Avd. de Brasil, 31
28020 Madrid
España
Tfno: 91 4175411
Fax 91 5974770
www.ieo.es

The IEO, established in 1914, is the oldest and largest marine research institution in Spain. It includes the headquarters in Madrid and nine laboratories distributed along the mainland coast and the archipelagos. It is the official Spanish representative, or one of the members of delegation, in most of the international oceanographic organisations and programmes (IOC, ICES, GOOS, EuroGOOS, etc.).. It is one of the advisory body to the government in marine affairs, particularly in fisheries matters. It has also a long experience in a wide range of ocean surveys and international experiments. The IEO is equipped with a large ocean-going research vessel and several smaller ones. Ships and laboratories are well equipped for field and laboratory work. The IEO is partner in several international and European projects dealing with data base building. It uses international adopted protocol for data quality control and management and it is a formal participant of the most important international intercomparison exercises . IEO maintains a tidegauge network as well as several time series sections around the mainland and archipelagos and is very involved in operational oceanography initiatives. Some of its priority lines for the reported period were: the study of the temporal variability and trends in the oceanographic conditions and biological communities in the Atlantic Ocean and Mediterranean Sea; climate variability; the study of water masses; Eastern Boundary currents; heat, freshwater and nutrients fluxes quantification; and research on the relations between physical processes and living marine resources.

Instituto Mediterráneo de Estudios Avanzados (IMEDEA).
Physical Oceanography Group (GOI_FIS).
CSIC-Univ. Illes Balears
C/ Miquel Marqués 21
07190 Esporles (Islas Baleares)
España
Tfno: +34 971 611716.
Fax: +34 971 611761
Web: http://www.imedea.uib.es/goifis

The Group of Physical Oceanography of IMEDEA has been recognized as a consolidated research group by the Regional Government of the Balearic Islands. The group presently involves more than twenty scientists and its research has a marked interdisciplinary character. Hence, the group has strong links with the biogeochemical groups of IMEDEA and with other institutions. The research topics are mostly related with ocean dynamics at different scales and involve most common methodologies such as technological development, field experiments, remote sensing, data analysis and numerical modelling. Present research topics related with the open ocean are the interdecadal sea-level variability and the relation between mesoscale dynamics and biogeochemical fluxes. Research on spatial objective analysis and the diagnosis of physical processes has also received particular attention. The geographical coverage ranges from the Mediterranean sea to the Southern Ocean. Regarding coastal oceanography, all the efforts focus on the integrated management of the coastal zone,

applied in this case to the Balearic Islands. Hence, this research line includes from coastal dynamics to beach geomorphology or harbour seiches, and involves the development of new technologies, such as ROVs or gliders. Operational oceanography is also one of the hot research topics.

Laboratori dÕEnginyeria Maritima (LIM/UPC)
Universitat Politécnica de Catalunya
c/ Jordi Girona, 1-3
Campus Nord-UPC, módulo D-1
08034 Barcelona
Tfno.: 93 401 6468
Fax: 93 401 1861
E-mail: info.lim@upc.es
Web: http://lim-ciirc.upc.es

LIM/UPC carries out basic and applied research projects in the following fields: coastal and estuarine hydrodynamics, maritime environment climate and quality, oceanographic physics and engineering, coastal morphology, harbour and coastal engineering, and coastal zone management. It has at present a solid infrastructure and the equipment and scientific material it needs to undertake its projects effectively, and in turn to offer these facilities to other institutions or entities.

Puertos Del Estado (PE)
Avda del Partenon 10
Campo de las Naciones
28042 Madrid
España
Tfno. 91-5245500
Fax 91-5245504

The main activities of PE have to do with operational oceanography. They maintain and exploit several buoy networks: Deep-water buoy network, coastal network, tide gauge network and current meter network. Data is used for assimilation into operational systems: operational forecasting of waves and sea level around the Spanish waters; implementation of autonomous wave propagation models on Harbour authorities; development of tide gauge pilot Station to test new technologies and development of routines for automatic data control and exploration. PE is one of the Spanish agencies member of EuroGOOS.

Universidad de Las Palmas de Gran Canaria. (ULPGC)
Campus Universitario de Tafira
31017 Las Palmas de Gran Canaria.
España
Tfno.: 928454500
Fax: 928452922

The main interests of ULPGC have been in the study of the N. Atlantic Western and Eastern Boundaries, upwelling, coupling of biological and physical processes, dyapicnal mixing, effect of islands on the circulation and the Antarctic.

3. Projects.

(*Title of the project and acronym, if exists, are given. Source of funding ï national (Nal) or European (E)- is indicated. A very short description of the project is given if the title is not self-explanatory. Acronyms of Spanish participant institutions in the project are also shown*.)

Argo España. -MCYT, REN2001-4022-E. *(Nal)* Argo profiler deployment. IEO, ULPGC, ICM, PE, IMEDEA.
Argo drifters in the Canary Basin. Ifremer-Coriolis. ICM-CMIMA.
CAÑONES: "Estudio multidisciplinar de la dinámica de un cañón submarino y su repercusión sobre la ecología del margen continental del Mediterráneo Noroccidental". *(Nal)* Submarine canyons dynamics and ecology. Nat., IMEDEA, ICM.
Climate Change and Impact Research: the Mediterranean Environment (CIRCE) (Contract no.: 036961). *(E)*. LIM/UPC.
Concepts and Science for Coastal Erosion Management (CONSCIENCE) (Contract no.: 044122). *(E)*. STREP. CIIRC.
CORICA: Corriente de Contorno Oriental-Canarias hidrografía., REN2001-2649-C02-02. *(Nal)* Eastern Boubdary Current_Canaries. IEO, ULPGC.
Corriente de Afloramiento del Noroeste Africano. CTM2005-00444/MAR.. *(Nal)* NW African upwelling. ICM, ULPGC.
Development of salinity remote sensing capability. N00014-04-1-0152 (ROPO Project 04PR04521-00) ICM
ECOOP, European Coastal-shelf Sea Operacional observing and forecasting system. Global Change and Ecosystems 036355-2. *(E)*. IEO ,PE ,AZTI , IMEDEA, METEOGalicia, LIM.
Environmental design of low crested coastal defense structures (DELOS) (EVK3-CT-2000-00041). *(E)*.. LIM/UPC.
ESASSI: "Contribucion española al proyecto internacional 'Synoptic Antarctic Shelf-Slope Interactions study". Spanish contribution to the international project SASSI. Nat. IMEDEA, ICM.
ESEAS (European Sea Leval Service) -RI: Sea Level Service - Research Infrastructure. Eur. EVR1-CT-2002-40025. *(E)*. IMEDEA, IEO, PE, ROA, UPC.
ESEOO: Establecimiento de un Sistema Español de Oceanografía Operacional. VEM2003-20577-C14_02. *(Nal)* (Operatonal Oceanography system). 20 Spanish institutions
Estuaries and Coastal Areas. Basis and Tools for a More Suitable Development (ECOSUD) (ICA4-CT-2001-10027 INCO-DEV). *(E)*.. CIIRC.
European Station For Time Series In The Ocean (ESTOC). IICM, If Meereskunde-Kiel, U. Bremen .
FERRYBOX: From On-line Oceanographic Observations to Environmental Information. FP5 EVK2-CT-2002-00144. *(E)*. IEO
GRAC II: ENVISAT Radar altimeter-2 calibration with light GPS buoys. ESTEC Conc. 15349/NLSF. *(E)*. ICM.
GYROSCOPE: Development of a real time in situ observing system in the North Atlantic by an array of Lagrangian profiling buoys. EVK2-CT-2000-00087. *(E)*. IEO, ICM, ULPGC.
IMAGEN: Procesos de transporte, campos de velocidades y análisis de estructuras oceánicas mediante imágenes de satélite. REN2001-0802-C02-02. *(Nal)* Velocity field from satelite data. ICM.

Impacto de la energías marinas (PSE-MAR) (PSE-12000-2006-7). *(Nal)*. CIIRC.
INGRES: Intercambios en el estrecho de Gibraltar y su respuesta a forzamientos meteorológicos y climáticos. REN03-01608/MAR. *(Nal)* (Gibraltar exchange). U. Málaga, IEO
Integrated flood risk analysis and management methodologies (FLOODsite) (GOCE-CT-2004-505420). *(E)*.. LIM/UPC. LIM/UPC.
Integrated Infraestructure Initiative (HYDRALAB-III) (Contract No:022441). European Union, RII3. LIM/UPC. (LIM/UPC participantes in the Trasnational Access, the Networking activities and in two Joint Research Activities: (SANDS) and Composite Modelling of the Interactions Between Beaches and Structures (CoMIBBS).
La vorticidad potencial en la simulación, análisis, y asimilación en fluídos geofísicos REN2002-01343/CLI. *(Nal)* Potential vorticity.. ICM
MAMA: Mediterranean network to Assess and upgrade Monitoring and forecasting Activity in the region. EVR1-2001-00006. *(E)*. ICM, IEO, IMEDEA.
MARIE Curie Actions - Modelling and assimilation for RofI Environments. Limits of predictability (MARIE) (MTKD-CT-2004-014509). *(E)*.. LIM/UPC.
Mass transfer through the submarine canyons. INTAS-2001-460. *(Nal)* ICM.
Mediterranean Ocean Forecasting System: Toward environmental predictions (MFSTEP) (EVK3-CT-2002-00075). *(E)*. LIM/UPC, ICCM, IMEDEA.
MERSEA: Marine environment and security for the European area,. AIP3-CT-2003-502885. *(E)*. ICM, IEO, ICCM, IMEDEA:
MIDAS-3: ESP2004-00671 *(Nal)* Contribución de España al desarrollo del segmento de Tierra de la misión SMOS de la ESA durante 2004-05. ICM
MIDAS-4: ESP2005-06823-C05-1. *(Nal)* Calibración de las medidas obtenidas por el radiómetro MIRAS de la misión SMOS y generación de mapas de salinidad y humedad del suelo. CSIC, IEO.
Nutrient dynamics mediated through turbulence and plankton interactions. EVK3-2000-00516. *(E)*. ICM
ORCA: Origen de la Corriente de Canarias. CTM2005-04701-C01-05/MAR. *(Nal)* IEO, ULPGC.
Oceanic Seamounts: an Integrated Study (OASIS). ULPGC
Previsión de oleaje en el Mediterráneo Español. Limitaciones errrores y propuesta de mejora (PREVIMED) (REN2002-03415/MAR). *(Nal)* Wave forecasting.CIIRC, LIM/UPC.
RAPROCAN: Radial profunda de Canarias. Periodical section. E. Boundary Current. Water masses climatology. IEO
Research infrastructure cooperation network (HYDRALAB-II) (HPRI-CT-1999-40008). *(E)*.. LIM/UPC.
Remolinos oceánicos y deposición atmosférica (RODA): dinámica y monitorización de remolinos oceánicos en la corriente de Canarias. *(Nal)* Canary currents gyres ULPGC, IMEDEA.
Remolinos/meandros de mesoscala en la parte central del Estrecho de Bransfield: identificación y acoplamiento físico-biológico. Branfield Strait mesoscale dynamics, Phisic-biological coupling *(Nal)* ULPGC.
SEADATANET: A Pan_European Infraestructura for Ocean and Marine Data Management. *(E)*. RII3-026212. IEO
SOFT: Satellite-based Ocean Forecasting..EVK3-2000-00561. *(E)*. IMEDEA.
Sustainable Ballast Water Management Plant (BaWaPla) (Contract Number: 015449). *(E)*. CIIRC.

Synergetic aspects and auxiliary data concepts for sea surface salinity measurements from space. AO/1-4505/03NL/CB. *(E)*. ICM

Transnational access for researchers to the majors research infrastructure "Wave flume Canal de Investigación y Experimentación Marítima II" (WAVELABII) (HPRI-CT-2002-00195). *(E)*., HPP/ARI. LIM/UPC.

VACLAN: Observación y evaluación de la variabilidad climática en aguas oceánicas del Atlántico Norte. REM2003-08193-C03-00 *(Nal)* Atlantic climatology. IEO, CSIC-IIM,UVIGOô

VANIMEDAT: ÅVariabilidad decadal e interdecadal del nivel del mar en el mediterráneo y el atlántico nororiental". *(Nal)* Interdecadal sea-level variability in the Mediterranean Sea and the NE sector of the Atlantic ocean. Nat. IMEDEA, Puertos del Estado.

Video monitoring of littoral processes in support of coastal-zone management (CoastView) (EVK3-CT-2001-00054). *(E)*. LIM/UPC.

Water quality and sustainable aquaculture. Links and implications (AQUAS) (C015105(INCO)). *(E)*. CIIRC.

4. Publications.

Acosta, J., Canals, M., Carbó, A., Muñoz, A., Urgeles, R., Muñoz, A. and Uchupi, E. (2004). Sea floor morphology and plio-quaternary sedimentary cover of the Mallorca channel, Balearic Islands, western Mediterranean. Marine Geology,206/1-4;165-179

Acosta, J., E. Ancochea, M. Canals, M.J. Huertas and E. Uchupi.2004. Early Pleistocene Volcanism in the Emile Baudot Seamount, Balearic Promontory (Western Mediterranean Sea).Marine Geology,Vol 207/1-4;247-257.Alemán J.V., J.L. Pelegrí, and P.Sangrà, Ocean Rheology. Journal of Non-Newtonian Fluid Mechanics, 133:121-131, (2006). ISSN: 0377-0257

Álvarez, A., Orfila, A. and J. Schellschopp, 2003: Satellite based forecasting of sea surface temperature in the Tuscan Archipielago. International Journal of Remote Sensing , 24, 11, 2237-2251.

Alvarez, A., Orfila, A. and J. TIntoré, 2004: Forecasting the SST of the Ligurian Sea on weekly time scales with a satellite based ocean forecasting (SOFT) system. J. Geophys. Res., 109, C03023, doi:10.1029/2003JC001929,

Beckers, M., M. Rixen, P. Brasseur, J.-M. Brankart, A. Elmoussaoui, M. Crépon, C. Herbaut, F. Martel, F. van den Berghe, L. Mortier, A. Lascaratos, P. Drakopoulos, G. Korres, K. Nittis, N. Pinardi, E. Masetti, S. Castellari, P. Carini, J. Tintore, A. Alvarez, S. Monserrat, D. Parrilla, R. Vautard, S. Speich, 2002: Model Intercomparison in the Mediterranean: MEDMEX simulations of the seasoin the Balearic Islands, Western Mediterranean. J. Mar. Sys., 33-34, 215:251.

Berger M. L., Y. Kerr, J. Font, J.P. Wigneron, J.C. Calvet, K. Saleh, E. Lopez-Baeza, L. Simmonds, P. Ferrazzoli, B. van den Hurk, P.Viterbo, P. Waldteufel, F. Peticolin, A. van de Griend, E. Attema, and M.Rast, Measuring the moisture in the Earth's soil - Advancing the science with ESA's SMOS mission. ESA Bulletin, 115(August):41-45, (2003). ISBN: 0376-4265.

Borges, R., A. Hernández-Guerra & L. Nykjaer, 2004. Analysis of Sea Surface Temperature time series of the Southeastern North Atlantic. International Journal of Remote Sensing 25, 869-891.

Bouzinac C., J. Font, and J. Johannessen, The annual cycles of sea level and sea surface temperature in the western Mediterranean Sea. Journal Geophysical Research, 108 (C3): 3059, 10.1029/2002JC1365, (2003)

Bolaños-Sanchez R, Sanchez-Arcilla A, Cateura J. 2007. Evaluation of two atmospheric models for wind-wave modelling in the NW Mediterranean. Journal of Marine Systems, 65 (1-4) : 336-353. ISSN: 0924-7963

Burchard, H., K. Bolding, and M. Ruiz-Villarreal, Three-dimensional modelling of estuarine turbidity maxima in a tidal estuary, Ocean Dynamics (Springer Verlag), 54(2), 250-265 , 2004.

Brenner, J., Jiménez, J.A., Sardá, R. 2006. Definition of Homogeneous Environmental Management Units for the Catalan Coast. Environmental Management, 38 (6) : 993-1005. ISSN: 0364-152X

Cabanas J.M. ; Alvarez I. 2006. Wind driven circulation characteristics in the NW of Iberian Peninsula. Journal of Atmospheric and Oceanic Science 10 (4), 1ï 17

Cabanas, J. M., A. Lavin, M. J. Garcia, C. Gonzalez-Pola, and E. Tel Perez. 2003. Oceanographic variability in the northern shelf of the Iberian Peninsula 1990-1999., ICES Mar. Sci. Symp., 219, 71-79.

Camps A., J. Font, M. VallÅllossera, R. Villarino, C. Gabarró, L. Enrique, J. Miranda, I. Corbella, N. Duffo, F. Torres, S. Blanch, A. Aguasca, and R. Sabia (2006) From the determination of sea emissivity to the retrieval of salinity: recent contributions to the SMOS mission from the UPC and ICM. Proceedings IEEE International Geosciences and Remote Sensing Symposium IGARSS2006, IEEE, Denver, Colorado, CR-ROM ISBN 0-7803-9510-7

Camps A., J. Font, J. Etcheto, I. Corbella, V. Caselles, and A. Weill, WISE 2000 and 2001: Campaign description and executive summary. In: EuroSTARRS, WISE, LOSAC Campaigns, volume 525 of SP, pages 17-26, ESTEC, Noordwijk, The Netherlands, ESA (European Spatial Agency), Noviembre 2003

Camps A., J. Font, M. Vall-llossera, C. Gabarró, I. Corbella, N. Duffo, F. Torres, S. Blanch, A. Aguasca, R. Villarino, L. Enrique, J. Miranda, J. Arenas, A. Julià, J. Etcheto, V. Caselles, A. Weill, J. Boutin, S. Contardo, R. Niclós, R. Rivas, S.C. Reising, P. Wursteisen, M. Berger, and M. Martín-Neira, The WISE 2000 and 2001 field experiments in support of the SMOS mission: sea surface L-band brightness temperature observations and their application to sea surface salinity retrieval . IEEE Transactions Geoscience and Remote Sensing, 42(4):804-823, (2004). ISSN: 0196-2892

Camps I. A., I. Corbella, M. VallÅllossera, N. Duffo, F. Torres, R. Villarino, L. Enrique, F. Julbe, J. Font, A. Julià, C. Gabarró andJ. Etcheto, J. Boutin, A. Weill, E. Rubio, Caselles V., P. Wursteisen, and M. Martín-Neira, L-band sea surface emissivity: Preliminary results of the WISE-2000 campaign and its application to salinity retrieval in the SMOS mission. Radio Science, 38(4):10.1029/2002RS002629, (2003)

Comerma, E., Espino, M., Salazar, M., Jerez, F., Madrigal, R., Sanchez-Arcilla, A. 2006. CAMCAT: an oil spill forecasting system for the Catalan-Balearic Sea based on the MFS products. Ocean Science Discussions (Online) , 3 : 1791-1823. ISSN: 1812-0822

Cupul-Magaña, L.A., Mosso-Aranda, C., Sierra, J.P., Marti, E., Ferman-Almada, J.L., Rodilla, M., Gonzalez-del-Rio, J., Sanchez-Arcilla, A. 2006. Characterization and distribution patterns of surficial sediments of Cullera Bay, Spain. Ciencias Marinas, 32 (4) : 617-629. ISSN: 0185-3880

Delgado-González, O., Lizárraga-Arciniega, R., Martínez-Díaz de León, A., Galindo-Bect, L., Fermán-Almada, J.L., Sánchez-Arcilla, A., Mosso, C., Pérez-Higuera, R., Cruz-Varela, A. 2005. Cambios en la posición de la línea de playa de la boca del Estero de Punta Banda, Baja California, durante 1972-2003. Ciencias Marinas, 31 (4) : 707-717. ISSN: 0185-3880

Dritschel D. G., and A. Viúdez, A balanced approach to modelling rotating stably-stratified geophysical flows. Journal of Fluid Mechanics, 488:123-150, (2003)

Emelianov M., J. Font, A. Julià, C. Gabarró, M. Lloret, J. Solé, and L. Enrique, Sea surface fields at Casablanca site (NW Mediterranean) during the EuroSTARRS campaign November 2001. In: EuroSTARRS, WISE, LOSAC Campaings, volume 525 of SP, pages 73-80, ESTEC, Noordwijk, The Netherlands, ESA (European Spatial Agency), Noviembre 2003

Emelianov M., J. Font, A. Turiel, C. Millot, J. Solé, P.M. Poulain, A. Julià, and M.R. Vitrià, Transformation of Levantine Intermediate Water tracked by MEDARGO floats in the Western Mediterranean. Ocean Science, 2:281-290, (2006)

Etcheto J., E. Dinnat, J. Boutin, A. Camps, J.L. Miller, S. Contardo, J. Wesson, J.Font, and D.G. Long, Wind speed effect on L-band brightness temperature inferred from EuroSTARRS and WISE 2001 field experiments. IEEE Transactions Geosciences and Remote Sensing, 42(10):2206-2213, (2004). ISSN: 0196-2892

Etcheto J., E. Dinnat, J. Boutin, S. Contardo, A. Camps, J. Miller, and J. Font, L-band emissivity : measurements versus model comparison. In: International Geosciences and Remote Sensing Symposium IGARSS2002, Proceedings IEEE Geosciences and Remote Sensing, New York (USA), (2003)

Eugenio, F., A. Hernández-Guerra, J. Marcello & E. Rovaris, 2005. Regional optimization of an atmospheric correction algorithm for the retrieval of sea surface temperature from the Canary Islands-Azores-Gibraltar area using NOAA/AVHRR data. International Journal of Remote Sensing 26, 1799-1814.

Flexas, M.M., van Heijst, G.J.F., Jordà, G., Sánchez-Arcilla, A. 2004. Numerical simulation of barotropic jets over a sloping bottom: Comparison to a laboratory model of the Northern Current. Journal of Geophysical Research, 109 (C12,C12039) : 1-19. ISSN: 0148-0227

Flexas, M.M., X. Durrieu de Madron, M.A. García, M. Canals and P.A. Arnau, 2002: Flow variability in the Gulf of Lions during the HFF Experiment (March-May 1997). J. Mar. Sys., 33-34, 197-214.

Flexas, M. M., G.J.F. van Heijst, R. R. Trieling, G. Jordà and A. Sánchez-Arcilla, 2004: Numerical simulations of barotropic jets over a sloping bottom: comparison to a laboratory model of the Norther current. J. Geophys. Res., 109, C12039 doi: 10.1029/2004JC002286

Flexas, M. M., D. Gomis, S. Ruiz, A. Pascual, P. León, 2006: In situ observations of the eastward migration of the Western Alborán Sea gyre. Progr. Oceanogr., 70, 486-509.

Font J., and F. Briand, Strategies for understanding mesoscale processes, volume 27 of CIESM Workshop Monographs. CESM, Monaco (MC), (2005), 1-132 pp. ISSN: 1726-5886

Font J., C. Gabarró, A. Julià, M. Emelianov, M. Lloret, J. Etcheto, S. Contardo, A. Lourenço, J. Boutin, and M. Moll, Oceanographic conditions during the Wind and Salinity Experiment 2000 and 2001. In: EuroSTARRS, WISE, LOSAC Campaings, volume 525 of SP, pages 51-59, ESTEC, Noordwijk, The Netherlands, ESA (European Spatial Agency), Noviembre 2003

Font J., G. Lagerloef, D. Le Vine, A. Camps, and O.Z. Zanife, The determination of surface salinity with SMOS : Recent results and main issues. In: Proceedings IEEE International Geosciences and Remote Sensing Symposium IGARSS 2003, Piscataway, NJ 08855-1331 (USA), IEEE, (2003)

Font J., G. Lagerloef, D. Le Vine, A. Camps, and O.Z. Zanifé, The determination of surface salinity with the European SMOS Space Mission. IEEE Transactions Geosciences and Remote Sensing, 42(10):2196-2205, (2004). ISSN: 0196-2892

Font J., G. Lagerloef, Y. Kerr, N. Skou, and M. Berger, Sea surface salinity mapping with SMOS space mission. In: Building the European capacity in operational oceanography.Proceedings of the 3rd EuroGOOS Conference 2002, volume 69 of Elsevier Oceanography Series, pages 186-189, Amsterdam (NL), NCMR, National Centre for Marine Research, (2003)

Font J., G.S.E. Lagerloef, D. Le Vine, and A. Camps, Open issues for the Soil Moisture and Ocean Salinity (SMOS) Satellite Mission Salinity Retrieval. In: EuroSTARRS, WISE, LOSAC Campaigns, volume 525 of SP, pages 7-13, Noordwijk (The Neetherlands), ESA (European Space Agency), Noviembre 2003

Font J., J. Boutin, N. Reul, P. Waldteufel, C. Gabarró, S. Zine, J. Tenerelli, F. Petitcolin, and J.L. Vergely (2006) An iterative convergence algorithm to retrieve sea surface salinity from SMOS L-band radiometric measurements. Proceedings IEEE International Geosciences and Remote Sensing Symposium IGARSS2006, IEEE, Denver, Colorado, CR-ROM ISBN 0-7803-9510-7

Font J., J. Isern-Fontanet, and J. Salas, Tracking a big anticyclonic eddy in the western Mediterranean Sea. Scientia Marina, 68(3):331-342, (2004). ISSN: 0214-8358

Fraile-Nuez E., and Hernández-Guerra, A. 2006. The wind-driven circulation for the eastern North Atlantic Subtropical Gyre from Argo data..: Geophys. Res. Lett. vol:33

Gabarró C., J. Font, A. Camps, and M. Vall.llosera, Errors on the retrieved sea surface salinity due to inaccuracies in the ancillary data: an intercomparison study. In: Proceedings IEEE International Geosciences and Remote Sensing Symposium IGARSS 2003, Piscateway, NJ 08855-1331 (USA), IEEE, (2003)

Gabarró C., J. Font, A. Camps, M. Vall-llossera, and A. Julià, A new empirical model of sea surface microwave emissivity for salinity remote sensing. Geophysical Research Letters, 31(LO1309):10.1029/2003GL018964, (2004). ISSN: 0094-8276

Gabarró C., M. Vall-llossera, J. Font, and A. Camps, Determination of sea surface salinity and wind speed by L-band microwave radiomatry from a fixed platform. International Journal of Remote Sensing, 25(1):111-128, (2004). ISSN: 0413-1161

García-Górriz, E., J. Candela, and J. Font, Near-Inertial and Tidal Currents detected with a Vessel Mounted Acoustic Doppler Current Profiler in the Western Mediterranean Sea. Journal Geophysical Research, 108(C5):3164, 10.1029/2001JC001239, (2003)

García-Muñoz M., J. Arístegui, J.L. Pelegrí, A. Antoranz, A. Ojeda, and M. Torres, Exchange of carbon by an upwelling filament off Cape Ghir (NW Africa). Journal of Marine Systems, 54(1-4):83-95, (2005). ISSN: 0924-7963

García-Olivares A., Analytic solution of nonlinear partial differential equations with physics. Kybernetes: The International Journal of Systems & Cybernetics, 32(4):548-560, (2003)

García-Olivares A., Analytic solution of partial differential equations with Adomian's decomposition. Kybernetes: The International Journal of Systems & Cybernetics, 32(3):354-368, (2003)

García-Olivares A., and P. Marijuán, Emergence of Power Laws from Partitional Dynamics. BioSystems, 74:63-71, (2004). ISSN: 0303-2647

García, J., Chiva, J., Aguirre, P., Álvarez, E., Sierra, J.P. y Mujeriego, R. 2004. Hydraulic behaviour of horizontal subsurface flow constructed wetlands with different aspect ratio and granular medium size. Ecological Engineering, 23 : 177-187. ISSN: 0925-8574

García, M. A., A. F. Ríos, C. Castro, M. D. Doval, G. Rosón, D. Gomis, O. López, 2002: Water masses and distribution of physico-chemical properties in the western

Bransfield Strait and Gerlache Strait during Austral summer 1995/96. Deep-Sea Res. II, 49, 585-602.

García-Lafuente, J., Díaz del Río, G. and Sánchez , C. 2006. Vertical structure and bottom intensification of tidal currents off Northwestern Spain. Journal of Marine Systems (In press)

García-Lafuente, J., J. Del Río, E. Álvarez, D. Gomis, J. Delgado, 2004: Some aspects of the seasonal sea level variations around Spain. J. Geophys. Res., 109, C09008, doi:10.1029/ 2003JC002070

Gazeau, F., C. M. Duarte, J.-P. Gattuso, C. Barrón, N. Navarro, S. Ruiz, Y. T. Prairie, M. Calleja, B. Delille, M.Frankignoulle, and A. V. Borges, 2005: Whole-system metabolism and CO_2 fluxes in a Mediterranean Bay dominated by seagrass beds (Palma Bay, NW Mediterranean), 2005. Biogeosciences, 2: 43ï 60.

Gil. J. 2003. Changes in the pattern of water masses resulting from a poleward slope current in the Cantabrian Sea (Bay of Biscay). Estuarine, Coastal and Shelf Sciencie 57 (2003) 1139-1149

Gil., J., R. Sánchez., S, Cerviño., D, Garabana. 2004. Goestrophic circulation and heat flux across the Flemish Cap, 1988-2000. J. Northw. Atl. Fish. Sci., Vol. 34: 61-81

Gil. J. 2004. The secondary ageostrophic circulation in the Iberian poleward current along the Cantabrian sea¨'"(Bay of Biscay). Journal of Physical Oceanographic. (Submitted).

Gil, J. and R.F. Sánchez. 2003. Aspects concerning the occurrence of summer upwelling along the southern Bay of Biscay over 1993-2000: ICES Mar. Sci. Sym., 219: 337-339.

Gomis, D., O. López, M. A. García, A. Pascual, 2002: Quasi-geostrophic 3D circulation and mass transport in the western sector of the South Shetland Islands. Deep-Sea Res. II, 49, 603-622.

Gomis, D., M. A. Pedder, 2005: Errors in dynamical fields inferred from synoptic oceanographic cruise data. Part I: the impact of observation errors and the sampling distribution. J. Mar. Sys., 56 (3-4), 317-333.

Gomis, D., A. Pascual, M. A. Pedder, 2005: Errors in dynamical fields inferred from synoptic oceanographic cruise data. Part II: the impact of the lack of synopticity. J. Mar. Sys., 56 (3-4), 334-351.

Gomis, D., M. N. Tsimplis, B. Martín-Míguez, A. W. Ratsimandresy, J. García-Lafuente, S. A. Josey, 2006: Mediterranean Sea level and barotropic flow through the Strait of Gibraltar for the period 1958-2001 and reconstructed since 1659. J. Geophys. Res., 111, C11005, doi:10.1029/2005JC003186.

Gonzalez-Pola, C., A. Lavin, and M. Vargas-Yanez, 2005. Intense warming and salinity modification of intermediate water masses in the southeastern corner of the Bay of Biscay for the period 1992-2003, J. Geophys. Res., 110, C05020, doi:10.1029/2004JC002367, 2005.

Gonzalez-Pola C., Lopez-Jurado J., Velez-Belchi P. Progressive warming of the Western Mediterranean Deep Water at the Balearic area since mid nineties. 37th CIESM Congress Proceedings (ISSN 0373-434X) p103. 2004.

Gonzalez-Pola, C. and A. Lavin. 2003. Seasonal cycle and interannual variability of the heat content on an hydrographic section off Santander (Southern Bay of Biscay) 1991-2000., ICES Mar. Sci. Symp., 219, 343-345.

González-Pola, C., M. Ruiz-Villarreal, A. Lavín, J.M. Cabanas and E. Álvarez-Fanjul. 2006. A subtropical water intrusion spring-event in the shelf-slope of the southwestern Bay of Biscay after strong wind-forcing pulses. Journal of Atmospheric and Ocean Science (In press).

González-Quirós, R., A. Pascual, D. Gomis, R. Anadón, 2004: Influence of mesoscale physical forcing on trophic pathways and fish larvae retention in the central Cantabrian Sea. Fish. Oceanog. 13:5, 1-14.

Grazzini J., A. Turiel, and H.Yahia, Presegmentation of high-resolution satellite images with a multifractal reconstruction scheme based on an entropy criterium. In: Procc. ICP (Int. Conference on Image Processing), volume I, pages 649-652, Genova (I), IEEE, September 2005

Grazzini, J., A. Turiel, and H. Yahia, Multifractal formalism for Remote sensing: A Contribution to the description and the understanding of meteorological phenomena in satellite images. In: Complexus Mundi: Emergent patterns in Nature. Ed: M.M.Novak, volume 9, pages 247-256. World Scientific, Singapore, (2006). ISBN: 981-256-666-X

Guillén, J., Jiménez, J.A., Palanques, A., Puig, P., Gracia, V. 2005. Bottom sediment variability in the active layer of the inner shelf off the Ebro delta. Journal of Coastal Research, 21 : 482-496. ISSN: 0749-0208

Hanson, H.; Aarninkhof, S.; Capobianco, M.; Jiménez, J.A.; Larson, M.; Nicholls, R.J.; Plant, N.G.; Southgate, H.N.; Steetzel, H.J.; Stive, M.J.F.; de Vriend, H.J. 2003. Modelling of coastal evolution on yearly to decadal time scales. Journal of Coastal Research, 19 (4) : 790-811. ISSN: 0749-0208

Hernández-Guerra A., E. Fraile-Nuez, Borges, R., F. López-Laatzen, P. Vélez-Belchí, G. Parrilla and Müller, T.J. 2003. Transport Variability in the Lanzarote Passage (Eastern Boundary Current of the North Atlantic Subtropical Gyre). Deep Sea Research I, 50, 189-200 .

Hernández-Guerra, A., E. Fraile-Nuez, F. López-Laatzen, A. Martínez, G. Parrilla, and P. Vélez-Belchí. 2005. Canary Current and North Equatorial Current from an inverse box model, J. Geophys. Res., 110, C12019, doi:10.1029/2005JC003032.

Hughes S. and A. Lavín. 2006. The ICES annual ocean climate status summary 2004. In ñEuropean Operational Oceanography: Present and Futureò. Proceedings of the 4th International Conference on EuroGOOS, June 2005, Brest, France. Edited by H.. Dahlin, N.C.Flemming, P. Marchand, and S.E. PeterssonVolumen: 1, 79-83

Hydes, D. J., A. Yool, J. M. Campbell, N. A. Crisp, J. Dodgson, B. Dupee, M. Edwards, S. E. Hartman, B. A. Kelly-Gerreyn, A. M. Lavin, C. Gonzalez-Pola, and P. Miller.2003. Use of a Ferry-Box system to look at shelf sea and ocean margin processes, in ñBuilding the European Capacity in Operational Oceanographyò, edited by H. Dahlin, pp. 297-303, Elsevier Science Ltd, 2003.

Isern-Fontanet J., E. García-Ladona, and J. Font, Identification of Marine Eddies from Altimetric Maps. Journal of Atmospheric and Oceanic Technology, 20(5):772-778, (2003)

Isern-Fontanet J., E. García-Ladona, and J. Font, Vortices of the Mediterranean Sea: An altimetric perspective. Journal of Physical Oceanography, 36(1):87-103, (2006). ISSN: 0022-3670

Isern-Fontanet J., E. García-Ladona, J. Font, and A. García-Olivares, Non-Gaussian Velocity Probability Density Functions: An Altimetric Perspective of the Mediterranean Sea. Journal of Physical Oceanography, 36(11):2153-2164, (2006). ISSN: 0022-3670

Isern-Fontanet J., J. Font, E. García-Ladona, M. Emelianov, C. Millot, and I. Taupier-Letage, Spatial structure of anticyclonic eddies in the Algerian basin (Mediterranean Sea) analyzed using the Okubo-Weiss parameter. Deep-Sea Res. II, 51(24-25):3009-3028, (2004). ISSN: 0967-0645

Jiménez, J.A., Madsen, O.S. 2003. Closure to A simple formula to estimate the settling velocity of natural sediments. Journal of Waterway, Port, Coastal and Ocean Engineering -ASCE, 130 (4) : 220-221. ISSN: 0733-950X

Jiménez, J.A.; Madsen, O.S. 2003. A simple formula to estimate the settling velocity of natural sediments. Journal of Waterway, Port, Coastal and Ocean Engineering -ASCE, 129 (2) : 70-78. ISSN: 0733-950X

Jiménez, J.A., Sánchez-Arcilla, A. 2004. A long-term (decadal scale) evolution model for microtidal barrier systems. Coastal Engineering, 51 (8-9) : 749-764. ISSN: 0378-3839

Johnson, H.K., Karambas, T.V., Avgeris, I., Zanuttigh, B., González-Marco, D., Cáceres, I. 2005. Modelling of waves and currents around subermeged breakwaters. Coastal Engineering, 52 (10-11) : 949-969. ISSN: 0378-3839

Jorda G, Comerma E, Bolanos R, Espino M. 2007. Impact of forcing errors in the CAMCAT oil spill forecasting system. A sensitivity study. Journal of Marine Systems, 65 (1-4) : 134-157. ISSN: 0924-7963

Jorda, G., Bolaños, R., Espino, M., Sanchez-Arcilla, A. 2006. Assessment of the importance of the current-wave coupling in the shelf ocean forecasts. Ocean Science Discussions (Online), 3 : 1825-1870. ISSN: 1812-0822

Jordà, G., E. Comerma, R. Bolaños, M. Espino, 2005: Impact of forcing errors in the CAMCAT oil spill forescasting system. A sensitivity study. J. Mar. Sys. (en prensa)

Jordi, A., A. Orfila, G. Basterretxea and J. Tintoré, 2005: Shelf-slope exchanges by frontal variability in a steep submarine canyon. Progres in Oceanography, 66, 120-141.

Jordi, A., A. Orfila, G. Basterretxea and J. Tintoré, 2005: Coastal trapped waves in the northwestern Mediterranean. Cont. Shelf Res., 25, 2, 185-196.

Koutandos E., Prinos P. and Gironella X. 2005. Floating breakwaters under regular and irregular wave forcing : reflection and transmission characteristics. Journal of Hydraulic Research, 43 (2) : 174-188. ISSN: 0022-1686

Kramer, M., Zanuttigh, B., van der Meer, J.W., Vidal, C., Gironella, F.X. 2005. Laboratory experiments on low-crested breakwaters. Coastal Engineering, 52 (10-11) : 867-885. ISSN: 0378-3839

Kerr Y., P. Waldteufel, J.P. Wigneron, J. Font, and M. Berger, The Soil Moisture and Ocean Salinity Mission general presentation. In: Proceedings IEEE International Geosciences and Remote Sensing Symposium IGARSS 2003, Piscataway, NJ 08855-1331 (USA), IEEE, (2003)

Lagerloef G., S. Garzoli, Y. Kerr, J. Font, D. Entekhabi, R. Colomb, D. LeVine, Y. Chao, D. Burrage, A. De Charon, E. Lindstrom, B. Molinari, A. Piola, R. Schmitt, E. Njoku, and I. Nollmann, Satellites to address ocean and land hydrology. EOS Trans. AGU, 85(42):419-421, (2004). ISSN: 0096-3941

Lamberti, A., Archetti, R., Kramer, M., Paphitis, D., Mosso, C., Di Risio, M. 2005. European experience of low crested structures for coastal management. Coastal Engineering, 52 (10-11) : 841-866. ISSN: 0378-3839

Lavín, A., H. Bryden and G. Parrilla. 2003. Mechanisms of heat, freshwater, oxygen and nutrient transport at 24.5°N in the subtropical North Atlantic. Deep Sea Research I, 50 1099-1128

Lavín, A., L. Valdés, F. Sánchez, P. Abaunza, A. Forest, J. Boucher, P. Lazure and A.M. Jegou. 2005. THE BAY OF BISCAY: The encountering of the ocean and the shelf .The Sea. Vol. 14, Chapter 24: 935-1002Editado por Robinson y Brink,

Lavin A., S. Pouliquen et al. 2006. IBI-ROOS Plan: Iberia-Biscay-Ireland Regional Operational Oceanography System 2006-2010. Publication nº 24., 48pp. EuroGOOS Office, SMHI, 60176 (Norrkoping, Sweden. ISBN 91-974828-3-8.

Lobo, F.J., R.F. Sánchez, González, R., Dias, J.M.A., Hernández-Molina, F.J., Fernández-Salas, L.M., Díaz del Río, V., Mendes, I. 2004. Contrasting styles of the Holocene highstand sedimentation and sediment dispersal systems in the northern shelf of the Gulf of Cadiz. Continental Shelf Research (24):461 ï 482

Lopez-Jurado, J. L., C. Gonzalez-Pola, and P. Velez-Belchi. 2005. Observation of an abrupt disruption of the long-term warming trend at the Balearic Sea, western Mediterranean Sea, in summer 2005. Geophys. Res. Lett., 32, L24606, doi:10.1029/2005GL024430

Liu, P., S. Monserrat, M. Marcos, 2002: Analytical simulation of shelf waves observed around the Balearic Islands, Geophys. Res. Let., 29, 17, 28-1:28-4 doi:10.1029/2002GL015555.

Liu, P, S. Monserrat, M. Marcos, A. B. Rabinovich, 2003: Coupling between two inlets: observation and modelling, J. Geophys. Res., 108, 3069, doi:10.1029/ 2002JC001478

Liu, P, S. Monserrat, M. Marcos, A. B. Rabinovich, 2004: Correction to ñCoupling between two inlets: observation and modellingò, J. Geophys. Res., 109, C03011, doi:10.1029/2003JC002016

Liu, P.L.-F. and Orfila, A., 2004: Viscous effects on transient long-wave propagation. J. Fluid Mechanics, 520, 83-92.

Machín F., A. Hernández-Guerra, and J.L. Pelegrí, Mass fluxes in the Canary Basin. Progress in Oceanography, 70(2-4):416-447, (2006). ISSN: 0079-6611

Machín F., and J. L. Pelegrí, Effects of the Canary islands in the blockage and mixing of the North Atlantic eastern water masses. Geophysical Research Letters, 33 (L04605). DOI: 10.1029/2005GL025048, (2006). ISSN: 0094-8276

Machín F., J.L. Pelegrí, I. Láiz, A. Marrero-Díaz, and A.W. Ratsimandresy, Near-surface circulation in the southern Gulf of Cádiz. Deep-Sea Research II, 53(11-13):1161-1181, (2006). ISSN: 0967-0645

Machin F., U. Send, and W. Zenk, Intercomparing drifts from RAFOS and cyclyng floats in the Deep Western Boundary Current along the Mid-Atlantic Ridge. Scientia Marina, 70(1):1-8, (2006). ISSN: 0214-8358

Marbà, N. ,Duarte, C., Holmer, M., Martínez, R., Basterretxea, G., Orfila, A., Jordi, A., and J. Tintoré, 2002: Assessing the effectiveness of protection on Posidonia oceanica populations in the Cabrera National Park. Environmental Conservation 29 (4):509-518.

Marcos, M., P. Liu, S. Monserrat, 2004: Nonlinear resonant coupling between two adjacents bays. J. Geophys. Res., 109, C05008, doi:10.1029/ 2003JC002039.

Marcos, M., D. Gomis, S. Monserrat, E. Álvarez, B. Pérez, J. García-Lafuente, 2005: Coherence of long sea-level time series in the Northern coast of Spain. J. Geophys. Res. 110, C03008, doi:10.1

Marrero-Díaz Á., Á. Rodríguez-Santana, F. Machín, and J.L. Pelegrí, Analytic salinity-temperature relations for the upper-thermocline waters of the eastern North Atlantic subtropical gyre. Scientia Marina, 70(2):167-175, (2006). ISSN: 0214-8358

Martins A. M., and J.L. Pelegrí, CZCS chlorophyll patterns in the South Atlantic Bight during low vertical stratification conditions. Continental Shelf Research, 26:429-457, (2006). ISSN: 0278-4343

Martin Míguez, B., Varela, R.A., Rosón Porto, G, Souto, C., Cabanas, J.M., Fariña, L., 2005. Physical and biogeochemical fluxes in shelf waters of the NW Iberian upwelling system during contrasting upwelling and downwelling conditions. I. Hydrography and dynamics. Journal of Marine Systems 54(1-4), 127-138

Martinez-Benjamin, JJ, Martinez-Garcia, M, Gonzalez Lopez, S, Nuñez Andres, A, Buil Pozuelo, F, Espino Infantes, M, Lopez-Marco, Martin, Garate, Garcia, Bonnefond, Laurain, Baron, Ortiz, Talaya et al. 2004. Ibiza Absolute Calibration Experiment: Survey and Preliminary Results. Marine geodesy, 27 (3-4) : 657-681. ISSN: 0149-0419

Martinez-Benjamín, J. J., M. Martínez-García, S. González, A. Núñez, F. Buill, M. Espino, J. López-Marco, J. Martin, J. Gárate, C. García, P. Bonnefond, O. Laurain, A. M. Barón, M.A. Ortiz, J. Talaya, B. Pérez, G. Rodríguez Velasco, D. Gomis, M. Marcos, Y. Menard, G. Jan, E. Jeansou, F. Lyard, I. Roblou, 2004: Ibiza Absolute Calibration Experiment: Survey and Preliminary Results. J. Mar. Geodesy, 27, 657-682

Meincke, J., D. Quadfasel, W.H. Berger, JK. Brander, R.R. Dickson, P. M. Haugan, M.Latif, J. Marotzke, J. Marshall, J. F. Minster, J. Pätzold, G. Parrilla, W. de Ruitjer and F. Scott. 2003. Variability of the thermohaline circulation. In ñMarine Science Frontires for Europeò, Ed. by G. Wefer, F. Lamy and F. Mantoura. Springer-Verlag, ISBN 3-540-40168-7, 39-60

Mendoza, E.T., Jiménez, J.A. 2006. Storm-Induced Beach Erosion Potential in Catalonian Coast. Journal of Coastal Research, SI48 : 41-48. ISSN: 0749-0208

Mercado Carmona, Jésús. T. Ramírez, D. Cortés, M. Sebastián, M. Vargas-Yáñez. 2005. Seasonal and inter-annual variability of the phytoplankton communities in an upwelling area of Alboran Sea (SW Mediterranean Sea). Scientia Marina, Vol. 69(4), 451-465

Mestres, M., Sanchez-Arcilla, A., Sierra, J.P., Mosso, C., Gonzalez del Rioz, J., Rodilla, M. 2004. Basis and tools for a sustainable development of estuaries and coastal areas: a case study from Cullera Bay. Management of environmental quality, 15 (1) : 25-32. ISSN: 1477-7835

Mestres, M.; Sierra, J.P.; Sánchez-Arcilla, A.; González del Río, J.; Wolf, T.; Rodríguez, A.; Ouillon, S. 2003. Modelling of the Ebro river plume. Validation with field observations. Scientia Marina, 67 (4) : 379-391. ISSN: 0214-8358

Miller J. L., and M. Goodberlet, Development and application of STARRS - a next generation airborne salinity imager. International Journal of Remote Sensing, 25(7-8):1319-1324, (2004). ISSN: 0413-1161

Monserrat, S., D. Gomis, A. Jansà, A. Rabinovich, P. P. Shirshov, 2006: Ciutadella harbour, Menorca, Spain, 15 June 2006, Rissaga. Tsunami Newsletter, XXXVIII, 2, 5-7.

Morozov, Eugene G., Gregorio Parrilla-Barrera, Manuel G. Velarde, and Anatoly D. Scherbinin. 2003 The Straits of Gibraltar and Kara Gates: A Comparison of Internal Tides. Oceanologica Acta. Volume 26 (3), 231-241

Mourre B., L. Crosnier, and C. Le Provost, Real-time sea level gauge observations and operational oceanography. Philosophical Transactions of the Royal Society A, 364, 867-884, doi:10.1098/rsta.006.1743 (2006)

Mourre B., P. De Mey, F. Lyard, and C. Le Provost, Assimilation of sea level data over continental shelves: an ensemble method for the exploration of model errors due to uncertainties in bathymetry. Dynamics of Atmospheres and Oceans, 38, 93-121. doi:10.1016/j.dynatmoce.2004.09.001 (2004)

Mourre B., P. De Mey, Y. Ménard, F. Lyard, and C. Le Provost, Relative performance of future altimeter systems and tide gauges in constraining a model of North Sea high-frequency barotropic dynamics. Ocean Dynamics, 56 (5-6), 473-486, doi: 10.1007/s10236-006-0081-2 (2006)

Obaton D., Garcia-Sotillo M., Ruiz-Villarreal M., Montero P., Chambel Leitao P., Fernandes R., De Roeck Y.H., White J. 2006. Biscay Iberian and Irish shelves OOS physical modelling and assimilation team. State of art and plans. In European Operational Oceanography: present and future, pp. 688-692. ISBN 92-894-9788-2

Orfila, A., A. Álvarez, J. Tintoré, A. Jordi and G. Basterretxea, 2005: Climate teleconnections at monthly time scales in the Ligurian Sea inferred from satellite data. Progres in Oceanography, 66, 157-170.

Orfila, A., A. Jordi, G. Basterretxea, G. Vizoso, N. Marbà, C.M. Duarte, F.E. Werner and J. Tintoré, 2005: Residence time and Posidonia oceanica in Cabrera Archipelago National Park, Spain. Cont. Shelf Res., 25, 11, 1339-1352.

Ostrovskii A., and J. Font, Advection and dissipation rates in the upper ocean mixed layer heat anomaly budget over the North Atlantic in summer. Journal Geophysics Research, 108(C12) : 3376, 10.1029/2003JC001967, (2003)

Otero, P., Ruiz-Villarreal, M. and Peliz, A., 2006 Variability of river plumes off NW Iberia in response to wind events, submitted to Journal of Marine Systems.

Palanques, A., E. Garcia-Ladona D. Gomis, J. Martín, M. Marcos, A. Pascual, P. Puig, J. M. Gili, M. Emelianov, S. Monserrat, J. Guillén, J.M. J. Tintoré, M. Segura, S. Ruiz, G. Basterretxea, J. Font, A. Jordi D. Blasco, F. Pagès, 2005: A Multidisciplinary Program to study the dynamics and the ecology of a North-western Mediterranean submarine canyon: The Palamós Canyon. Progr. Oceanog. 66 (2-4), 89-119.

Pallàs-Sanz E., and A. Viúdez, Diagnosing Mesoscale Vertical Motion from Horizontal Velocity and Density Data. Journal of Physical Oceanography, 35(10):1744-1762, (2005). ISSN: 0022-3670

Pallàs-Sanz, E., and A. Viúdez, Three-dimensional ageostrophic motion in mesoscale vortex dipoles. Journal of Physical Oceanography, 37, 84-105 (2007). ISSN: 0022-3670

Parisi-Baradad, V., A. Lombarte, E. García-Ladona, J. Cabestany, J. Piera, and O. Chic, Otolith shape contour analysis using affine transformation invariant wavelet transforms and curvature scale space representation. Marine and Freshwater Research, 56(5):795-804, (2005). ISSN: 1323-1650

Parrilla-Barrera, G., M. Vargas-Yáñez, P. Vélez-Belchi, A. Lavín, C. Gonzálezï Pola, E. Fraile, A. Hernández-Guerra, E. Tel & D. Vega. 2003. A comparison with the Argo observing system - Gyroscope 0302 cruise. In ñBuilding the European Capacity in Operational Oceanographyò.. Edited by H.. Dahlin, N.C. Flemming, K. Nittis, and S.E. Petersson. Elsevier Oceanography Series, 69. 356-360

Pascual, A., B. Buongiorno Nardelli, G. Larnicol, M. Emelianov, D. Gomis, 2002: A case of an intense anticyclonic eddy in the Balearic Sea studied from satellite and in situ data. J. Geophys. Res. 107 (C11), 3183, doi: 10.1029/2001JC000913.

Pascual, A., D. Gomis, 2003: Use of surface data to estimate geostrophic transport. J. Atmos. Ocean Tech., 20, 912-926.

Pascual, A., D. Gomis, R.H. Haney, S. Ruiz, 2004: A quasi-geostrophic analysis of a meander in the Palamós Canyon: vertical velocity, geopotential tendency and a relocation technique. J. Phys. Ocean., 34, 2274-2287.

Pascual, A., M-I Pujol, G. Larnicol, P-Y Le Traon, M-H Rio, 2005: Mesoscale Mapping Capabilities of Multisatellite Altimeter Missions: First Results with Real Data in the Mediterranean Sea. J. Mar. Sys., en prensa

Pascual, A., Y. Faugère, G. Larnicol, P-Y Le Traon, 2005: Improved description of the ocean mesoscale variability by combining four satellite altimeters. Geophys. Res. Lett. (in press)

Pelegrí,J.L.; Marrero-Díaz, A. Ratsimandrey, A. Antoranz, J. Cisneros-Aguirre, C. Gordo, D. Grisolía, A. Hernández-Guerra, I. Láiz, A. Martínez, G. Parrilla, P. Pérez-Rodríguez, A. Rodríguez-Santana and P. Sangrá. 2005. Hydrographic cruises off northwest Africa: The Canary Current and the Cape Ghir region. Journal of Marine Systems. 54: 39-63.

Pelegrí J.L., A. Marrero-Díaz, and A.W. Ratsimandresy, Nutrient irrigation of the North Atlantic. Progress in Oceanography, 70(2-4):366-406, (2006). ISSN: 0079-6611.

Pelegrí J.L., J. Churchill, A.D. Kirwan, S.K. Lee, R.E. Munn, and N.R. Pettigrew, Gabriel T. Csanady: Understanding the physics of the ocean. Progress in Oceanography, 70(2-4):91-112, (2006). ISSN: 0079-6611

Pelegrí J. L., J. Arístegui, L. Cana, M. González, A. Hernández-Guerra, S. Hernández-León, A. Marrero-Díaz, M. F. Montero, P. Sangrá, and M. Santana-Casiano, Coupling between the open ocean and the coastal up welling region off Northwest Africa: Water recirculation and offshore pumping of organic matter. Journal of Marine Systems, 54(1-4):3-37, (2005). ISSN: 0924-7963

Pelegrí, J. L., M. Auladell, A.W. Ratsimandresy, P. Sangrà, and E. García-Ladona. Intertial Instability in Oceanic Flows. ERCOFTAC Bulletin, 60:22ï 29, (2004).

Pereira, L.C.C., Jiménez, J.A., Braga, P., Medeiros, C., da Costa, R. 2003. Effects of sedimentation on scleractinian and actinian species in artificial reefs at the Casa Caiada beach (Brazil). Journal of Coastal Research, SI 35 : 418-425. ISSN: 0749-0208

Pereira, L.C.C., Jiménez, J.A., Medeiros, C. 2003. Environmental degradation of the littoral of Casa Caiada and Rio Doce, Olina-PE (Brazil). Journal of Coastal Research, SI 35 : 502-508. ISSN: 0749-0208

Pérez-Torrado, F.J., R. Paris, M.C. Cabrera, J. Schneider, P. Wassmer, J.C. Carracedo, A. Rodríguez-Santana & F. Santana, 2006. Tsunami deposits related to flank collapses in oceanic volcanoes: The Agaete valley evidence, Gran Canaria, Canary Islands. Marine Geology 227, 135-149.

Petersen, W; Colijn, F; Hydes, DJ; Kaitala, S; Kontoyiannis, H; Lavin, A; Lips, I; Howarth, J; Ridderinkhof, H; Sørensen, K..2006. European FerryBox Project: From Online Oceanographic Measurements to Environmental Information. In European Operational Oceanography: Present and Future. Proceedings of the 4th International Conference on EuroGOOS, June 2005, Brest, France. Edited by H.. Dahlin, N.C.Flemming, P. Marchand, and S.E. Petersson. Volumen: 1, 551-560.

Piera J., V. Parisi-Baradad, E. García-Ladona, A. Lombarte, L. Recasens, and J. Cabestany, Otolith shape feature extraction oriented to automatic classification with open distributed data. Marine and Freshwater Research, 56:805-814, (2005). ISSN: 1323-1650

Pont O., A. Turiel, and C.J. Pérez-Vicente, Application of the microcanonical multifractal formalism to monofractal systems. Physical Review E, 74:061110, (2006). ISSN: 1550-2376

Ramírez, T., E. Liger, J. Mercado, D. Cortés, M. Vargas-Yáñez, M. Sebastián, A. Reul, J. Aguilera, B. Bautista. 2006. Respiratory ETS activity of plankton in the northwestern Alboran Sea: seasonal variability and relationship with hydrological and biological features. J. Plankton Research, Vol. 28(7), 629-641.

Ramírez, T., J. Mercado, D. Cortés, M. Vargas-Yáñez, M. Sebastián, E. Liger. , 2005. Seasonal dynamics of inorganic nutrients and phytoplankton biomass in the NW Alboran Sea. Estuarine, coastal and shelf Science. Vol. 65,654-670.

van Rijn, L.C., D.J. Walstra, B. Grasmeijer, J. Sutherland, S. Pan & J.P. Sierra. 2003. The predictability of cross-shore bed evolution of sandy beaches at the time scale of storms and seasons using process-based profile models. Coastal Engineering, 47 (1) : 295-327. ISSN:

Ratsimandresy A.W., and J.L. Pelegrí, Vertical Alignment of the Gulf Stream. Tellus, 57A(4):691-700, (2005). ISSN: 0280-6495

Rio, M-H, P-M Poulain, A. Pascual, E. Mauri, G. Larnicol: A mean dynamic topography of the Mediterranean Sea computed from altimetric data and in-situ measurements J. Mar. Sys. (in press)

Rosón, G., A. F. Ríos, A. Lavín, F. F. Pérez and H. L. Bryden.2003. Carbon distribution and fluxes in the subtropical North Atlantic Ocean (24.5°N. Journal of Geophysical Research. 108 C5, 3144, doi:10.1029/1999JC000047.

Rousseau S., and P. Forget, Ocean wave mapping from ERS SAR images in the presence of swell and wind waves. Scientia Marina, 68(1):1-5, (2004). ISSN: 0214-8358

Rubio, A., Arnau, P.A., Espino, M., Flexas, M.M., Jordà, G., Salat, J., Puigdefàbregas, J., Sánchez-Arcilla, A. 2005. A field study of the behaviour of an anticyclonic eddy on the Catalan continental shelf (NW Mediterranean). Progress in Oceanography, 66 (2-4) : 142-156. ISSN: 0079-6611

Rubio, A., P. Arnau, M. Espino, M. M. Flexas, G. Jordà, J. Salat, J. Puigdefàbregas and A. Sánchez-Arcilla, 2005: A field study of behaviour of an antyclonic eddy on the Catalan continental shelf (NW Mediterranean). Progress in Oceanography (66) 2-4, 142-156, 2005.

Ruiz S, J. Font, M. Emelianov, J. Isern, C. Millot, P. Salas and I. Taupier-Letage, 2002: Deep structure of an open sea eddy in the Algerian Basin", J. Mar. Sys., 33-34, 179-195.

Ruiz, S., J. Font, G. Grifftihs, A. Castellón, 2002: Estimation of heading gyrocompass error using a GPS 3DF system: Impact on ADCP measurements. Sci. Mar., 66 (4), 347-354.

Ruiz, S., D. Gomis, J. Font, 2007: Recovery of the North-East Atlantic temperature field from profiling floats: determination of the optimal float number from sampling and instrumental error analysis. J. Mar. Sys., 65, 212-223.

Ruiz Villarreal, P. Montero, J.J. Taboada, R. Prego, P. Leitão and V. Pérez-Villar, 2002. ñHydrodynamic model study of the Ria de Pontevedra under estuarine conditionsò, Estuarine, Coastal and Shelf Science, 53

Ruiz-Villarreal M., C. González-Pola C., G. Diaz del Rio, A. Lavin, P. Otero, S. Piedracoba, J.M. Cabanas. 2006. Oceanographic conditions in North and Northwest Iberia and their influence on the Prestige oil spill. Marine Pollution Bulletin53 (5-7), 220-38

Ruiz-Villarreal, M., K. Bolding, H. Burchard and E. Demirov, 2005. Coupling of the GOTM turbulence module to some three-dimensional ocean models, in Marine Turbulence: Theories, Observations and Models, Ed: H. Baumert, J. Simpson, and J. Sündermann, Cambridge University Press, pp. 225-237, 2005c

Ruiz Villarreal, M., González-Pola, C., Otero, P., Díaz del Río, G., Lavín, A., and

Cabanas J.M., 2006, Circulation in the Galicia-Southern Bay of Biscay: reanalysis of the circulation influencing the Prestige oil spill. In European Operational Oceanography: present and future, Edited by H.. Dahlin, N.C.Flemming, P. Marchand, and S.E. Petersson pp. 342-348. ISBN 92-894-9788-2

Sabates A., J. Salat, and M. Masó, Spatial heterogeneity of fish larvae across a meandering current in the northwestern Mediterranean. Deep-Sea Research I, 51(4):545-557, (2004). ISSN: 0967-0637

Salas Pérez J. J., Evolution of the open-sea eddy ALGERS'98 in the Algerian Basin with Lagrangian trajectories and remote sensing observations. Journal Marine Systems, 43:105-131, (2003)

Salas, J., D. Gomis, A. Olivos-Ortiz, G. Garcia-Uribe, 2006: Seasonal Hydrodynamical features on the Continental Shelf of Colima (West coast of Mexico). Scientia Marina 70(4): 719-726.

Salat, J., M. A. García, A. Cruzado. A. Palanques, L. Arín, D. Gomis, J. Guillen, A. de León, J. Puigdefàbregas, J. Sospedra, Z. R. Velásquez, 2002: Seasonal Changes of water mass structure and shelf-slope exchanges at the Ebro shelf (NW Mediterranean). Cont. Shelf Res. 22/2, 327-346.

Saleh, K. J. P. Wigneron, J.C. Calvet, E. López-Baeza, P. Ferrazzoli, M. Berger, P. Wursteisen, L. Simmonds, and J.L. Miller, The EuroSTARRS airborne campaign in support of the SMOS mission: First results over land surfaces. International Journal of Remote Sensing, 25(1):177-194, (2004). ISSN: 0143-1161

Sampaio, C, P. Mafalda Jr., S. Sallés, T. Ramírez, D. Cortés, A. García, J. Mercado, M. Vargas-Yáñez. 2005. Tendencias estacionales y espaciales en la comunidad mesozooplanctónica en una serie temporal plurianual en el noroeste del Mar de Alborán, España. Revista de Biología Marina y Oceanografía, Vol. 40(1), 45-54,

Sánchez, R.F. and P. Relvas. 2003. Spring-Summer climatological circulation in the upper layer in the region of Cape St. Vincent, SW Portugal. ICES Journal of Marine Science (60):1232-1250

Sánchez, R.F., F. Sánchez, J. Landa and A. Fernández. 2003. Influence of oceanographic parameters on recruitment of megrim and four-spot megrim (L. boscii) in the northern Spanish continental shelf. ICES Mar. Sci. Sym., 219: 400-402.

Sánchez, R.F., F. Sánchez and J. Gil. 2003. The Optimal Environmental Window that controls hake recruitment in the Cantabrian Sea. ICES Mar. Sci. Sym., 219: 415-417

Sanchez R. and J. Gil. 2004. Structure, mesoscale interactions and potential vorticity conservation in a 3D Swoddy in the Bay of Biscay. Journal of Marine Systems 46 (2004) 47-68

Sangrá P., J.L. Pelegrí, A. Hernández-Guerra, I. Arregui, J.M. Martin, A. Marrero-Díaz, A. Martínez, A.W. Ratsimandresy, and A. Rodríguez-Santana. 2005. Life history of an anticyclonic eddy. Journal of Geophysical Research, 110(C3):C03021, 10.1029/2004JC002526, (2005). ISSN: 0148-0227

Sangrà, P., Pelegrí, J.L., Marrero-Díaz, A., Auladell, M., Fraile-Nuez, E., and Rodríguez-Santana, A. 2006. On the nature of oceanic eddies shed by Gran Canaria Island. Deep Sea Research I (acepted) CLAVE: A

Sardà, F., Calafat, A., Flexas, M.F., Tselepides, A., Canals, M., Espino, M., Tursi, A. 2004. An introduction to Mediterranean deep-sea biology. Scientia Marina, 68 (Suppl. 3) : 7-38. ISSN: 0214-8358

Sardà, F, A. Calafat, M.M. Flexas, A. Tselepides, M. Canals, M. Espino and A. Tursi, 2004: An introduction fo Mediterranean deep-sea biology, 68, 7-38, Sci. Mar.

Sierra, J.P., Mösso, C., Alsina, J.M., Sánchez-Arcilla, A., Berdala, E. 2005. Modelado hidro-morfodinámico de una playa multibarrada longitudinalmente uniforme. Ingenieria Hidraulica en Mexico, XX (2) : 19-35. ISSN: 0186-4076

Sierra, J.P., Sanchez-Arcilla, A., Figueras, P.A., Gonzalez del Rio, J., Rassmussen, E.K., Mosso, C. 2004. Effects of discharge reductions on salt wedge dynamics of the Ebro river. River Research and Applications, 20 (1) : 61-77. ISSN: 1535-1459

Tagliani, P.R.A.; Landazuri, H.; Reis, E.G.; Tagliani, C.R.; Asmus, M.L.; Sánchez-Arcilla, A. 2003. Integrated coastal zone management in the Patos Lagoon estuary: perspectives in context of developing country. Ocean & Coastal Management, 46 (9-10) : 807-822. ISSN: 0964-5691

The MAMA Consortium (S. Vallerga, A. Drago, J. Font, and et al.) MAMA - Towards a new paradigm for ocean monitoring in the Mediterranean. In: Building the European capacity in operational oceanography. Proceedings of the 3rd EuroGOOS Conference 2002, volume 69 of Elsevier Oceanography Series, pages 46-56, Amsterdam (NL), NCMR, National Centre for Marine Research, (2003)

Theocharis A., C. Millot, J. Font, and J. Salat, Long term sustained observing system for climatic variability studies in the Mediterranean. In: Building the European capacity in operational oceanography. Proceedings of the 3rd EuroGOOS Conference 2002, volume 69 of Elsevier Oceanography Series, pages 78-86, Amsterdam (NL), NCMR, National Centre for Marine Research, (2003)

Turiel A., J. Grazzini, and H. Yahia, Edge-Preserving Smoothing of High-Resolution Images with a Partial Multifractal Reconstruction Scheme.In: XX ISPRS Congress, B3, pages 1125-1129, (2004)

Turiel A., J. Grazzini, and H. Yahia, Multiscale techniques for the detection of precipitation using thermal IR satellite images. IEEE Geoscience and Remote Sensing Letters, 2(4):447-450, (2005). ISSN: 0161-7869

Turiel A., J. Isern-Fontanet, E. García Ladona, and J. Font. Multifractal Method for the Instantaneous Evaluation of the Stream Function in Geophysical Flows. Physical Review Letters, 95:104502-1-104502-4, (2005). ISSN: 1079-7114

Tsimplis, M. N., E. Álvarez-Fanjul, D. Gomis, L. Fenoglio-Marc, B. Pérez, 2005 : Mediterranean sea level trends: atmospheric pressure and wind contribution. Geophys. Res. Let., 32, L20602, doi:10.1029/2005GL02.

Valdemoro, H.I., Jiménez, J.A. 2006. The Influence of Shoreline Dynamics on the Use and Exploitation of Mediterranean Tourist Beaches. Coastal Management, 34 (4) : 405-423. ISSN: 0892-0753

Valdemoro, H.I., Sanchez-Arcilla, A., Jimenez, J.A. 2007. Coastal dynamics and wetlands stability. The Ebro delta case. Hydrobiologia, 577 : 17-29. ISSN: 0018-8158

Van Gastel P., and J.L. Pelegrí, Estimates of gradient Richardson numbers from vertically smoothed data in the Gulf Stream region. Scientia Marina, 68(4):459-482, (2004). ISSN: 0214-8358

Vargas-Yañez, M., G. Parrilla, A. Lavin, P. Velez-Belchi, and C. Gonzalez-Pola, 2004. Temperature and salinity increase in the eastern North Atlantic along the 24.5 degrees N in the last ten years, Geophys. Res. Lett., 31, L06210, doi:10.1029/2003GL019308.

Vargas-Yáñez, Manuel, Florian Garivier, Olivier Pirra, M. García-Martínez. 2005. The use of routine hydrographic stations for the estimation of the parameters needed for optimal statistical interpolation. Application to the northern Alboran Sea. Scientia Marina, Vol. 69(4), 435-449.

Vargas-Yáñez, Manuel, J. Salat, M. Luz Fernández de Puelles, J.L. López-Jurado, J. Pascual, T. Ramírez, I. Franco.. 2005.Trends and time variability in the western Mediterranean continental shelf. Journal of Geophysical Research, Vol. 110, No. C10, C10019 doi. 10.1029/2004JC002799.

Vargas-Yañez, M., G. Parrilla, A. Lavin, P. Velez-Belchi, C. Gonzalez-Pola, and A. Hernandez-Guerra, 2005. Eddy-induced variability in a transatlantic section: Argo observing system-gyroscope 0302 cruise comparison, Journal of Atmospheric and Oceanic Technology, 22(7), 1069-1079, doi: 10.1175/JTECH1761.1.

Vargas-Yañez, M., Salat, J., Fdez-Puelles, ML., López-Jurado J.L., Pascual, J., Ramirez, T., Cortés, D., Franco, I. 2005. Trends and time variability in the northern continental shelf of the Western Mediterranean. Journal of Geophysical Research. Vol 10,. (2005).

Vargas Yáñez, Manuel, & Ana Sabatés. 2007. High frequeny variability of fish larvae distributions in the Alboran Sea: The influence of mesoscale processes. Aceptado en J. Mar. Systems.

Vélez-Belchi, P. J. Tintoré, M. Vargas-Yáñez, J. C. Gascard. 2005. Observation of a Western Alboran Gyre migration event. Progress in Oceanografïa, Vol. 66 No. 2-4, 190-210.

Viúdez A., A new interpretation of the beta term in the vorticity equation. Journal Atmospheric Science, 60:1866-1870, (2003)

Viúdez A., and D. G. Dritschel, Optimal potential vorticity balance of geophysical flows. Journal of Fluid Mechanics, 521:343-352, (2004). ISSN: 0022-1120

Viúdez A., and D. G. Dritschel, Vertical velocity in mesoscale geophysical flows. Journal of Fluid Mechanics, 483:199-223, (2003). ISSN: 0022-1120

Viúdez A., and D.G. Dritschel, Dynamic potential vorticity initialization and the diagnosis of mesoscale motion. Journal Physical Oceanography, 34(12):2761-2773, (2004). ISSN: 0022-3670

Viúdez A., and D.G. Dritschel, Potential vorticity and the quasigeostrophic and semigeostrophic mesoscale vertical velocity. Journal Physical Oceanography, 34(4):865-887, (2004). ISSN: 0022-3670

Viúdez A., and D.G. Dritschel, Spontaneous generation of inertia-gravity wave packets by balanced geophysical flows. Journal of Fluid Mechanics, 553:107-117, (2006). ISSN: 0022-1120

Viúdez Á., Spiral patterns of inertia-gravity waves in geophysical flows. Journal of Fluid Mechanics, 562:73-82, (2006). ISSN: 0022-1120

Viúdez A., The multi-flow framework and the generalized Lagrangian mean theory. Fluid Dynamics Research, 32:141-177, (2003)

Viúdez, A., The vorticity-velocity gradient cofactor tensor and the material invariant of the semigeostrophic theory. Journal of the Atmospheric Sciences, 7(62):2294-2301, (2005). ISSN: 0022-4928

SPANISH NATIONAL COMMITTEE
OF GEODESY AND GEOPHYSICS

SECTION OF
SEISMOLOGY AND PHYSICS OF THE EARTH INTERIOR

R E P O R T

2003-2006

Presented to the XXIV General Assembly of
the International Union of Geodesy and
Geophysics Perugia, Italy, July 2007

PREFACE

This report has been elaborated by Spanish Institutions and Universities related to the Section and with common interests in the field of Seismology and Physics of the Earth Interior. It has been prepared for submission to the IUGG General Assembly which will be held in Perugia, Italy, during the days 2-13 of July.

The goals of this report are the main trends and key activities in seismological research carried out in Spain during the years 2003-2006. These activities are presented in the form of individual reports provided by the institutions listed below:

- Instituto Geografico Nacional
- Geologic Institute of Catalonia
- Ebro Observatory (CSIC- Ramon Llull University)
- Real Instituto y Observatorio de la Armada, San Fernando, Cádiz
- Polytechnic University of Catalonia
- University of Zaragoza
- University of Jaén
- Universidad of Almeria
-

in accordance with the following scheme:

- Name of the Institution, address, phone, fax and email
- Targets of the Center (only for Institutes and/or Observatories)

- Networks under Control and Maintenance (only for Institutes and/or Observatories)
- Earthquake Catalogues and Documentation (only for Institutes and/or Observatories)
- Current Research Interests
- Research Projects (with especial emphasis in international projects)
- Collaboration Agreements (only international agreements during the period of reference or in force)
- Attendance at International Meetings and Communications (only international meetings)
- Publications (preferably international publications)

Thanks a lot to the Heads of the different departments by their cooperation.

José Badal

President of the Section of Seismology
and Physics of the Earth Interior

Member of the Spanish National Committee
of Geodesy and Geophysics

University of Zaragoza
Sciences B, Physics of the Earth
Pedro Cerbuna, 12
50009 Zaragoza, Spain
Phone: + 34 976 761139
Fax: + 34 976 761140
E-mail: badal@unizar.es

1. Current Research Interests

Modelling of Earth Structures by Surface Wave Dispersion
Forward and Inverse Modelling
Elastic, Anelastic and Anisotropic Media
Near-Surface Seismic Velocity Modelling
3-D Imaging of Earth Structures at Different Scales
Surface Wave Seismic Tomography
Wide-angle Seismic Profiling
Self-organized Criticality in Geosciences
Statistical analysis of the recurrence of large earthquakes in individual faults
Empirical Scaling Relations for Seismic Faults

2. Research Projects

Crust- upper mantle structure in the eastern Tibet margin
In collaboration with the Institute of Geology and Geophysics of Beijing, China
Code KZCX2-109
Sponsor: Knowledge Innovation Programme, Chinese Academy of Sciences
Duration: 2002-2005

3D Seismological study in the eastern Kunlun fault belt, Tibet
In collaboration with the Institute of Geology and Geophysics of Beijing, China
Code 40304006
Sponsor: Key Project, National Natural Science Foundation of China, Division of Geophysics
Duration: 2004-2007

Crust/mantle structure and its control to minerization in Lhasa Block, Central Tibet
In collaboration with the Institute of Geology and Geophysics of Beijing, China
Code 2002CB412604
Sponsor: Nature Science National Programme, Ministry of Science and Technology, China
Duration: 2002-2007

Modelos físicos de sistemas de muchos cuerpos: aplicaciones geofísicas
Code BFM2002-01798
Sponsor: Dir. Gral. de Investigación Científica y Técnica (DGICYT)
Duration: 2002-2005

Estudio de fallas sísmicas y modelado de sistemas complejos

Code FIS2005-06237

Sponsor: Dir. Gral. de Investigación Científica y Técnica (DGICYT)

Duration: 2005-2008

3. Collaboration Agreements (in force)

Collaboration Agreement between the University of Zaragoza (Spain) and the Institute of Geology and Geophysics of Beijing, Chinese Academy of Sciences (P.R. China), for modelling and imaging of crust-mantle structures.

4. Permanence in Scientific Institutions

- Institute of Geophysics, Chinese Academy of Sciences, Beijing, China, June 2005 and November 2006
  Topics: Crust-upper mantle seismic velocity structure/ Symmetry signature of the crust/ Composition of the crust/ Surface wave tomography
- Department of Information Engineering, Jilin University, Changchun, China, June 2005
  Topic: Modelling of Rayleigh Wave Velocity Dispersion
- Department of Geophysics, Jilin University, Changchun, China, June 2005
  Topic: Surface Wave Tomography
- Department of Geophysics, Yunnan University, Kunming, China, June 2005
  Topic: Long- and short-period Rayleigh wave velocity dispersion: large- and small-sized problems
- Escuela de Ingeniería Geológica, Facultad de Ingeniería, Universidad de Los Andes, Mérida, Venezuela, Marzo 2006
  Topic: Earthquakes, Seismic Hazard and Seismic Risk

5. Attendance at International Meetings and Communications

- **EGS-AGU-EUG Joint Assembly**
  Nice, France, April 2003.
- **XXVIII IUGG General Assembly**
  Nice, France, April 2003.
- **IV Assembleia Luso-Espanhola de Geodesia e Geofísica**
  Figueira da Foz, Portugal, February 2004.
- **1st General Assembly of the European Geosciences Union**
  Nice, France, April 2004.
- **VI Congreso Geológico de España**
  Zaragoza, Spain, July 2004.
- **XXIX General Assembly of the European Seismological Commission**
  Potsdam, Germany, 12-17 September 2004.
- **International Workshop on Challenges for Geomagnetism, Aeronomy and Seismology**
  Roquetes (Tarragona), Spain, 29th September ï 1st October 2004.

- **International Conference 250th Anniversary of the 1755 Lisbon Earthquake**
  Lisbon, Portugal, 1-4 November 2005.
- **2nd General Assembly of the European Geosciences Union**
  Vienna, Austria, April 2005.
- **6th International Conference on Geomorphology**
  Zaragoza, Spain, 2005.
- **Workshop on Fracture Dynamics: Theory and Application to Earthquakes**
  Madrid, Spain, 2005.
- **5ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica**
  Sevilla, Spain, February 2006.
- **3rd General Assembly of the European Geosciences Union**
  Vienna, Austria, April 2006.
- **Third International Symposium on the Effects of Surface Geology on Seismic Motion**
  Grenoble, France, August 30 ï September 1, 2006.
- **30th General Assembly of the European Seismological Commission**
  Geneva, Switzerland, 3-8 September 2006.
- **12th International Workshop on Seismic Anisotropy**
  Leisure City Conference Center, Beijing, China, 23-27 October 2006.

Communications (40)

M. Chourak, V. Corchete, J. Badal, 2003. *Modelling the shear wave velocity structure of the uppermost lithosphere in Eastern Spain*, EGS-AGU-EUG Joint Assembly, Nice, France, April 2003.

Zhongjie Zhang, Kun Liu, Yun Chen, José Badal, 2003. *Crustal-scale seismic anisotropy in Southeastern China as revealed by wide-angle seismic data*, EGS-AGU-EUG Joint Assembly, Nice, France, April 2003.

J. Badal, E. Samardzhieva, 2003. *Prognostic estimations of casualties caused by strong seismic impacts*, EGS-AGU-EUG Joint Assembly, Nice, France, April 2003.

J. Badal, M. Vázquez-Prada, A. González, E. Samardzhieva, 2003. *Quantitative assessment of earthquake damages: approximate economic loss*, EGS-AGU-EUG Joint Assembly, Nice, France, April 2003.

J. Badal, M. Vázquez-Prada, A. González, M. Chourak, E. Samardzhieva, Z. Zhang, 2003. *Vulnerability of populations and man-made facilities to seismic hazard*, EGS-AGU-EUG Joint Assembly, Nice, France, April 2003.

Mimoun Chourak, José Badal and Víctor Corchete, 2004. *Seismic velocity structure of the uppermost lithosphere in the northeastern quadrant of Spain*, IV Assembleia Luso-Espanhola de Geodesia e Geofísica, Figueira da Foz, Portugal, February 2004.

Zhongjie Zhang, José Badal, Yinkang Li, Yun Chen, Liqiang Yang and Jiwen Teng, 2004. *Wide-angle seismic reflection-refraction survey of the lithosphere in Southeastern China*, IV Assembleia Luso-Espanhola de Geodesia e Geofísica, Figueira da Foz, Portugal, February 2004.

Zhongjie Zhang, Kun Liu, Yun Chen, Jiwen Teng, José Badal and Enru Liu, 2004. *Crustal-scale seismic anaisotropy in Southeastern China as revealed by controlled source seismology*, IV Assembleia Luso-Espanhola de Geodesia e Geofísica, Figueira da Foz, Portugal, February 2004.

José Badal, M. Vázquez-Prada and Álvaro González, 2004. *Prognostic estimations of earthquake casualties and damages in urban nuclei of Spain*, IV Assembleia Luso-Espanhola de Geodesia e Geofísica, Figueira da Foz, Portugal, February 2004.

J. Badal, A. González, M. Vázquez-Prada, Z. Zhang and M. Chourak, 2004. *Vulnerability of populations and man-made facilities to seismic hazard in the Iberian Peninsula*, IV Assembleia Luso-Espanhola de Geodesia e Geofísica, Figueira da Foz, Portugal, February 2004.

J. Badal, U. Dutta, N. Biswas, F. Gómez, F. Serón, 2004. *Delineación de suelos en un área metropolitana mediante el empleo de ondas Rayleigh de alta frecuencia*, VI Congreso Geológico de España, Zaragoza, Spain, July 2004.

J. Badal, A. González, M. Vázquez-Prada, 2004. *Escenarios urbanos de impacto sísmico*, VI Congreso Geológico de España, Zaragoza, Spain, July 2004.

J. Badal, Á. González, M. Vázquez-Prada, 2004. *A rapid loss assessment methodology for relatively large earthquakes*, XXIX General Assembly of the European Seismological Commission, Potsdam, Germany, September 2004.

J. Badal, Á. González, M. Vázquez-Prada, 2004. *Urban earthquake impact scenarios*, XXIX General Assembly of the European Seismological Commission, Potsdam, Germany, September 2004.

J. Badal, Á. González, M. Vázquez-Prada, Z. Zhang and M. Chourak, 2004. *The earthquake impact scenario of Iberia: human casualty and damage levels*, XXIX General Assembly of the European Seismological Commission, Potsdam, Germany, September 2004.

J. Badal, A. González, M. Vázquez-Prada and Zhongjie Zhang, 2005. *Prognostic estimations facing seismic risk in urban nuclei*, International Conference 250th Anniversary of the 1755 Lisbon Earthquake, Lisbon, Portugal, 1-4 November 2005.

Jingyi Chen, José Badal, Jiwen Teng, 2006. *Reflexiones sísmicas, ángulos de polarización, velocidad P y anisotropía cortical*, 5ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica, Sevilla, Spain, February 2006.

Zhongjie Zhang, José Badal, Xi Zhang, 2006. *Velocidades sísmicas, impedancias de Lamé y composición de la corteza*, 5ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica, Sevilla, Spain, February 2006.

Zhongjie Zhang, José Badal, Liqiang Yang, Jiwen Teng, 2006. *Simetría especular de la corteza y compensación isostática en China*, 5ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica, Sevilla, Spain, February 2006.

C. López Casado, J. Badal and J. A. Peláez Montilla, 2006. *Site effects from subduction and volcanic chain earthquakes occurred in El Salvador*, Third International Symposium on the Effects of Surface Geology on Seismic Motion, Grenoble, France, August 30 ï September 1, 2006.

Yun Chen, José Badal, Jiafu Hu, 2006. *Surface wave group velocity tomography of the Qinghai-Tibet Plateau*, XXX General Assembly of the European Seismological Commission, Geneva, Switzerland, 3-8 September 2006.

Zhiming Bai, José Badal, Zhongjie Zhang, 2006. *Crust-upper mantle P-wave velocity structure in Yunnan, Southwestern China: geodynamic implications*, XXX General Assembly of the European Seismological Commission, Geneva, Switzerland, 3-8 September 2006.

Jingyi Chen, José Badal, Jiwen Teng, 2006. *Joint inversion of seismic reflection traveltimes and wave polarizations*, XXX General Assembly of the European Seismological Commission, Geneva, Switzerland, 3-8 September 2006.

Jingyi Chen, Zhongjie Zhang and José Badal, 2006. *Anisotropic inversion by joining seismic reflexion traveltimes and wave polarizations*, 12th International Workshop on Seismic Anisotropy, Leisure City Conference Center, Beijing, 23-27 November 2006.

Zhongjie Zhang, Kun Liu, Jiwen Teng, Yun Chen, José Badal and Enru Liu, 2006. *Constructing regional and local seismic anisotropy images from wide-angle seismic data*, 12th International Workshop on Seismic Anisotropy, Leisure City Conference Center, Beijing, 23-27 November 2006.

Yun Chen, Zhongjie Zhang and José Badal, 2006. *Radial anisotropy in the crust and upper mantle beneath the Qinghai-Tibet Plateau and surrounding regions*, 12th International Workshop on Seismic Anisotropy, Leisure City Conference Center, Beijing, 23-27 November 2006.

Vázquez-Prada, M., González, A., Gómez, J.B. and Pacheco, A.F., 2003. *Statistical analysis of lightning data*, XXVIII IUGG General Assembly, Nice, France, 6-11 April 2003.

Vázquez-Prada, M., González, A., Gómez, J.B. and Pacheco, A.F., 2003. *Quantifying the forecasting of characteristic earthquakes in a minimalistic model*, XXVIII IUGG, Nice, France, 6-11 April 2003.

González, A., Gómez, J.B., Vázquez-Prada, M. and Pacheco, A.F., 2003. *Scaling relationships between length, slip rate and characteristic earthquake return interval in seismic faults: empirical data and model analysis*, XXVIII IUGG General Assembly, Nice, France, 6-11 April 2003.

Vázquez-Prada, M., González, A., Gómez, J.B., Pacheco, A.F., 2004. *Model of regional seismicity based on the minimalist model of characteristic earthquakes*, 1st EGU General Assembly, Nice, France, 25-30 April 2004.

González, A., Vázquez-Prada, M., Gómez, J.B., Pacheco, A.F., 2004. *New forecasting strategy for stochastic systems and its application to the Minimalist Model of characteristic earthquakes*, 1st EGU General Assembly, Nice, France, 25-30 April 2004.

Vázquez-Prada, M., González, A., Gómez, J.B., Pacheco, A.F., 2004. *The minimalist model of characteristic earthquakes as a useful tool for description of the recurrence of large earthquakes*, 1st EGU General Assembly, Nice, France, 25-30 April 2004.

González, A., Vázquez-Prada, M., Gómez, J.B., Pacheco, A.F., 2004. *Using synchronization to improve earthquake forecasting in a cellular automaton model*,

XXIX General Assembly of the European Seismological Commission, Potsdam, Germany, 12-17 September 2004.

González, A., Gómez, J.B. and Pacheco, A.F., 2005. *Empirical scaling relations for seismic faults*, 2nd EGU General Assembly, Vienna, Austria, 24-29 April, 2005.

González, A., Vázquez-Prada, M., Gómez, J.B. and Pacheco, A.F., 2005. *Synchronizing cellular automata to forecast earthquakes*, 2nd EGU General Assembly, Vienna, Austria, 24-29 April, 2005.

González, A., Gómez, J.B. and Pacheco, A.F., 2005. *The occupation of a box as a toy model for the seismic cycle of a fault*, 2nd EGU General Assembly, Vienna, Austria, 24-29 April, 2005.

González, A.; Gómez, J.B.; Pacheco, A.F., 2005. *Estimating earthquake recurrence interval from other fault parameters*, 6th International Conference on Geomorphology, Zaragoza, Spain, 2005.

González, A.; Gómez, J.B.; Pacheco, A.F., 2005. *Empirical scaling relations for seismic faults*, Workshop on Fracture Dynamics: Theory and Application to Earthquakes, Madrid, Spain, 2005.

J.B. Gómez, A.F. Pacheco, 2006. *New Monte Carlo results in time-dependent hierarchical fibre-bundle models of fracture*, 5ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica, Sevilla, Spain, February 2006.

Gómez, J.B., Pacheco, A.F., 2006. *Failure by fatigue of hierarchical load-transfer models: lifetime of infinite systems*, 3rd EGU General Assembly, Vienna, Austria, 2-7 April, 2006.

6. Publications (21)

M. Chourak, V. Corchete, J. Badal, F. J. Serón and F. Gómez, 2003. Imaging of the near-surface shear-wave velocity structure of the Granada Basin (southern Spain), *Bull. Seism. Soc. Am.*, **93**, 430-442.

José Badal, 2004. Seismic velocity structures based on long- and short-period surface wave propagation (short review). In: Z. Zhang, R. Gao, Q.T. Lu and Z.K. Liu (eds.), Deep Structure and Geodynamics of Continental China, Chinese Science Publisher, Beijing, pp. 1013-1036.

M. Chourak, M. Navarro, V. Corchete, J. Badal, 2004. Near surface velocity structure of Andalusia (southern Spain) and Alboran Sea region from 0.15-2.0 Hz Rayleigh waves, *Tecnociencia*, **6**, Nº 1, 125-141.

J. Badal, U. Dutta, N. Biswas, F. Gómez, F. Serón, 2004. Delineación de suelos en un área metropolitana mediante el empleo de ondas Rayleigh de alta frecuencia, *Geo-Temas*, **6**(3), 209-212.

José Badal, Utpal Dutta, Francisco Serón and Niren Biswas, 2004. Three-dimensional imaging of shear wave velocity in the uppermost 30 m of the soil column in Anchorage, Alaska, *Geophys. J. Int.*, **158**, 983-997.

José Badal, Miguel Vázquez-Prada and Álvaro González, 2005. Preliminary quantitative assessment of earthquake casualties and damages, *Natural Hazards*, **34**, 353-374.

Zhongjie Zhang, José Badal, Yinkang Li, Yun Chen, Liquiang Yang and Jiwen Teng, 2005. Crustï upper mantle seismic velocity structure across Southeastern China, *Tectonophysics*, **395**, 137-157.

M. Chourak, V. Corchete, J. Badal, F. Gómez and F. J. Serón, 2005. Shallow seismic velocity structure of the Betic Cordillera (southern Spain) from modelling of Rayleigh wave dispersion, *Surv. Geophys*, **26**, 481-504.

José Badal, Miguel Vázquez-Prada, Alvaro González and Zhongjie Zhang, 2005. Prognostic estimations facing seismic risk levels in Spain, *International Conference 250th Anniversary of the 1755 Lisbon Earthquake*, Lisbon, pp. 198-205.

C. López Casado, J. Badal and J.A. Peláez Montilla, 2006. Site effects from subduction and volcanic chain earthquakes occurred in El Salvador, *Third Inter. Symp. on the Effects of Surface Geology on Seismic Motion*, Grenoble.

Yun Chen, Zhongjie Zhang and José Badal, 2006. Radial anisotropy in the crust and upper mantle beneath the Qinghai-Tibet Plateau and surrounding regions, *12th International Workshop on Seismic Anisotropy*, Beijing, pp. 203-206.

Álvaro González, Miguel Vázquez-Prada, Javier B. Gómez and Amalio F. Pacheco, 2006. A way to synchronize models with seismic faults for earthquake forecasting: Insights from a simple stochastic model, *Tectonophysics*, **424**, 319ī 334.

Álvaro González, Javier B. Gómez and Amalio F. Pacheco, 2006. Updating seismic hazard at Parkfield, *Journal of Seismology*, **10**, 131ī 135.

Álvaro González, Javier B. Gómez and Amalio F. Pacheco, 2005. The occupation of box as a toy model for the seismic cycle of a fault, *American Journal of Physics*, **73**, 946ī 952.

Pacheco A. F. and J. Sañudo, 2005, Maximum entropy profile for the mesosphere, *Nuovo Cimento*, **C28**, 29-32.

González, A., M. Vázquez-Prada, J.B. Gómez and A.F. Pacheco, 2004, Using synchronization to improve the forecasting of large relaxations in a cellular automaton model, *Europhysics Letters*, **68**, 611-617.

Gómez, J.B. and A.F. Pacheco, 2004. The Minimalist Model of Characteristic Earthquakes as a Useful Tool for Description of the Recurrence of Large Earthquakes, *Bull. Seism. Soc. Am.*, **95**, 1960-1967.

López, R., M. Vázquez-Prada, J.B. Gómez and A.F. Pacheco, 2004. A Model of Characteristic Earthquakes and its implication in Regional Seismicity, *Terra Nova*, **16**, 116-120.

Vázquez-Prada, M., A. González, J.B. Gómez and A.F. Pacheco, 2003. Forecasting Characteristic Earthquakes in a Minimalist Model, *Nonlinear Processes in Geophysics*, **10**, 565-571.

Moreno, Y., M. Vázquez-Prada, J.B. Gómez and A.F. Pacheco, 2003. Error Diagrams and Temporal Correlations in a Fracture Model with Characteristic and Power-Law Distributed Avalanches, *European Physics Journal B*, **34**, 489-494.

Pacheco, A. F. and J. Sañudo, 2003. The Virial Theorem and the Atmosphere, *Nuovo Cimento*, **C26**, 311.

Instituto Geografico Nacional (IGN)
Gral. Ibañez Ibero 3, 28003 Madrid
ph: 00 34 91 597538430
fax: 00 34 93 5538440
mail: sismologia@fomento.es

1. Targets of the Center

Spanish National Seismic Network .
Regional seismicity and seismotectonics.
Seismic risk assessment, earthquake engineering and building code.

2. Networks under Control and Maintenance

Seismic Network of Spain: with 35 broad-band seismometers, one hundred strong motion accelerometers and one seismic array (25 stations) for the knowledge of the seismicity in the Iberian Peninsula. Seismic activity in real time and periodic bulletins is made available through Internet.
http://www.ign.es/

3. Earthquake Catalogues and Documentation

Compilation, revision and update of the earthquake catalogue for the Iberian Peninsula and Canary Islands regions. The Archivo Nacional de Geofisica contains the seismograms of the Seismological Observatories from 1909 and documents about the historical seismicity.

4. Current Research Interests

Seismic network optimization
Seismicity and seismotectonics of the Iberian Peninsula and Canary Islands
Local effects
Seismic hazard and civil defense plans

5. Research Projects

EVITA2: *Escenarios de peligrosidad sísmica para sistemas de evaluación integrada del riesgo sísmico. diseño óptimo de un sistema integrado para la Vega Baja, Alicante.*
Spanish Government.
Period: 2004-2006

TRANSFER: *Tsunami Risk and Strategies for the European Region*.
European Union Project.
Period: 2006-2008

MEREDIAN: *Developing Existing Earthquake Data Infrastructures Towards a Mediterranean-European rapid Earthquake Data Information and Archiving Network*
European Union Project
Period: 2000-2005

6. Attendance at International Meetings and Communications

Batlló, J. and Martínez Solares, J.M. (2004).- "A new version of the Catalogue of Old Spanish Seismographs". European Seismological Commission, XXIX General Assembly, Sept 12-17. Potsdam , Germany.

Tatevosian, R., Ugalde, A., Izquierdo, A. and Martínez Solares, J.M. (2004).- "Calculated macroseismic intensities felt over Spanish Territory based on Earthquake Catalogue Data". International Workshop Challenges for Geomagnetism, Aeronomy and Seismology in the XXI Century, 29 sept -1 oct. Ebro Observatory (Roquetas).

López, C., Cisternas, A. y Muñoz, D. (2004).- "Campo cercano en terremotos de la Peninsula Iberica y su entorno." IV Assembleia Luso-Espanhola de Geodesia e Geofísica. Figueira da Foz, Portugal, February.

Cantavella, J.V., Herraiz, M., Jimenez, M.J. y Garcia, M. (2004).- "Atenuación sismica en el Sureste de la Peninsula Iberica." IV Assembleia Luso-Espanhola de Geodesia e Geofísica. Figueira da Foz, Portugal, February.

Alcalde, J.M., Cantavella, J.V., Carreño, E. y Sanchez, M. (2004).- "La Red de Acelerografos del Instituto Geografico Nacional." IV Assembleia Luso-Espanhola de Geodesia e Geofísica. Figueira da Foz, Portugal, February.

Martinez Solares, J.M., Gil, A., Socias, I., Mezcua, J., Martin Martin, A.J. and Marin, V. (2005).- "Geophysical maps of Spain". XXII International Cartographic Conference, La Coruña (Spain), July.

Jiménez, M.J., Vaccari, F., García Fernández, M., Pinat, T., Romanelli, F., Panza, G.F. and Martínez Solares, J.M. (2005).- "The source of the 1755 Lisbon great earthquake based on the modeling of effects: damage and tsunami". 250th Anniversary of the 1755 Lisbon Earthquake, 1 - 4 November. Lisboa.

Peláez, J.A., Castillo, M., Sánchez Gómez, M., Martínez Solares, J.M. y López Casado, C. (2006).- "El terremoto de Andujar, Jaén, de 1170. Una revisión crítica." V Asamblea Hispano-Portuguesa de Geodesia y Geofísica. Sevilla. February.

Bravo, J.B. y Cisternas, A. (2006).- "Comparación de la onda Lg en la Peninsula Iberica y en el mar de Alboran. Influencia de una capa sedimentaria." V Asamblea Hispano-Portuguesa de Geodesia y Geofísica. Sevilla. February.

de Torre, J.R., Anton, R., Bravo, J.B., Garcia, A., Tordesillas, J.M., Lopez, M., Hernandez, C., Naveiras, F., Barco, J., Lopez, A., Garcia, O. y Lambas, F. (2006).- "Redes de control sismico basadas en tecnologia IP. Aplicacion al Sistema de Monitorizacion de terremotos del Instituto Geografico Nacional." V Asamblea Hispano-Portuguesa de Geodesia y Geofísica. Sevilla. February.

Batllo, J. y Martínez Solares, J.M. (2006).- "El nuevo catálogo-inventario de sismógrafos antiguos españoles." V Asamblea Hispano-Portuguesa de Geodesia y Geofísica. Sevilla. February.

7. Publications

2003

J. Rueda y J. Mezcua (2003). Fundamentos sismológicos para una alerta temprana de tsunamis en las costas españolas. Aplicación al tsunami producido por el terremoto de Argel de 21 de mayo de 2003. Publicación Dirección General de Protección Civil.

J. Rueda (2003). Sismicidad, sismotectónica y peligrosidad sísmica en Galicia. Revista Galega de Seguridade Pública, 5, 89-1

Martínez Solares, J.M. (2003*).* Sismicidad histórica de la Península Ibérica. *Física de la Tierra*, Vol. 15, p. 13-28.

López, C. y Muñoz, D (2003*).* Fórmulas de magnitud en los boletines y catálogos españoles. *Física de la Tierra*, Vol. 15, p. 49-71.

Carreño, E., López, C., Bravo, B., Expósito, P., Gurria, E. y García, O. (2003*).* Sismicidad de la Península Ibérica en la época instrumental: 1985-2002. *Física de la Tierra*, Vol. 15, p. 73-91.

Tordesillas, J.M., M. López, E. Carreño, C. López, J. Martínez, R. Capote, L. Castro y M. Tsige. (2003). ñInterferometría de RADAR (INSAR) y su Aplicación a la Sismotectónicañ. Pub. Técnica 41. pp.54. IGN

2004

Martínez Solares, J.M. and López Arroyo, A. (2004).- "The great historical 1755 earthquake. Effects and damage in Spain." *Journal of Seismology*, Vol.8, p. 275-294.

Roca, A., Izquierdo, A., Sousa-Oliveira, C. and Martínez Solares, J.M. (2004).- "An outline of earthquake catalogues, databases and studies of historical seismicity in the Iberian Peninsula." Investigating the record of past earthquakes. 21st Course of the International School of Geophysics, Erice, Sicily, 1-7 July 2002. *Annali di Geofisica*, Vol. 47, n. 2/3, p.561-570.

J. Mezcua, J. Rueda and R.M. García Blanco (2004). "Revaluation of historic earthquakes in Spain". *Seism. Res. Lett.* 75, 75-81.

2005

J. Rueda y J. Mezcua (2005). Near-real-time Seismic Moment-tensor determination in Spain. Seism. Res. Lett. 76, 455-465.

Martínez Solares, J.M. & López Arroyo, A. (2005).- "O terramoto de 1755 en Espanha". *O Grande Terramoto de Lisboa*, Fundaçao Luso-Americana. Volume I, p.237-264.

Martínez Solares, J.M., del Fresno, C., Goded, T., Gaite, B., Sánchez, F. y Buforn, E. (2005).- "Terremotos y tsunamis: cómo se generan estos procesos naturales." *Enseñanza de las Ciencias de la Tierra*, Vol. 13, n. 1, p.15-19.

Martínez Solares, J.M. (2005).- "Los tsunamis en el contexto de la Península Ibérica" *Enseñanza de las Ciencias de la Tierra*, Vol. 13, n. 1, p. 52-58.

Carreño Herrero, E. (2005).- "La peligrosidad de tsunamis en las costas españolas. Simulaciones" *Enseñanza de las Ciencias de la Tierra*, Vol. 13, n. 1, p. 60-64.

Peláez, J.A., Castillo, J.C., Sánchez Gómez, M., Martínez Solares, J.M. y López Casado, C. (2005).- "Fuentes medievales y posibles evidencias arqueológicas del terremoto de Andujar de 1170". *Boletín del Instituto de Estudios Giennenses*, Num. 192, p.139-177.

2006

J. Rueda (2006). Discriminación sísmica mediante el análisis de las señales generadas por explosiones y terremotos. Aplicación a la región suroeste de Europa-Norte de África. Tesis Doctoral Universidad Politécnica de Madrid, 450 pp.

J. Mezcua y J. Rueda (2006). Estudio sismotectónico y evolución geodinámica de la Península Ibérica. Publicación Universidad Complutense de Madrid Física de la Tierra, 18, 137-155.

Blanco, M.J. y C. López (2006). Crisis sismo-volcanica de Tenerife en 2004. Vigilancia volcanica del Instituto Geográfico Nacional en Canarias: situación actual y futura. En III Jornadas canarias de Geologia, 3-20.

J. Rueda y J. Mezcua (2006). Descripción de la Red Sísmica Nacional. Jornadas prácticas de campo sobre sismicidad y riesgo sísmico en la provincia de Granada, Granada, mayo 2006, 26 pp.

J. Mezcua y J. Rueda (2006). Predicción de terremotos. Estado de la cuestión. Universidad Menéndez Pelayo, (en prensa).

Geologic Institute of Catalonia (IGC)
Balmes 209-211, 08006 Barcelona
ph: 00 34 93 5538430
fax: 00 34 93 5538440
mail:

1. Targets of the Center

The Institut Geològic de Catalunya is an institution from the Autonomous Government of Catalonia in charge of Geology and related Geosciences. The main working areas are: Geology and Geological Cartography, Engineering Geology, Seismology, Applied Geophysics, Snow Avalanches and study of other Natural Hazards.

The activities in the field of Seismology and Earthquake Engineering are focused on two main subjects:
- study and survey of regional seismicity,
- seismic risk assessment and earthquake engineering.

This report refers only to activities related to Seismology and Applied Geophysics.

2. Networks under Control and Maintenance

Seismic network of Catalonia: It is a dense seismic network for the surveillance of the seismicity in the territory of Catalonia (NE of Spain). Periodic bulletins are published and distributed and information is also made available through Internet.
http://www.igc.cat/web/gcontent/ca/sismologia/igc_sismologia.html

3. Earthquake Catalogues and Documentation

In addition to the current data acquisition of related to the seismic network, one of our fields of activity is the compilation, revision and up date of the seismic catalogue for the region. The most recent issue is a review of the middle age earthquakes (Olivera et al., 2006a).

4. Current Research Interests

Seismic network developments
Earthquake catalogues investigation
Seismic zonation
Local effects / Microzoning
Vulnerability, risk assessment and civil defense plans

5. Research Projects

European projects:

NERIES. Network of Research Infrastructures for European Seismology
Program: FP6 (Integrated Infrastructures Initiative)
Partners: The consortium consists of 25 participants, earthquake observatories and research institutes, including ORFEUS and EMSC
Period: 2006 ï 2010

RISCMASS. Methodologies for mass movements risk management and Insurance policies

Program: Interreg IIIB Medocc (FEDER)
Partners: Calabria Region (IT) (Coordinator), CNR-IRPI (IT), Sicily Region (IT), Universitat Alacant (ES), NOA ï National Observatory of Athens (GR)
Period: 2004- 2006.

ISARD. Regional automatic seismic damages information
Program: Interreg IIIA (FEDER)
Partners: BRGM (FR), CSTB (FR), Protecció civil Generalitat de Catalunya (ES), Ajuntament de Puigcerdà (ES) and CRECIT (And). IGC is the coordinator
Period: 2003 ï 2007

EUROSEISRISK. Seismic hazard assessment, site effects and soil-structure interaction in an instrumented basin
Program: FP5
Partners: UTHESS (GR), IESEE(GR), LCPC(FR), RWTH (G), UTRS(IT), UTOK (J), UKOM (Sl)
Period: 2002 ï 2005

RISK-UE. An advanced approach to earthquake risk scenarios with application to different European Towns
Program: FP5
Partners: BRGM (Coordinator, FR), GeoTer (FR), POLIMI (IT), UNIGE (IT), UTCB (RU), AUTH (GR), IZIIS (FY), CSLMEE (BU), CIMNE (ES)
Period: 2001 ï 2005

Projects co-financed by national organisations:

CASABLANCA. Characterization of the detectability of a permanent Broadband OBS, for the seismology and seismic risk analyses. Application on the Coastal area of Catalonia
Program: Ministerio de Educación y Ciencia (Spanish Government)
Partners: ICC (Geology department)
Period: 2003-2007

ERSE. Scenarios of seismic risk on Spain
Program: Ministerio de Educación y Ciencia (Spanish Government)
Partners: Universidad Complutense de Madrid, Real Instituto y Observatorio de la Armada
Period: 2003-2006

COSTE. Earthquake and Tsunamis effects on Spanish coastal areas
Program: Ministerio de Educación y Ciencia (Spanish Government)
Partners: Universidad Complutense de Madrid, Real Instituto y Observatorio de la Armada
Period: 2006-2009

6. Attendance at International Meetings and Communications

The personal from IGC has participated in many national and international congresses, symposia and workshops in the field of Geophysics, Seismology and Earthquake Engineering.

7. Publications

2003

Figueras, S., Coral, H., Goula, X.: Estudis de risc sísmic a Andorra. Utilització de mètodes experimentals i de simulació numérica per la microzonació sísmica dôàrees urbanitzades. Horitzó, núm. 4, pàg. 36-41. 2003.

Irizarry, J., Goula, X., Susagna, T.: Evaluación de la peligrosidad sísmica de la ciudad de Barcelona en términos de aceleración espectral. Proceedings del 2o Congreso Nacional de Ingeniería Sísmica, pàg. 389-399. Málaga, 2003.

Irizarry, J., Podestà, S., Resemini, S.: Curvas de capacidad para edificios monumentales: La iglesia Santa Maria del Mar de Barcelona. Proceedings del 2o Congreso Nacional de Ingeniería Sísmica, pàg. 541-555. Málaga, 2003.

Olivera, C., Fleta, J., Susagna, T., Figueras, S., Goula, X., Roca, A.: Sismicidad y deformaciones actuales en el nordeste de la península Ibérica. Física de la Tierra, núm. 15, pàg. 111-144. Madrid, 2003.

Roca, A., Irizarry, J., Marturià, J., Mena, U.: Aplicación preliminar del análisis del sistema urbano a la evaluación del riesgo sísmico en la ciudad de Barcelona. Proceedings del 2o Congreso Nacional de Ingeniería Sísmica, pàg. 400-412. Málaga, 2003.

Secanell, R., Irizarry, J., Susagna, T., Martin, C., Goula, X., Combes, P., Fleta, J.: Evaluación unificada de la peligrosidad sísmica alrededor de la frontera entre Francia y España. Proceedings del 2o Congreso Nacional de Ingeniería Sísmica, pàg. 439-447. Málaga, 2003.

2004

Figueras, S., Goula, X., Coral, H., González, M.: Estudio de movimientos de ladera activados por terremotos en Andorra. Proceedings de la 4a Asamblea Hispano Portuguesa de Geodesia y Geofísica. Figueira da Foz, 2004.

Fleta, J., Roca, A., Palau, J., Barberà, M., Galiano, G., Fortuny, J., Miralles, F.: La consideración de los riesgos geológicos de movimientos del terreno, aludes y terremotos para la planificación territorial en Cataluña. Proceedings del VI Congreso Geológico de España, pàg. 331-334. Saragossa, 2004.

Gayà, M. A., Teixidó, T.: Procesado de sísmica de reflexión superficial en el complejo turbidítico de Ainsa (Huesca, España). Proceedings del XII Congreso Venezolano de Geofísica. Caracas, 2004.

González, M., Goula, X.: El projecte Isard. Horitzó, núm. 5, pàg. 14-15. 2004.

Goula, X., González, M., El Asbai, E. H., Susagna, T.: Terratrèmol dôAl Hoceima: Resultats preliminars de la visita tècnica a la zona danyada pel terratrèmol dôAl Hociema (Marroc) del 24 de febrer de 2004. Horitzó, núm. 6, pàg. 24-36. Andorra, juliol 2004.

Irizarry, J., Goula, X., Susagna, T., Roca, A., Maña, F.: Earthquake risk scenarios for monuments in Barcelona, Spain. Proceedings de la 13th World Conference on Earthquake Engineering. Vancouver, 2004. Publicació en CD-ROM, paper núm. 2162.

Olivera, C., Redondo, E., Barriendos, M., Llasat, C., Roca, A.: Incidencia de los efectos catastróficos producidos por episodios meteorológicos extremos en la valoración de los daños ocasionados por terremotos. El caso del sismo del año 1448 en Cataluña. Proceedings de la 4a Asamblea Hispano Portuguesa de Geodesia y Geofísica. Figueira da Foz, 2004.

Olivera, C., Redondo, E., Lambert, J., Riera, A., Roca, A.: Los terremotos destructores bajomedievales en Cataluña (NE de la Península Ibérica). Proceedings de la 4a Asamblea Hispano Portuguesa de Geodesia y Geofísica. Figueira da Foz, 2004.

Roca, A., Fleta, J.: Politiques de gestion et état des connaissances sur les risques naturels en Espagne. Risques naturels et aménagement en Europe, pàg. 157-171. París, 2004.

Roca, A., Izquierdo, A., Sousa-Oliveira, C., Martínez-Solares, J. M.: An outline of earthquake catalogues, databases and studies of historical seismicity in the Iberian Peninsula. Annals of Geophysics, vol. 47, núm. 2-3, pàg. 561-570. Roma, 2004.

Secanell, R., Goula, X., Susagna, T., Fleta, J., Roca, A.: Seismic hazard zonation of Catalonia, Spain, integrating random uncertainties. Journal of Seismology, núm. 8, pàg. 25-40. Països Baixos, 2004.

Tapia, M., Susagna, T., Goula, X., Irizarry, J.: Ley de atenuación del movimiento del suelo en el Noreste de Epaña. Proceedings de la 4a Asamblea Hispano Portuguesa de Geodesia y Geofísica. Figueira da Foz, 2004.

Teixidó, T., Gabàs, A., Martínez, P.: Métodos eléctricos y sísmicos en la detección de zonas de dilución salinas. Caso del Río Cardener, Barcelona. Proceedings de la 4a Asamblea Hispano Portuguesa de Geodesia y Geofísica. Figueira da Foz, 2004.

2005

Brusi, D., González, M., Figueras, S.: Conocer los Tsunamis: un seguro de vida. Enseñanza de las Ciencias de la Tierra, Monográfico: Tsunami. AEPECT, vol. 13, núm. 1, pàg. 73-84. 2005.

Figueras, S.: Redes de vigilancia sísmica y vigilancia de Tsunamis. Enseñanza de las Ciencias de la Tierra. Monográfico: Tsunami. AEPECT, vol. 13, núm. 1, pàg. 46-51. 2005.

Figueras, S.: Quan la terra tremola. IES Francesc Ribalta 1979/2004, 25 anys d'Institut, pàg. 115-122. Solsona, 2005.

Figueras, S., Macau, A., Goula, X., González, M.: Aplicación del método de Newmark para el estudio de los movimientos de ladera activados por terremotos en Andorra. Proceedings del VI Simposio nacional sobre taludes y laderas inestables, vol. II, pàg. 867-878. València, 2005.

González, M., Figueras, S.: El Tsunami de Sumatra del 26 de diciembre de 2004. Enseñanza de las Ciencias de la Tierra. Monográfico: Tsunami. AEPECT, vol. 13, núm. 1, pàg. 2-14. 2005.

Goula, X., Susagna, T., Irizarry, J., Romeu, N.: Generation of automatic seismic risk scenarios in Catalonia. 250th Anniversary of the 1755 Lisbon earthquake. Lisboa, 2005.

Murphy, P., Goula, X., Susagna, T.: Alhucemas, un año después del terremoto. AFKAR/IDEAS, pàg. 116-119. Primavera, 2005.

Roca, A., Olivera, C., Susagna, T., Fleta, J., Macau, A.: Far-field effects of the 1755 Lisbon earthquake in Catalonia, Spain. Influence of local geology and comparison with 20 th Century macroseismic data. 250th Anniversary of the 1755 Lisbon earthquake. Lisboa, 2005.

2006

Figueras, S.: Els efectes dels terratrèmols sobre el terreny. La Punxa, Vol.42, pp 38-43. 2006.

Goula, X. and Susagna, T.: Observation, characterization and prediction of strong ground motion. In: C. S. Oliveira, A. Roca and X. Goula, (Editors), Assessing and Managing Earthquake Risk, 47 - 66, Springer. 2006.

Macau, A., Figueras, S., Susagna, T. y Goula, X.: Estudi dels efectes de sòl per a la microzonació sísmica a la cubeta dôAndorra la Vella ï Escaldes ï Engordany. Revista Horitzó, CRECIT-IEA. Vol. 10, pp. 18-27. 2006.

Mañá, F., Bozzo, L. y Irizarry, J.: Building against earthquakes In: C. S. Oliveira, A. Roca and X. Goula, (Editors), Assessing and Managing Earthquake Risk, 287 - 308, Springer. 2006.

Olivera, C., Redondo, E., Lambert, J., Riera Melis, A. y Roca, A.: Els Terratrèmols dels segles XIV I XV a Catalunya. Institut Cartogràfic de Catalunya. 407 pp. 2006a.

Olivera, C., Redondo, E. y Fleta, J.: Efectes dels terratrèmols de 1427 i 1428 a les terres de Girona. La Punxa, Vol 40, pp 60-67. 2006b.

Oliveira, C. S., Roca, A. y Goula, X.: Assessing and managing earthquake risk. An introduction. In: C. S. Oliveira, A. Roca and X. Goula, (Editors), Assessing and Managing Earthquake Risk, 1 - 14, Springer. 2006.

Roca, A., Goula, X., Susagna, T., Chávez, J., González, M. y Reinoso, E.:. A simplified method for vulnerability assessment of dwelling buildings and estimation of damage scenarios in Spain. Bulletin of Earthquake Engineering, Vol 4, pp 141 -158. 2006.

Roca, A., Irizarry, J., Lantada, N., Barbat, A., Goula, X., Pujades, L. y Susagna, T.: Método avanzado para la Evaluación de la Vulnerabilidad y el Riesgo Sísmico. Aplicación a la Ciudad de Barcelona. Física de la Tierra, Vol. 18, pp. 183-203. 2006.

Roca, A., Oliveira, C. S., Ansal, A. y Figueras, S.: Local site effects and microzonation. In: C. S. Oliveira, A. Roca and X. Goula, (Editors), Assessing and Managing Earthquake Risk, 67 - 90, Springer. 2006.

Ruiz, M., Gallart, J., Díaz, J., Olivera, C., Pedreira, D., López, C., González-Cortina, J.M. and Pulgar, J.A.: Seismic activity at the Western Pyrenean edge. Tectonophysics, 412, 3-4, 217- 235. 2006.

Susagna, T., Goula, X., Roca, A., Pujades, L., Gasulla, N. and Palma, J.J.: Loss scenarios for regional emergency plans: application to Catalonia, Spain. In: C. S. Oliveira, A. Roca and X. Goula, (Editors), Assessing and Managing Earthquake Risk, 463 - 478, Springer. 2006.

Susagna, T., Pujades, Ll. y Palma, J.J.: Anàlisi del risc al Pla d'emergències sísmiques. La Punxa, Vol 41, pp 56-62. 2006.

Ebro Observatory (CSIC- Ramon Llull University)
Horta Alta, 38, 43520-Roquetes (Tarragona), Spain
Phone: +34 977 500511
Fax: +34 977 504660
E-mail: augalde@obsebre.es

1. Targets of the Center

The Ebro Observatory is a fundamental research Institute and observatory of geophysical phenomena. Its mission is to promote and coordinate fundamental and multidisciplinary high-quality research on Geophysics to become a necessary referent in its research lines. To follow with the actualizations of the present system for recording, archiving and exchanging geomagnetic, ionospheric, solar, meteorological, and seismological data, which continue feeding its valuable data series.

2. Networks under control and maintenance

EBR seismic station supplies data to the Virtual European Broadband Seismograph Network as a part of the MEREDIAN (Mediterranean-European Rapid Earthquake Data Information and Archiving Network) real-time data exchange initiative. In this sense, data streams from the SeisComP/SeedLink server are collected by the Antelope real-time system at the ORFEUS data center in De Bilt (The Netherlands).

EBR seismic station provides with seismic readings the ISC (International Seismological Centre) whose main task is to compile earthquake parametric data and to produce the final earthquake bulletin of global seismicity.

3. Earthquake catalogues and documentation

All the recorded seismograms since 1904 to date are available by request at *http://www.obsebre.es/php/sismica/certif_sismica.php*

4. Current research interests

Scattering; coda-wave attenuation; 3D imaging of scatterers in the crust by means of coda envelope inversion.

5. Research Projects

Project title: CARACTERIZACIÓN DE LA DETECTABILIDAD DE UN SISMÓGRAFO SUBMARINO (OBS), BROADBAND, PERMANENTE, PARA EL ESTUDIO DE LA SISMICIDAD Y EL RIESGO SÍSMICO. APLICACIÓN A LA ZONA COSTERO CATALANA (REN2003-06577)
Supported by: MCYT
Dates: from 2003 to 2007
Participant researcher: A. UGALDE

6. Attendance at International Meetings

1. Authors: C. VARGAS, A. UGALDE, L.G. PUJADES AND J.A. CANAS
   Title: SPATIAL VARIATION OF CODA-WAVE ATTENUATION IN NORTH-WESTERN COLOMBIA
   Type of participation: POSTER
   Meeting: EUROPEAN GEOPHYSICAL SOCIETY
   Place: NICE (FRANCE) Date: 04/03
2. Authors: J. N. TRIPATHI AND A. UGALDE

Title: REGIONAL ESTIMATION OF Q FROM SEISMIC CODA OBSERVATIONS BY THE GAURIBIDANUR SEISMIC ARRAY (SOUTHERN INDIA)
Type of participation: POSTER
Meeting: EUROPEAN GEOPHYSICAL SOCIETY
Place: NICE (FRANCE) Date: 04/03

3. Authors: C. A. VARGAS, L.G. PUJADES, A. UGALDE, AND J.A. CANAS
Title: SEISMOTECTONIC AND SEISMIC ANOMALIES IN NORTH WESTERN OF SOUTH AMERICA
Type of participation: POSTER
Meeting: IUGG
Place: SAPPORO (JAPAN) Date: 07/03

4. Authors: L.G. PUJADES, J.A. CANAS, R. GONZÁLEZ, O. CASELLES, A. UGALDE, AND C. A. VARGAS
Title: INTRINSIC, SCATTERING, TOTAL AND CODA SEISMIC ATTENUATION IN THE IBERIAN PENINSULA
Type of participation: POSTER
Meeting: IUGG
Place: SAPPORO (JAPAN) Date: 07/03

5. Authors: J. N. TRIPATHI AND A. UGALDE
Title: ESTIMATION OF INTRINSIC ABSORPTION AND SCATTERING ATTENUATION IN SOUTHERN INDIA USING A DEPTH DEPENDENT STRUCTURE MODEL
Type of participation: POSTER
Meeting: IUGG
Place: SAPPORO (JAPAN) Date: 07/03

6. Authors: J. BATLLO AND A. UGALDE
Title: ONE HUNDRED YEARS OF SEISMIC RECORDING AND RESEARCH AT THE EBRE OBSERVATORY
Type of participation: POSTER
Meeting: ESC
Place: POSTDAM (GERMANY) Date: 09/04

7. Authors: J. BATLLO, D. ARRAZOLA AND A. UGALDE
Title: EARTHQUAKE MAGNITUDE EVALUATION THROUGH MAGNETOGRAMS. PRELIMINARY RESULTS
Type of participation: POSTER
Meeting: IAGA 2005 SCIENTIFIC ASSEMBLY
Place: TOULOUSE (FRANCE) Date: 07/05

8. Authors: J. BATLLO, D. ARRAZOLA AND A. UGALDE
Title: FEASIBILITY OF EARTHQUAKE MAGNITUDE DETERMINATION USING MAGNETOGRAMS
Type of participation: POSTER
Meeting: IASPEI GENERAL ASSEMBLY
Place: SANTIAGO DE CHILE (CHILE) Date: 10/05

9. Authors: R. TATEVOSSIAN, A. UGALDE, J. BATLLO AND R. MACIÀ

Title: MACROSEISMIC AND INSTRUMENTAL DATA COMPREHENSIVE ANALYSIS: EARTHQUAKES OF JUNE 2, 1930 AND FEBRUARY 13, 1949 IN CATALONIA (SPAIN)
Type of participation: ORAL
Meeting: IASPEI GENERAL ASSEMBLY
Place: SANTIAGO DE CHILE (CHILE) Date: 10/05

10. Authors: E. CARCOLÉ, A. UGALDE, J.N. TRIPATHI AND C. A. VARGAS
Title: SPATIAL DISTRIBUTION OF SCATTERERS IN THE CRUST BY INVERSION ANALYSIS OF SEISMIC CODA ENVELOPES. A CASE STUDY OF GAURIBIDANUR SEISMIC ARRAY SITE (SOUTHERN INDIA) AND GALERAS VOLCANO (COLOMBIA)
Type of participation: POSTER
Meeting: EGU
Publication: GEOPHYSICAL RESEARCH ABSTRACTS, VOL. 8, 07692, 2006
Place: VIENNA (AUSTRIA) Date: 04/06

11. Authors: T. FRONTERA, J. A. JARA, X. GOULA, A. UGALDE AND C. OLIVERA
Title: INSTALLATION AND FIRST RESULTS OF A PERMANENT OCEAN BOTTOM SEISMOMETER OFFSHORE TARRAGONA (NE SPAIN)
Type of participation: POSTER
Meeting: FIRST EUROPEAN CONFERENCE ON EARTHQUAKE ENGINEERING AND SEISMOLOGY
Publication:
Place: GINEBRA (SUITZERLAND) Date: 09/06

7. Publications (only in international journals)

1. Authors: A. UGALDE
Title: THE EBRE OBSERVATORY SEISMOLOGICAL STATION: PAST AND PRESENT INSTRUMENTATION AND NOISE CONDITIONS
Ref. Journal: **ANNALS OF GEOPHYSICS**, 46, 4, 609-624, 2003.

2. Authors: C. A. VARGAS, L. G. PUJADES, A. UGALDE and J. A. CANAS
Title: LOCAL EARTHQUAKE TOMOGRAPHY IN COLOMBIAN TERRITORY
Ref. Journal: **REV. INT. MÉTODOS NUMÉRICOS PARA CÁLCULO and DISEÑO EN INGENIERÍA** (In Spanish, abstract in English), 19-3, 255-278, 2003.

3. Authors: C. A. VARGAS, A. UGALDE, L. G. PUJADES and J. A. CANAS.
Title: SPATIAL VARIATION OF CODA-WAVE ATTENUATION IN NORTH-WESTERN COLOMBIA
Ref. Journal: **GEOPHYSICAL JOURNAL INTERNATIONAL**, 158, 609-624, 2004.

4. Authors: J .N. TRIPATHI and A. UGALDE.
Title: REGIONAL ESTIMATION OF Q FROM SEISMIC CODA OBSERVATIONS BY THE GAURIBIDANUR SEISMIC ARRAY (SOUTHERN INDIA)
Ref. Journal: **PHYSICS OF THE EARTH AND PLANETARY INTERIORS**, 145, 115-126, 2004

5. Authors: BATLLO, J., ARRAZOLA, D. and UGALDE A.
Title: NEW RESULTS FROM OLD DATA: USING MAGNETOGRAMS FOR EARTHQUAKE MAGNITUDE EVALUATION

Ref. Journal: **EOS**, 86, No. 48, 2005.

6. Authors: TATEVOSSIAN R., UGALDE A., APTEKMAN J. and PETROSSIAN A.
Title: ON THE PROBLEM OF HOMOGENEOUS PRESENTATION OF SEISMIC HISTORY OF LARGE TERRITORIES
Ref. Journal: **IZVESTIYA, PHYSICS OF THE SOLID EARTH**, 42-2, 124-131, 2006.

7. Authors: TATEVOSSIAN R., UGALDE A., BATLLO, J. and MACIÀ R.
Title: MACROSEISMIC AND INSTRUMENTAL DATA COMPREHENSIVE ANALYSIS: EARTHQUAKE OF JUNE 2, 1930 IN CATALONIA (SPAIN)
Ref. Journal: **RUSSIAN JOURNAL OF EARTH SCIENCES**, VOL. 8, ES1001, doi:10.2205/2005ES000195, 2006.

8. Authors: UGALDE, A., CARCOLÉ, E. and TRIPATHI, J.N.
Title: SPATIAL DISTRIBUTION OF SCATTERERS IN THE CRUST BY INVERSION ANALYSIS OF CODA ENVELOPES: A CASE STUDY OF GAURIBIDANUR SEISMIC ARRAY
(SOUTHERN INDIA)
Ref. Journal: **GEOPHYSICAL JOURNAL INTERNATIONAL**, 166, 782-794, 2006.

9. Authors: CARCOLÉ, E., UGALDE, A. and VARGAS, C.A.
Title: THREE-DIMENSIONAL SPATIAL DISTRIBUTION OF SCATTERERS IN GALERAS VOLCANO, COLOMBIA
Ref. Journal: **GEOPHYS. RESEARCH LETTERS**, 33, L08307, doi:10.1029/2006GL025751, 2006.

Real Instituto y Observatorio de la Armada (ROA)
Plaza de las Marinas s/n. 11100 San Fernando (Cádiz). España.
Phone: +34 956 599367
Fax: +34 956 599366
E-mail: mdavila@roa.es, pazos@roa.es

1. Targets of the Center:

Seismic Instrumentation and Seismic nets.
Seismicity and Sismotectonics.
Crust and upper mantle structure.

2. Networks under Control and Maintenance:

Western Mediterranean Broad Band network (FDSN code: WM), in collaboration with the Geophysical Department of the ñUniversidad Complutense de Madridò (UCM): 3 stations installed in Southern Spain, 1 station at Balearic islands and 3 stations at Spanish facilities located Northern Africa.
San Fernando Observatory Short Period network (SFS network): 9 short period analogue stations installed Southern Spain, in the vicinities of the Gibraltar Strait.
San Fernando Observatory Long Period Station (SFS station): 3 components LP station installed in a tunnel at San Fernando.

3. Earthquake Catalogues and Documentation:

Monthly: San Fernando Preliminary Bulletin of earthquakes.
Annually: ñAnales de observaciones geofísicas del Real I. y Observatorio de la Armadaò.

4. Current Research Interests:

Upgrading the bandwidth of Short Period sensors.
Extend the BB WM network.
Deployment of Ocean Bottom Seismometers.
Seismicity and Seismotectonics of the Ibero-Maghrebian region.
Crust and upper mantel structure at Brandsfield Strait area (Antarctica) and at Northern Caribbean plate (Dominican Republic-Puerto Rico area).

5. Research Projects:

ñEarthquake monitoring and Earthquake Risk in Western Mediterraneanò. (EERWEM; INCO-CT2005-015107-EERWEM). European Union INCO project.
ñGeociencias en Iberia: estudios integrados de topografía y evolución 4dò (TOPO-IBERIA; CSD2006-00041).
ñEscenarios realistas de riesgo sísmico en Españaò (ERSE: REN2003-05178-C03-02).
Sismómetro de Fondo Marino (ñOcean Bottom Seismometerò, OBS) Isla de Alborán (OBS-ALBORÁN), (RIOA05-23-002).
ñActividad tectónica, deformaciones corticales y nuevas aplicaciones GPS en la evaluación del riesgo Sísmico y de Tsunamis en Españaò (ACOGE_RISTE; CGL2006-10311-C03-02).
ñEstructura y Geodinámica del borde NE de la Placa Caribe, Microplaca de Puerto Rico: Contribución del Real Instituto y Observatorio de la Armadaò (GEOPRICO-ROA; REN2002-12855-E/MAR).

ñRed sísmica semi-permanente de fondo marinoò (RED FOMAR; CGL2005-24194-E).
ñRed temporal de estaciones sísmicas de Banda Ancha: subred ROAò (REN2002-11457-E/RIES).
Actividad Geodinámica en la isla Decepción (GEODEC). Subproyecto Estudio del Complejo Volcánico de I. Decepción y su entorno a partir de técnicas de Geofísica Marina (REN 2000-0551-C03-03 ANT).

6. Collaboration agreements:

MoU among ROA, UCM and GeoforshchungsZentrum (GFZ, Potsdam).
MoU among ROA, UCM and Université Mohammed V (Morocco).
MoU among ROA, UCM and Université dôOran (Algeria).
Agreement of collaboration with the following organizations: OERFEUS, IRIS and CSEM-EMSC.

7. Attendance at International Meetings and Communications:

Title: FOMAR NET: A combined OBS (permanent and temporary) net deployed at Gulf of Cadiz ï Alboran Sea region (Western Mediterranean).
Meeting: Vienna, 02-07 Abril 2006, EGU General Assembly.
Authors: Davila, J.M.; Pazos, A.; Buforn, E.; Udías, A.; Hanka, W.; ROA Seismic group.

Title: Preliminary seismic risk scenarios for Málaga, Spain.
Meeting: San Francisco, 18-22 Abril 2006, 8th U.S. National Conference on Earthquake Engineering.
Authors: Irizarry, J.; Macau, A.; Goded, T.; Clavero, D.; Pazos, A.; Figueras, S.; García, R.; and ERSE Working group.

Title: On land broad band ñWestern Mediterraneanò and ocean bottom ñFOMARò seismic networks.
Meeting: San Fernando, 13-16 Junio 2006, Earthquake monitoring and Earthquake Risk in Western Mediterranean (EERWEM international workshop).
Authors: Martín Davila, J.; Pazos, A.; Buforn, E.; Udías, A.; Hanka, W.; Benzzeghoud, M.; Harnafi, M.; Nadji, A.; Prian, J.; Quijano, J.; Peña, J.A.; Gallego, J.; and Muñoz-Delgado, G.

Title: Ppreliminary seismic risk scenarios for Malaga, Spain.
Meeting: Ginebra, 3-8 Septiembre 2006, First European Conference on Earthquake Engineering and Seismology (ECEES).
Authors: Irizarry, J.; Macau, A.; Goded, T.; Clavero, D.; Pazos, A.; Figueras, S.; Garcia; R.

Title: The OBS FOMAR network.
Meeting: Geneva, 3-8 Septiembre 2006, First European Conference on Earthquake Engineering and Seismology (ECEES).
Authors: Martin Davila, J.; Pazos, A.; Buforn, E.; Udías, A.; Hanka, W.

Title: The Western Mediterranean seismic network.
Meeting: Geneva, 3-8 Septiembre 2006, First European Conference on Earthquake Engineering and Seismology (ECEES).

Authors: Pazos, A.; Davila, J. M.; Buforn, E.; Udías, A.; Hanka, W.; Benzzeghoud, M.; Harnafi, M.; Nadji, A.; Rimi, A.; Momsour, H.

Title: The ERSE PROJECT: preliminary results
Meeting: Vienna, 26 de abril, European Geosciences Union 2005.
Authors: Buforn, E.; Martín Dávila, J.; Susagna, T.; Gárate, J.; Muñoz, D.; del Fresno, C.; Pazos, A. y Macau, A.

Title: ñLa red sísmica VBB ROA/UCM/GFZ y la red GPS del ROAò.
Meeting: Al Hoceima (Marruecos), 24-Febrero-2005, Séisme dôAl Hoceima: bilan et perspectives.
Authors: Martín Davila, J.M.; Pazos, A.; Buforn,E.; Gárate, J.; Hanka, W.;Udías, A.; Heinloo, A.

Title: ñThe ERSE PROJECT: preliminary resultsò.
Meeting: Vienna, 24-Abril-2005, EGU General Assembly.
Authors: Buforn, E.; Martín Davila, J.; Susagna, T.; Goded, T.; Gárate, J.; Muñoz, D.; del Fresno, C.; Pazos, A.; Macau, A.

Title: ñGEOPRICO-DO Project. A new marine geophysical study at north-eastern Caribbean plate boundary zone (Dominican Republic - Puerto Rico - Lesser Antilles)ò.
Meeting: Vienna, 24-Abril-2005, EGU General Assembly.
Authors: Carbó, A.; Geoprico-Do working group.

Title: ñReal Instituto y Observatorio de la Armada en San Fernando. (Royal Naval Institute and Observatory in San Fernando; ROA) Geophysical/Geodetic activitiesò.
Meeting: París, 8-Septiembre-2005, EMSC-ORFEUS anual meeting.
Authors: Davila, J.M.; Gárate, J.; Pazos, A.; Catalán, M.; Buforn, E.; Udías, A.; Hanka, W.

Title: ñUsing the parallel port for data acquisitionò.
Meeting: Vilanova i la Geltrú (Barcelona), 17-Noviembre-2005, MARTECH 05. International Workshop on Marine Technology
Authors: Pazos, A.; Alguacil, G.; Davila, J.M.

Title : ñPermanent + Temporal GPS + Seismic Nets deployed South Spain-North Africa regionò.
Meeting: Potsdam, 12-17 September 2004, XXIX ESC General Assembly.
Authors: Martín Davila, J.; Gárate, J.; Buforn, E.; Pazos, A.; Udías, A.; Hanka, W.; Perez-Peña, A. and García, Carcía..

Title: ñERSE (Realistic Scenarios of Seismic Risk in Spain) projectò.
Meeting: Potsdam, 12-17 September 2004, XXIX ESC General Assembly.
Authors: Buforn, E.; Martín Davila, J.; Goula, X.; Udías, A.; Gárate, J.; Susagna, T.; Muñoz, D.; Pazos, A. and Figueres, S.

Title: ñSeismic Noise at the Broadband Station MELIò.
Meeting: Potsdam, 12-17 September 2004, XXIX ESC General Assembly.
Authors: Pazos, A.; Fichtner, A.; Martin Davila, J.; Buforn, E.; Hanka, W. and Cesca, S.

Title: ñUpper Crustal Seismic Study in Deception Island (Antartica)ò.
Meeting: Potsdam, 12-17 September 2004, XXIX ESC General Assembly.
Authors: Agudo, L. M.; Córdoba, D.; Dávila, J. M. and Pazos, A.

Title: ñAn acquisition system using the parallel portò.
Meeting: Potsdam, 12-17 September 2004, XXIX ESC General Assembly.
Authors: Pazos, A.

Title: ñSeismic Nets deployed by San Fernando Observatory (ROA) in the Ibero-Mahgrebian region (Eurasia-Africa plate boundary), in collaboration with other institutions: UCM (Universidad Complutense de Madrid), GFZ (GeoForschungsZentrum), etc: Present situation and next Futureò.
Meeting: Tortosa, Spain, 29 Sep. ï 01 Oct. 2004, Challenges for Geomagnetism, Aeronomy and Seismology in the XXI century.
Authors: Pazos, A.; Martín Davila, J.; Buforn, E.; Udías, A.; Hanka, W.; Gárate, J.; Prián, J.; Quijano, J.; Peña, J. A. y Muñoz-Delgado, G.

Title: Crustal structure at the Bransfield Strait and Deception Island (Antartica). (EAE 03-A-05510)
Meeting: Nice, France, 7-11 April 2003, EGS-AGU-EUG Joint assembly.
Authors: Agudo, L.M.; Córdoba, D.; Pazos, A.; Davila, J.M..; Catalán, M.; Carbó, A.; Muñoz, A.

Title: TEDESE Project: preliminary results. (EAE 03-A-04289)
Meeting: Nice, France, 7-11 April 2003, EGS-AGU-EUG Joint assembly.
Authors: Buforn,E.; Martín Davila,J.; Bock,G.; Pazos,A.; Udías,A.; Hanka,W.; Gárate,J.; Pérez Peña,A.

Title: The TEDESE Project: first results from Receiver Functions. (EAE 03-A-07545)
Meeting: Nice, France, 7-11 April 2003, EGS-AGU-EUG Joint assembly.
Authors: Li, X.; Hanka, W.; Bock, G.; Buforn, E.; Martín Davila, J.; Pazos, A.; Udías, A.; Kind, R.; Wylegalla, K.

Title: The ROA/UCM/GFZ seismic BB network in the Southern Spain and Northern Africa.
Meeting: Nicosia, Cyprus, 10-13 Sept. 2003, Seismic Analysis and Earthquake Hazard Assesment in the Mediterranean Region (RELMER Workshop).
Authors: Martín Davila, J.; Buforn, E.; Hanka, W.; Pazos, A.; Udías, A.

8. Publications:
Title: ñPreliminary seismic risk scenarios for Malaga, Spainò.
Journal: Proceedings of the 8th U.S. National Conference on Earthquake Engineering, San Francisco. Paper Nº 1638, (2006).
Authors: Irizarry, J.; Macau, A.; Goded, T.; Clavero, D.; Pazos, A.; Figueras, S.; García, R.; and ERSE Working group.

Title: ñOn land broad band ñWestern Mediterraneanò and ocean bottom ñFOMARò seismic networksò.
Journal: Boletín ROA Nº 3, 43-47, (2006).

Authors: Martín Davila, J.; Pazos, A.; Buforn, E.; Udías, A.; Hanka, W.; Benzzeghoud, M.; Harnafi, M.; Nadji, A.; Prián, J.; Quijano, J.; Peña, J.A.; Gallego, J.; and M.-Delgado, G.

Title: ñThe Western Mediterranean seismic networkò.
Journal: Proceedings of the First European Conference on Earthquake Engineering and Seismology, Ginebra. Paper nº 687, (2006).
Authors: Pazos, A.; Davila, J.M.; Buforn, E.; Udías, A.; Hanka, W.; Benzzeghoud, M.; Harnafi, M.; Nadji, A.; Rimi, A.; Momsour, H.

Title: ñLa Geofísica en el Real Instituto y Observatorio de la Armada en San Fernandoò.
Journal: Física de la Tierra, 18, 119-135. Servicio de Publicaciones Universidad Complutense de Madrid (UCM). Madrid, (2006).
Authors: Martín Davila, J.; Gárate Pasquín, J.; Pazos García, A.; y Catalán Morollón, M.

Title: ñSurvey explores active tectonics in North-eastern Caribbeanò.
Journal: EOS, Transactions, American Geophysical Union, **86** (51), 537-540, (2005).
Authors: Carbó, A.; Córdoba, D.; J. Martín Davila; Ten Brink, U.; Herranz, P.; Von Hilldebrandt, C.; Payero, J.; M. Martín, A.; Pazos, A.; Catalán, M.; Granja, J.L. y Gómez, M

Title: ñA Simple Technique to Extend the Bandwidth of Electromagnetic Sensorsò.
Journal: Bulletin of the Seismological Society of America, **95**, 5, 1940-946, (2005).
Authors: Pazos, A.; Alguacil, G.; and Martín Davila, J.

Title: ñUsing the parallel port for data acquisitionò.
Journal: MARTECH05 Workshop. Instrumentation ViewPoint. SARTI. Univ. Polit. Cataluña, Autumn , 59 - 60 (2005).

Title: ñLa medida de la impedancia equivalente como método paramétrico de calibraciónò
Journal: Resúmenes 4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica, 287-288, (2004).
Authors: Pazos, A. y Alguacil, G.

Title: ñUn estudio de sincronismo en campañas marinas de perfiles sísmicos de refracciónò.
Authors: Pazos, A.; Córdoba, D.; Bermúdez, A.; Davila, J.M.; Agudo, L.M.; Zahinos, A.; Carbó, A.; Catalán, M.; and Muñoz, A.
Journal: Resúmenes 4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica, 385-386, (2004).

Title: ñProyecto TEDESE: principales resultadosò.
Authors: Martín Davila, J.; Buforn, E.; Gárate, J.; Pazos, A.; Udías, A.; and Hanka, W.
Journal: Resúmenes 4ª Asamblea Hispano-Portuguesa de Geodesia y Geofísica, 291-292, (2004).

Title: ñEstación Sísmica Digital. Tratamiento digital de señalesò.
Authors: Pazos, A.
Journal: Boletín ROA Nº2/2004, 204 pp (2004).

Title: Non-linear Filter, using the Wavelet Transform, applied to seismological records
Authors: Pazos, A.; Gonzáles, M.J.; Alguacil, G.
Journal: Journal of Seismology, 7, 413-429, (2003)

Title: Sismicidad del Golfo de Cádiz y zonas adyacentes.
Authors: Martín Davila, J.; Pazos, A.
Journal: Física de la Tierra, 15, (2003).

Polytechnic University of Catalonian
Department of Geotechnical Engineering and Geosciences
C/ Jordi Girona 1-3, UPC-Campus Nord. D-2. 08034 Barcelona. Spain
Phone: +34 93 401 72 50
Fax: +34 93 401 72 50
E-mail: luis.pujades@upc.es

1. Areas of research:
Applied Geophysics and Geophysical tomography
Earthquake Engineering

2. Scientific Programs
Main projects in national programs:
Seismic risk: seismological and earthquake engineering aspects.
REN2000-1740-C05-001 RIES. (2000-2003)
Developement and application of advanced procedures to obatin seismic risk scenarios.
REN2001-24184-C04-01 RIES (2001-2004)
Seismic vulnerability study: ciutat vella, Valencia. Documentation and management though a Geografic Information System.
REN2003-07170 RIES (2003-2006)
Riesgo sísmico para pueblos y ciudades de España y estructura inelástica mediterránea.
CGL-2004-22325-E (2005-2006).
Contribuciones avanzadas para la evaluación del peligro y el riesgo sísmico en regiones y ciudades de España.
CGL-2005-04541-C03-02/BTE (2005-2008)
Main projects in european programs
An advanced approach to earthquake risk scenarios with applications to different European towns (RISK-UE).
EESD-ENV-99-2 (JO 1999/C330/10).
Seismic Resistance of Cultural Heritage Buildings.
ALA/95/23/2003/077-122 (2004-2006)

3. **Publications:**

2006

Pujades L.G., Roca A., Oliveira C.S. and S. Safina (2006). Response of Hospital Systems. Capter 12 in: Assessing and Managing Earthquake Risk. Editors: Oliveira C.S., Roca A. and X. Goula Ed. Springer. Dordrecht. The Netherlands. pp. 261-286.

ISBN: 10: 1-4020-3524-1 (HB). 13: 978-1-4020-3524-1 (HB). 10:1-4020-3608-6 (e_book) 13: 978-1-4020-3608-8 (e_book).

Barbat A.H., Lagomarsino S., and L.G. Pujades (2006). Vulnerability assessment of dwelling buildings. Capter 6 in: Assessing and Managing Earthquake Risk. Editors: Oliveira C.S., Roca A. and X. Goula Ed. Springer. Dordrecht. The Netherlands. pp. 115-134.

ISBN: 10: 1-4020-3524-1 (HB). 13: 978-1-4020-3524-1 (HB). 10:1-4020-3608-6 (e_book) 13: 978-1-4020-3608-8 (e_book).

Susagna T., Goula X., Roca A., Pujades L.G. and N. Gasulla (2006) Loss scenarios for regional emer¬gency plans: application to Catalonia, Spain. Chapter 22 in: Assessing and Managing Earthquake Risk. Editors: Oliveira C.S., Roca A. and X. Goula. Ed. Springer. Dordrecht. The Netherlands. pp. 463-478.

ISBN: 10: 1-4020-3524-1 (HB). 13: 978-1-4020-3524-1 (HB). 10:1-4020-3608-6 (e_book) 13: 978-1-4020-3608-8 (e_book).

X. Lana, M.D. Martinez, A. Burgueño, C. Serra, J. Martin-Vide, L. Gomez. (2006). Distributions of long dry spells in the Iberian Peninsula, years 1951-1990. *International Journal Of Climatology* , **26**, 1999-2021. ISSN: 0899-8418.

C. Serra, A. Burgueño, M.D. Martinez, X. Lana. (2006). Trends in dry spells across Catalonia (NE Spain) during the second half of the 20th century. Theoretical And Applied Climatology , **85**, 165-183. ISSN: 0177-798X.

R. Franklin, J.O.Caselles, J.A.Canas, J.Clapes i Ll.G. Pujades. (2006). Estimación de la respuesta de sitio mediante el método del cociente espectral aplicado a ruido ambiental: aplicación a la Ciutat Vella de Valencia. Revista internacional de métodos numéricos para cálculo y diseño en ingeniería , **22 (2)** : 169-191. ISSN: 0213-1315.

Barbat, A.H., Pujades L.G. and N. Lantada. (2006). Performance of buildings under earthquake in Barcelona, Spain. *Computer-Aided Civil And Infrastructure Engineering* , **21**: 573-593. ISSN: 1093-9687.

Bonett R.L., Barbat A., Pujades L.G., Lagomarsino S. and A. Penna. (2006). Performance assessment for unreinforced masonry buildings in low seismic hazard areas. *Revista Ingenierias* , **5 (8)** : 105-119. ISSN: 1692-3324.

X. Lana, A. Burgueño, M.D. Martinez, C. Serra. (2006). Statistical distributions and sampling strategies for the analysis of extreme dry spells in Catalonia (NE Spain). *Journal Of Hydrology* , **324** ( ) : 94-114. ISSN: 0022-1694.

2005

A. H. Barbat, S. Oller, L. G. Pujades. (2005). Conceptos de vulnerabilidad y ductilidad en el proyecto sismorresistente de edificios. *Hormigón y acero* , **238** ( ) : 61-73. ISSN: 0439-5689.

M.D. Martínez, X. Lana, O. Caselles, J.A. Canas, L. Pujades. (2005). Elastic-anelastic regional structures for the Iberian Peninsula obtained from a Rayleigh wave tomography and a causal uncoupled inversion. *Pure And Applied Geophysics* , **162 (12)** : 2321-2353. ISSN: 0033-4553.

Safina S., Pujades L.G. y A. Roca. (2005). Respuesta del sistema regional de hospitals en la atención de una emergencia.. *Boletin Técnico IMME. Instituto de Materiales y Modelos Estructurales* , **43 (3)** : 58-70. ISSN: 0376-723X .

X. Lana, M.D. Martínez, C. Serra, A. Burgueño. (2005). Periodicities and irregularities of indices describing the daily pluviometric regime of the Fabra Observatory (NE Spain) for the years 1917-1999. *Theoretical And Applied Climatology* , **82 (3-4)** : 183-198. ISSN: 0177-798X .

A. Burgueño, M.D. Martinez, X. Lana, C. Serra. (2005). Statistical distribution of the daily rainfall regime in Catalonia (northeastern Spain) for the years 1950-2000. *International Journal Of Climatology* , **25** ( ) : 1381-1403. ISSN: 0899-8418.

X. Lana, M.D. Martinez, A.M. Posadas, J.A. Canas. (2005). Fractal behaviour of the seismicity in the Southern Iberian Peninsula. *Nonlinear Processes In Geophysics* , **12** ( ) : 353-361. ISSN: 1023-5809.

M.D. Martinez, X. Lana, A.M. Posades, L. Pujades. (2005). Statistical distribution of elapsed times and distances of seismic events: the case of the Southern Spain seismic catalogue. *Nonlinear Processes In Geophysics* , **12** ( ) : 235-244. ISSN: 1023-5809.

2004

R. Moreno, A. H. Barbat, L. Pujades. (2004). Seismic fragility curves for framed buildings with flat beams. *Intersections/Intersectii* , **1 (4)** : 36-43. ISSN: 1582-3024.

R. Bonett, A. H. Barbat, L. Pujades. (2004). Seismic fragility curves for traditional unreinforced masonry buildings of Barcelona, Spain. *Intersections/Intersectii* , **1 (4)** : 3-11. ISSN: 1582-3024.

A. Benavent-Climent, H. Akiyama, F. López-Almansa, L.G. Pujades. (2004). Prediction of ultimate earthquake resistance of gravity-load designed RC buildings. *Engineering Structures* , **26** ( ) : 1103-1113. ISSN: 0141-0296.

Ll. Torres, F. López-Almansa, L.M. Bozzo. (2004). Tension-stiffening model for cracked flexural concrete members. *Journal Of Structural Engineering-Asce* , **130** ( ) : 1242-1251. ISSN: 0733-9445.

J.O.Caselles, J.Clapés, R.Osorio, LL.G.Pujades, J.A.Canas, V.Pérez Gracia. (2004). Detección de galerías de agua en Barcelona. *Geotemas* , **6 (3)** : 221-224. ISSN: 1576-5172.

Moreno González, R; Bairán, J.M.; Pujades, L.; Aparicio, A.C. Barbat, A. (2004). Evaluación probabilista del comportamiento sísmico de edificios porticados de hormigón armado. *Hormigón Y Acero* , **232** : 125-136. ISSN: 0439-5689.

X. Lana, M.D. Martinez, C. Serra and A. Burgueño. (2004). Spatial and temporal variability of the daily rainfall regime in Catalonia (Northeaster Spain), 1950-2000 . *International Journal Of Climatology* , **24 (5)** : 613-641. ISSN: 0899-8418.

A. Burgueño, C. Serra and X. Lana. (2004). Monthly and annual statistical distributions of daily rainfall at the Fabra Observatory (Barcelona, NE Spain) for the years 1917-1999. *Theoretical And Applied Climatology* , **77 (1-2)** : 57-75. ISSN: 0177-798X .

Carlos A. Vargas, Arantza Ugalde, Lluís G. Pujades, José A. Canas. (2004). Spatial variation of coda wave attenuation in northwestern Colombia. *Geophysical Journal International* , **158** : 609-624. ISSN: 0956-540X.

Fortunato Espinoza Barreras; Ulises Mena Hernandez; Jose A. Canas Torres; Lluis Pujades Beneit, Oriol Caselles. (2004). Estimación de algunas propiedades dinámicas de los edificios de barcelona, españa, utilizando sig. *Revista Internacional de Ingenieria de Estructuras* , **9 (1)** : 19-29. ISSN: 1390-0315.

2003

González-Drigo, R., Pujades L.G., Caselles O., Canas J.A. y M.V. Pérez-Gracia.. (2003). Distribución de Q de coda y análisis de la atenuación sísmica intrínseca y dispersiva en la Península Ibérica. *Rev. Inter.. de métodos numéricos para cálculo y diseño en ingeniería*, **19 (2)** : 211-237. ISSN: 0213-1315.

Ll. Torres, X. Cahís, F. López Almansa, L.M. Bozzo. (2003). Modelo de comportamiento en servicio para estructuras reticulares de hormigón. Parte I:

Descripción del modelo y ejemplos de aplicación. *Hormigón y Acero* , **227** ( ) : 43-53. ISSN: 0439-5689.

Ll. Torres, X. Cahís, F. López Almansa, L.M. Bozzo. (2003). Modelo de comportamiento en servicio para estructuras reticulares de hormigón. Parte II: Diagrama tensión - deformación para elementos fisurados a flexión. *Hormigón y Acero* , **227** ( ) : 55-65. ISSN: 0439-5689.

Vargas C.A., Pujades L.G., Ugalde A., Canas J.A.. (2003). Tomografía sísmica local en el territorio Colombiano. *Revista internacional de métodos numéricos para cálculo y diseño en ingeniería* , **19 (3)** : 255-278. ISSN: 0213-1315.

Bonett R., Penna A., Lagomarsino S., Barbat A.; Pujades L.G. Moreo R.. (2003). Evaluación de la vulnerabilidad sísmica de estructuras de mampostería no reforzada. Aplicación a un edificio de la zona del Eixample en Barcelona (España).. *Revista Internacional de Ingenieria de Estructuras* , **8 (2)** : 91-120. ISSN: 1390-0315.

Ll.Torres, F. López Almansa, X. Cahís, L.M. Bozzo. (2003). A numerical model for sequential construction, repairing and strengthening of 2-D concrete frames. *Engineering Structures* , **25 (4)** : 323-336. ISSN: 0141-0296.

X. Lana, C. Serra, A. Burgueño. (2003). Trends affecting pluviometric indices at the Fabra Observatory (Barcelona, NE Spain) from 1917 to 1999. *International Journal Of Climatology* , **23** ( ) : 315-332. ISSN: 0899-8418.

University of Jaén
Department of Physics
Campus de Las Lagunillas, s/n, Building A3, 23071-Jaén
Phone: 34 953212442
Fax: 34 953212838
E-mail: japelaez@ujaen.es

Current research interests:

Seismic hazard assessment, seismotectonics, strong ground motion and earthquake engineering.

Research Projects:

- Earthquakes and crustal deformation in Southern Spain. Application to seismic risk.
Institution: D.G.E.S.I.C. (REN2000-0777-C02-01 RIES)
Dates: 2000-2003
Main researcher: Elisa Buforn (UCM)
Researcher: José A. Peláez

- Seismicity and active tectonic in the western Betic Cordillera. Application to the reduction of geological risks.
Institution: D.G.I.-M.E.C. (CGL2004-01636/BTE)
Dates: 2004-2007
Main researcher: C. López Casado (University of Granada)
Researcher: José A. Peláez

- Seismic hazard assessment in Northern Morocco. Attainment of a seismic catalog and compilation and analysis of seismotectonic information.
Institution: A.E.C.I.-M.A.E.C. (A/3802/05)
Dates: 2006-2007
Main researcher: José A. Peláez

Attendance at International Meetings and Communications:

- Hamdache, M., Peláez, J.A. and López Casado, C. (2003). Probabilistic seismic hazard assessment in northern Algeria, using spatially-smoothed seismicity. Part I: seismic hazard maps in terms of PGA. *XXIII General Assembly of the International Union of Geodesy and Geophysics*. 30 June - 11 July, Sapporo (Japan), 2003.

- Hamdache, M., Peláez, J.A. and López Casado, C. (2003). Probabilistic seismic hazard assessment in northern Algeria, using spatially-smoothed seismicity. Part II: spectral acceleration and uniform hazard spectra. XXIII General Assembly of the International Union of Geodesy and Geophysics. 30 June - 11 July, Sapporo (Japan), 2003.

- Hamdache, M., Peláez, J.A. and López Casado, C. (2003). New probabilistic seismic hazard map in terms of PGA for Northern Algeria. *Colloque International. Risque, vulnérabilité & fiabilité dans la construction. Vers une réduction des désastres. Session spéciale: séisme de Boumerdès du 21 mai 2003*. 11-12 October, Alger (Algeria), 2003.

- Peláez, J.A., Hamdache, M. and López Casado, C. (2004). Reappraisal of seismic hazard in northern Algeria considering the 21 may 2003 Algiers earthquake. *IV*

Asamblea Hispano-Portuguesa de Geodesia y Geofísica. 3-7 February, Figueira da Foz (Portugal), 2004.

- Peláez, J.A., Delgado, J. and López Casado, C. (2004). Seismic hazard in Southeastern Spain in terms of Arias intensity. *IV Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. 3-7 February, Figueira da Foz (Portugal), 2004.

- Peláez, J.A., Gil, A.J., Álvarez, J., López, D., Núñez, E., Rodríguez, A. and Rodríguez, G. (2004). Two checking astrogeodetic geoid profiles in southern Spain. *IV Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. 3-7 February, Figueira da Foz (Portugal), 2004.

- López Casado, C., Peláez, J.A., Rubio, A. and Henares, J. (2004). Phase-shifts observed in the correction process of the El Salvador (Mw 7.6) earthquake accelerograms of January 13, 2001 using causal filters. *IV Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. 3-7 February, Figueira da Foz (Portugal), 2004.

- Henares, J., López Casado, C., Martínez, F. and Peláez, J.A. (2004). Temporal multifractal analysis in the Betic Cordillera. *IV Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. 3-7 February, Figueira da Foz (Portugal), 2004.

- Henares, J., López Casado, C., Martínez, F. and Peláez, J.A. (2004). Fractal analysis of faults and seismicity in the Betic Cordillera. IV Asamblea Hispano-Portuguesa de Geodesia y Geofísica. 3-7 February, Figueira da Foz (Portugal), 2004.

- Hamdache, M., Peláez, J.A., Bellalem, F. and Talbi, A. (2004). Seismic hazard assessment and design spectra for the Algiers region (Algeria) after the earthquake of May 21, 2003. *European Geosciences Union. General Assembly 2004*. 25-30 April, Niza (France), 2004.

- Talbi, A., Hamdache, M., Bellalem, F. and Peláez, J.A. (2004). Probabilistic seismic hazard curves in terms of peak ground acceleration at the Algiers (Algeria) city using the simulation approach. *European Geosciences Union. General Assembly 2004*. 25-30 April, Niza (France), 2004.

- Peláez, J.A., Delgado-García, J., Antón, C. and López Casado, C. (2005). Economic losses for a current 1755 seismic scenario. *International Workshop. 250th Anniversary of the 1755 Lisbon Earthquake*. 1-3 November, Lisbon (Portugal), 2005.

- Peláez, J.A., López Casado, C. and Henares, J. (2005). Contribution of the distant seismicity to the seismic hazard values in Portugal. *International Workshop. 250th Anniversary of the 1755 Lisbon Earthquake*. 1-3 November, Lisbon (Portugal), 2005.

- López Casado, C., Peláez, J.A. and Henares, J. (2005). Site response using both subduction and volcanic chain earthquakes. The 2001 El Salvador seismic crisis. *International Workshop*. *250th Anniversary of the 1755 Lisbon Earthquake*. 1-3 November, Lisbon (Portugal), 2005.

- López Casado, C., Peláez, J.A. and Henares, J. (2006). On the computation of spectral ratios for site effect assessments. *V Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. 30 January - 3 February, Sevilla (Spain), 2006.

- Peláez, J.A., Castillo, J.C., Sánchez Gómez, M., Martínez Solares, J.M. and López Casado, C. (2006). The 1170 Andújar, Jaén, earthquake. A critical review. *V Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. 30 January - 3 February, Sevilla (Spain), 2006.

- Peláez, J.A., Gil, A.J., Sanz de Galdeano, C., Martínez Solares, J.M., and Galindo Zaldívar, J. (2006). A plausible ógeodetic scenarioô for the 1884 Arenas del Rey earthquake. *V Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. 30 January - 3 February, Sevilla (Spain), 2006.

- Peláez, J.A., Hamdache, M. and López Casado, C. (2006). Uniform hazard spectra and spectral acceleration maps in Northern Algeria. *V Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. 30 January - 3 February, Sevilla (Spain), 2006.

- Peláez, J.A., Hamdache, M. and López Casado, C. (2006). Strong ground motion in the 21 May 2003 Algiers, Algeria, earthquake. *V Asamblea Hispano-Portuguesa de Geodesia y Geofísica*. 30 January - 3 February, Sevilla (Spain), 2006.

- López Casado, C., Badal, J. and Peláez, J.A. (2006). Site effects from subduction and volcanic chain earthquakes occurred in El Salvador. *Third International Symposium on "The Effects of Surface Geology on Seismic Motion"*. 30 August - 1 September, Grenoble (France), 2006.

- Hamdache, M., Peláez, J.A. and López Casado, C. (2006). Seismic hazard spectral acceleration maps and uniform hazard spectra in Northern Algeria. *Un Seminaire International sur les Geosciences au Service du Developpment Durable*. 26-28 November, Tebessa (Algeria), 2006.

Intenational Publications:

- Henares, J., López Casado, C., Sanz de Galdeano, C., Delgado, J. and Peláez, J.A. (2003). Stress fields in the Iberian-Maghrebi region. *Journal of Seismology* **7**, 65-78.

- Sanz de Galdeano, C., Peláez, J.A. and López Casado, C. (2003). Seismic potential of the main active faults in the Granada Basin (southern Spain). *Pure and Applied Geophysics* **160**, 1537-1556.

- Peláez, J.A., Sanz de Galdeano, C. and López Casado, C. (2003). Use of active fault data versus seismicity data in the evaluation of seismic hazard in the Granada basin (Southern Spain). *Bulletin of the Seismological Society of America* **93**, 1670-1678.

- Peláez, J.A., Hamdache, M. and López Casado, C. (2003). Seismic hazard in Northern Algeria using spatially smoothed seismicity. Results for peak ground acceleration. *Tectonophysics* **372**, 105-119.

- Hamdache, M., Peláez, J.A. and Yelles-Chauche, A.K. (2004). The Algiers, Algeria earthquake (Mw 6.8) of 21 may 2003: Preliminary report. *Seismological Research Letters* **75**, 360-367.

- Peláez, J.A. and Hamdache, M. (2004). Comment on the paper ñEarthquake Hazard Assessment in the Oran Region (Northwest Algeria)ò by Youcef Bouhadad and Nasser Laouami. *Natural Hazards* **32**, 155-159.

- Hamdache, M., Peláez, J.A. and López Casado, C. (2004). Contribution of the Algiers earthquake (Mw 6.8) of May 21, 2003 to the probabilistic seismic hazard values in Northern Algeria *in* Earthquake Hazard, Risk and Strong Ground Motion (Chen, Y.T., Panza, G.F. and Wu, Z.L., Ed.), *Seismological Press*, 65-75.

- Peláez, J.A., Hamdache, M. and López Casado, C. (2005). An updating of the probabilistic seismic hazard in Northern Algeria including the 21 May 2003 M 6.8 Algiers earthquake. *Pure and Applied Geophysics* **162**, 2163-2177.

- Peláez, J.A., Delgado, J. and López Casado, C. (2005). A preliminary probabilistic seismic hazard assessment in terms of Arias Intensity in southeastern Spain. *Engineering Geology* **77**, 139-151.

- Peláez, J.A., Hamdache, M. and López Casado, C. (2006). Seismic hazard in terms of spectral accelerations and uniform hazard spectra in Northern Algeria. *Pure and Applied Geophysics* **163**, 119-135.

University of Almeria
Group of Applied Geophysics
Head of Team: Dr. Francisco Luzón
Tlf. +34 950015106
FAX: +34 950015477
e-mail: fluzon@ual.es

International meetings

- 28th General Assembly of the European Geophysical Society, (april 2003) Nice, (France).

- XXIII General Assembly of the International Union of Geodesy and Geophysics, Sapporo (Japan) 2003, IUGG International Union of Geodesy and Geophysics.

- 4th International Conference on Boundary Element Techniques. 15-17 July 2003, University of Granada, Spain

- 29th General Assembly of the European Geophysical Society, 6-11 april 2004, Nice (France).

- XXIX General Assembly, European Seismological Commission, Potsdam, Germany, 12-17, September, 2004.

- Internacional Conference on Computational & Experimental Engineering and Sciences. Madeira. Portugal. 26-29 july. 2004.

- International Workshop Challenges for Geomagnetism, Aeronomy and Seismology in the XXI Century, Tortosa/Roquetes (España) 2004.

- American Geophysical Union 2004 Fall Meeting, December 13-17, 2004, San Francisco, California.

- *European Geosciences Union General Assembly* (april 2005) Viena, (Austria).

- VI Workshop meeting on seismic waves in laterally inhomogeneous media. Praga (Rep. Checa). 20-25 de junio. 2005

- American Geophysical Union 2005 Fall Meeting, December 13-17, 2004, San Francisco, California

- CGU Anual Meeting, Banff (Canada) 2005, Canadian Geophysical Union.

- *European Geosciences Union General Assembly* (2-7 abril de 2006) Viena, (Austria).

- *8th U.S. National Conference on Earthquake Engineering. 100th Anniversary Earthquake Conference*, (18-22 Abril 2006), San Francisco, (EEUU).

- *20 Years of Nonlinear Dynamics in Geosciences*, (11-16 de junio de 2006). Organizado por la American Meteorological Society y EGU. Rodas (Grecia)

- *30th General Assembly of the European Seismological Commission (ESC): 1st ECEES (ESC-EAEE)*,(4-6 de Septiembre 2006), Ginebra.

- *7th International Conference on Boundary Element Techniques*, (4-6 de Septiembre 2006) París.

-*9th Granada Seminar Computational and Statistical Physics*. (11-15 de septiembre de 2006) Granada.

- *12th Japan Earthquake Engineering Symposium* (3-5 Noviembre 2006). Tokio, (Japón).

- *Americal Geophysical Union Fall Meeting*, (11-15 de diciembre 2006) San Francisco (EEUU).

Internacional Publications

- F. Luzón, L. Ramírez, F. J. Sánchez-Sesma and A. Posadas (2003). Propagation of SH elastic waves in deep Sedimentary Basins with an Oblique Velocity Gradient (2003), *Wave Motion*, Vol. 38 (1), pp.11-23.

- Chourak M., Corchete V., Badal J., Serón F. J. and Soria F., 2003. *Imaging of the Near-Surface Shear-Wave Velocity Structure of the Granada Basin (Southern Spain), Bull. Seism. Soc. Am.*, 93, No. 1, 430-442.

- F. Arqueros, A. Jiménez, and A. Valverde (2003). A novel procedure for the optical characterization of solar concentrators, *Solar Energy*, 75, 135ï 142.

- F. Luzón, S. A. Gil-Zepeda, F. J. Sánchez-Sesma and C. Ortiz-Alemán (2004). 3D Simulation of the ground motion in the Zafarraya basin (Southern Spain) under incident plane waves. (2004), *Geophys. J. Int*., 156, 584-594.
- F. Luzón, L. Ramírez, F. J. Sánchez-Sesma and A. Posadas (2004). Simulation of the seismic response of sedimentary basins with vertical constant-gradient of velocity (2004), *Pure and Applied Geophysics*, Vol. 12, 1533-1547.

- Z. Al yuncha, F. Luzón, A. Posadas and G. Alguacil (2004). The use of ambient noise measurements for the estimation of surface soil effects: thecase of the city of Motril, southern Spain (2004), *Pure and Applied Geophysics*, Vol. 12, 1549-1559.

- J. Almendros, F. Luzón, and A. Posadas (2005). Microtremor analyses at Teide Volcano (Canary Islands,Spain): Assessment of natural frequencies of vibration using time-dependent horizontal-to-vertical spectral ratios. (2004), *Pure and Applied Geophysics*, Vol. 12, 1579-1596.

- Chourak M., Corchete V., Badal J., F. Gómez and Serón F. J., 2005. *Shallow seismic velocity structure of the Betic Cordillera (southern Spain) from modelling of Rayleigh wave dispersion. Surveys in Geophysics*, 26, 481-504.

- Corchete V., Chourak M. and Khattach D., 2005. *The high-resolution gravimetric geoid of Iberia: IGG2005*, *Geophys. J. Int.*, 162, 676ï 684.

- J. M. García, M. D. Romacho and A. Jiménez (2004). Determination of near-surface attenuation, with κ parameter, to obtain the seismic moment, stress drop, source dimension and seismic energy for microearthquakes in the Granada Basin (Southern Spain), *Phys. Earth Planet. Inter*., 141, 1, 9-26.

- A. Jiménez, A. M. Posadas, T. Hirata and J. M. García (2004). Probabilistic seismic hazard maps from seismicity patterns analysis: the Iberian Peninsula case, *Nat. Hazards Earth Syst. Sci*., 4, 407-416.

- A. Rodríguez-Castellanos, F. Luzón, and F.J. Sánchez-Sesma (2005). Diffraction of seismic waves in an elastic, cracked halfplane using a boundary integral formulation. (2005).. *Soil Dynamics and Earthquake Engineering*, Vol. 25, 827ï 837.

- F.J. Chávez-García and F. Luzón (2005). On the correlation of seismic microtremors. (2005), *J. Geophys. Res*., Vol. 110, No. B11, B11313, doi: 10.1029 /2005JB003671

- J.A. Pérez-Ruiz and F. Luzón (2005). Simulation of an Irregular Free Surface with a Displacement Finite-Difference Scheme. (2005). *Bull. Seism. Soc. Am*., 95, (6), 2216-2231.

- A. Jiménez, J. M. García and M. D. Romacho (2005). Simultaneous inversion of source parameters and attenuation factor using genetic algorithms, *Bull. Seism. Soc. Am*., 95, 1401-1411.

- A. Jiménez, A. M. Posadas and J. M. Marfil (2005). A probabilistic seismic hazard model based on cellular automata and information theory, *Nonlinear Processes in Geophysics*, 12, 381-396.

- M. Charco, J. Fernández, F. Luzón, and J.B. Rundle (2006). On the relative importance of self-gravitation and elasticity in modeling volcanic ground deformation and gravity changes, *J. Geophys. Res.*, 111, B03404, doi:10.1029/2005JB003754.

- García-Jerez A., F. Luzón, M. Navarro, A. Pérez-Ruiz (2006). Characterization of the sedimentary cover at the Zafarraya Basin (Southern Spain) by means of ambient noise. *Bull. Seism. Soc. Am*., 96, 957-967.

- A. Jiménez, K F. Tiampo, S. Levin and A. M. Posadas (2006). Testing the persistence in earthquake catalogs: the Iberian Peninsula, *Europhys. Lett*., 73 (2), 171-177.

- Corchete V., Flores D. and Oviedo F., 2006. The first high-resolution gravimetric geoid for the Bolivian tableland: BOLGEO, *Phys. Earth Planet. Inter.*, 157, 250-256.

- A. Jiménez and A. M. Posadas (2006). A Mooreôs cellular automaton model to get probabilistic seismic hazard maps for different magnitude releases: a case study for Greece, *Tectonophysics*, 423, 35-42.

- A. Rodríguez-Castellanos, F. J. Sánchez-Sesma, F. Luzón, and R. Martin (2006). Multiple scattering by near-free-surface discontinuities: an indirect boundary element method, *Bull. Seism. Soc. Am.,* 96, 1359-1374.

- F.J. Sánchez-Sesma, J.A. Pérez-Ruiz, M. Campillo and F. Luzón (2006). The elastodynamic 2D Green function retrieval from cross-correlation: The canonical inclusion problem, *Geophys. Res. Lett*., 33, L13305, doi:10.1029/2006GL026454.

SPANISH NATIONAL COMMITTEE OF GEODESY AND GEOPHYSICS

NATIONAL REPORT 2003-2006

Presented to the
XXIV General Assembly of the
International Union of Geodesy and Geophysics
Perugia, Italy

IAVCEI Section

UNIVERSITY OF LA LAGUNA, TENERIFE

DEPARTMENTO DE EDAFOLOGÍA Y GEOLOGÍA

Working group: Submarine growth and emersion of Canary islands: the geological study of the Basal Complexes.

Members of the working group:

Ramón Casillas Ruiz, Lecturer at the University of La Laguna.
Agustina Ahijado Quintillán, Lecturer at the University of La Laguna .
Julio De la Nuez Pestana, Lecturer at the University of La Laguna .
Carolina Castillo Ruiz, Lecturer at the University of La Laguna .
Candelaria Martín Luis Lecturer at the University of La Laguna .
Carlos Fernández Rodríguez, Lecturer at the University of Huelva .
Encarnación García Navarro, Lecturer at the University of Huelva.
Juan Ramón Colmenero Navarro, Professor at the University of Salamanca
Domingo Gimeno Torrente, Lecturer at the University of Barcelona.
Attila Demeny, Researcher at the Hungarian Academy of Sciences.
Geza Nagy, Researcher at the Hungarian Academy of Sciences.
Peter Sipos, Researcher of the Hungarian Academy of Sciences.
Kadosa Balogh Scientific, Researcher of the Hungarian Academy of Sciences.

Research interests:

1,2,3,5,10,18 Mineralogy and petrology, geochemistry, radioactive isotopes and geochronology, stable isotopes, volcanism and tectonic setting, other.

Scientific programme for the period 2003-2006:

The scientific programme during this period has been to establish a model that allows to understand the relationship among construction processes (mainly magmatism), the stress state affecting the volcanic edifices (greatly conditioned by the weight of these edifices) and sudden destruction events such as giant gravitational landslides during the early submarine building and emersion of the Canary Islands through the study of the rocks of the Basal Complexes outcropping in three Islands: Fuerteventura, La Gomera and La Palma, and, probably, in Tenerife Island.

Petrological and geochemical features of the submarine and early subaerial volcanic rocks, as well as their cogenetic plutonic and subvolcanic complexes have been studied. A sedimentological, palaeontological and biostratigraphic (macro and microfauna) characterization of the interbedded sediments in the submarine stage have been carried out. On the other hand, the analysis of the distribution, geometry and structural features of the volcanic edifices have been also carried out.

List of publications

Demény, A., Vennemann, T.W., Ahijado, A., Casillas, R., Nagy, G., Homonnay, Z., Gutiérrez, M., Szabó, CS., 2004. H, O , Sr and Nd isotopic evidence for

recycled oceanic crust in submarine alkaline basalts of Fuerteventura, Canary Islands, Spain. Chemical Geology 205, 37-5

Demény, A., Vennemann, T.W., Ahijado, A., Casillas, R., 2004. Oxygen isotope thermometry in carbonatites, Fuerteventura, Canary Islands . Mineralogy and Petrology, 80, 155-172

Ahijado, A., Casillas, R., Nagy, G., Fernández, C., 2005. Sr-rich minerals in a carbonatite skarn, Fuerteventura, Canary Islands (Spain). Mineralogy and Petrology, 84, 107-127.

Gutierrez M., Casillas, R., Fernández, C., Balogh, K., Ahijado A, Castillo, C., Colmenero, J.R., García-Navarro, E. 2006. The submarine volcanic succession of the basal complex of Fuerteventura, Canary Islands: a model of submarine growth and emergence of tectonic volcanic islands. Geological Society of America Bulletin, 118(7-8), 785-804.

Fernández C., Casillas, R., García-Navarro, E., Gutiérrez, M., Camacho, M., Ahijado, A. 2006. Miocene rifting of Fuerteventura (Canary Islands), Tectonics, 25(6),

---

SPANISH NATIONAL RESEARCH COUNCIL (CSIC)

NATIONAL MUSEUM OF NATURAL HISTORY, MADRID

Working group: Intraplate volcanism

Members of the working group:
José López-Ruiz, Professor
José María Cebriá Gómez, Tenured Scientist
Miguel de las Doblas Lavigne, Tenured Scientist
Carlos Martín Escorza, Tenured Scientist

***Research interests*:** Mineralogy and petrology, geochemistry, volcanism and tectonic setting.

Scientific programme for the period 2003-2006: Geochemistry and geodynamic implications of the Messejana-Plasencia megadyke (MPD); Basic magmatism within the Variscan Belt of Spain and France; Synthesis of the volcanism in the Neogene Volcanic Province of SE Spain (NVPSE).
The MPD belongs to the so-called Central Atlantic Magmatic Province (CAMP). Geochemical modelling suggests that most magmas in this province derive from enriched lithopheric mantle sources. In the case of the MPD, the primitive magmas assimilated < 10% of felsic granulites from the lower crust. The radial distribution of the MPD along other CAMP dykes, suggest that their origin is related to the impingment of the mantle plume responsible for the opening of the Central Atlantic.
The geochemical signature of the Permo-Carboniferous basic rocks of Spain and France reveals the heterogeneity of the mantle sources involved, as well as the participation of assimilation coupled to fractional crystallization processes prior to their extrusion.

Concerning the NVPSE, the petrology and geochemistry of the magmatic rocks has been compiled and integrated into a new geodynamic model involving two main tectonomagmatic stages.

Publications

J.M. Cebriá, J. López-Ruiz, M. Doblas, L.T. Martin y J. Munhá. Geochemistry of the Early Jurassic Messejana-Plasencia dyke. Implications on the Central Atlantic Magmatic Province. *Journal of Petrology*, 44, 547-568 (2003).

G. Perini, J.M. Cebriá, J. López-Ruiz y M. Doblas. Carboniferous-Permian mafic magmatism in the Variscan belt of Spain and France: Implications on mantle sources. In: *Permo-Carboniferous magmatism and rifting in Europe* (M.. Wilson, E.-R. Neumann, G. Davies, M. Timmerman, M. Heeremans y B.T. Larsen, Eds.). Geological Society of London, Special Public. 223, 415-438 (2004).

J. López-Ruiz, J.M. Cebriá, M. Doblas y R. Benito. La región volcánica de Almería ï Murcia. En: *Geología de España* (J.A. Vera, Ed.), Sociedad Geológica de España ï Instituto Geológico y Minero de España, Madrid, 678-682 (2004).

NATIONAL MUSEUM OF NATURAL HISTORY, MADRID

Working group: Active Volcanism

Members of the working group:

Ramon Ortiz, Professor
Alicia García, Tenure Scientist
Nieves Sanchez, post-doctoral researcher
Marta Tarraga, Post-graduate fellowship
Jose. M. Marrero, Post-graduate fellowship

***Research interests*:** Volcanic hazards, geophysical structural studies, physical modelling of volcanic processes.

Scientific programme for the period 2003-2006: Geophysical surveillance of active volcanoes: Teide, Geophysical structural studies of the Canary Islands, Instrumental & software development for volcano monitoring, and Theory of precursors of volcano activity

List of publications:

Blanco-Montenegro, I.; G. Montesinos, F.; García A.; Vieira, R.; Villalaín, J. J. 2005. Paleomagnetic determinations on Lanzarote from magnetic and gravity anomalies: Implications for the early history of the Canary Islands. *Journal of Geophysical Research*, USA, 110: B12102-B12111

Carniel,R., Barazza, F., Tárraga, M., Ortiz, R. 2006. On the singular values decoupling in the Singular Spectrum Analysis of volcanic tremor at Stromboli. *Natural Hazards and Earth System Sciences*, Vol. 6: 903-909.

Carniel, R., Ortiz, R., Di Cecca, M., 2006. Spectral and dynamical hints on the timescale of preparation of the 5 April 2003 explosion at Stromboli volcano. *Canadian Journal of Earth Sciences*,43: 41-55.

Carniel, R.; Tárraga, M. 2006. Can tectonic events change volcanic tremor at Stromboli?. *Geophysical Research Letters.,* 33, L20321, doi:10.1029/2006GL027690.

Del Pin, E., Carniel, R., Tárraga, M. 2006. Event recognition by Detrended Fluctuation Analysis: an application to Teide - Pico Viejo volcanic complex, Tenerife, Spain. *Chaos Solitons and Fractals, Elsevier,* doi:10.1016/j.chaos.2006.07.044.

García, A., Vila, J., Ortiz, R., Macia, R., Sleeman, R., Marrero, J.M., Sánchez, N., Tárraga, M. and Correig, A.M. (2006): Monitoring the reawakening of Canary Islandsô Teide volcano. *EOS, 87, 6: 61-72.*

Ortiz, R., H. Moreno, A. García, G. Fuentealba, M. Astiz, P. Peña, N. Sánchez, M. Tárraga, 2003: Villarrica volcano (Chile): characteristics of the volcanic tremor and forecasting of small explosions by means of a material failure method. *J. Volcanol. Geotherm.* Res. 128: 247-259.

Quintero Oliveros, A., Carniel, R., Tárraga, M., Aspinall, W. 2006. On the application of Hidden Markov Model and Bayesian Belief Network to seismic noise at Las Cañadas Caldera, Tenerife, Spain. *Chaos, Solitons and Fractals, Elsevier,* 10.1016/j.chaos. 2006.09.073.

Tárraga, M., Carniel, R., Ortiz, R., Marrero, J. M., García, A. 2006. On the predictability of volcano-tectonic events by low frequency seismic noise analysis at Teide-Pico Viejo volcanic complex, Canary Islands. *Natural Hazards and Earth System Sciences,* 6: 365-376.

Tárraga, M., Carniel, R., Ortiz, R., García, A., Moreno, H. 2006. A dynamical analysis of the seismic activity of Villarrica volcano (Chile) during september - october 2000. *Chaos Solitons and Fractals, Elsevier,* ref. CHAOS 5290. doi:10.1016/j.chaos.2006.10.062

Vila, J., Macià, R., Kumar, D., Ortiz, R., Moreno, H., Correig, A.M., 2006. Analysis of the unrest of active volcanoes using variations of the base level noise seismic spectrum. *J. Volcanol. Geotherm. Res.*153:11-20.

INSTITUTE OF ASTRONOMY AND GEODESY, MADRID

***Working group*:** GEOMOD

Members of the working group

José Fernández Torres (Co-ordinator): Tenured Scientists, CSIC
Antonio J. González Camacho, Tenured Scientists, CSIC
Alfredo Aparicio Yague, Researcher, CSIC
Gema Rodríguez Velasco
María Charco Romero
Pablo J. González Mendez
Lavinia Tunini
Alicia Arjona Almodóvar

Rosana Romero Calero

Research interests:
Volcanism and tectonic setting, Geophysical structural studies, Physical modeling of volcanic processes, Geophysical surveillance of active volcanoes

Scientific programme during the perior 2003-2006:

The research in the field of gravimetry of this group includes structural gravimetry to determine densities distribution below surface solving the inverse gravimetric problem in volcanic areas, as well as the micro-gravity to study time dependent gravity variation associated to volcanic loading. Both lines are carried out from the theoretical and observational sides. There are several volcanic areas around the world where both methodologies have been applied.

This group does a great part of its research on the development of theoretical deformation models for geodetic effects produced by volcanic activity, including the test and use of the model for interpretation of observed deformation and gravity changes. An important part of this research is therefore dedicated to the development of methodologies for interpretation via solution of the inverse problem. Again, the different developed models and inverse techniques have been applied to different active volcanic zones around the world.

An important aspect of the research of this group has been the designing, application and testing of the appropriated geodetic monitoring techniques and strategies in the Canary Islands and other active zones. In this field this group has been the first in defining and observing GPS networks covering the full surface of Tenerife and La Palma, to use InSAR in cooperation with INDRA Espacio S.A. in Lanzarote, La Palma and Tenerife, as well as to use micro-gravity measurements in Tenerife (in co-operation with Institute ñJaume Almeraò, Barcelona, Open University, London, and University of Bristol), for volcano monitoring. In all these cases very interesting results have been obtained.

***List of publications*:**

Romero, R., Carrasco, D., Araña, V., and Fernández, J., 2003. A new approach to the monitoring of deformation on Lanzarote (Canary Islands): an 8-year radar perspective. *Bulletin of Volcanology*, 65: 1-7, DOI: 10.1007/s00445-002-0232-3.

Fernández, J., Yu, T.-T., Rodríguez-Velasco, G., Gonzalez-Matesanz, F.J., Romero, R., Rodríguez, G., Quirós, R., Dalda, A., Aparicio, A., and Blanco, M.J., 2003. New Geodetic Monitoring System in the Volcanic Island of Tenerife, Canaries, Spain. Combination of InSAR and GPS Techniques. *Journal Volcanology and Geothermal Research*, 124/3-4, 241-253.

Montesinos, F.G., Camacho, A.G., Nunes, J.C., Oliveira, C.S. y Vieira, R. A 3-D gravity model for a volcanic crater in Terceira Island (Azores). *Geophysical Journal International*, Vol..154; pp. 1-14., 2003.

Fernández, J., 2004 (Guest Editor). *Pure and Applied Geophysics*, vol 161, nº 7, Topical Issue ñGeodetic and geophysical effects associated with seismic and volcanic hazards.ò, ISSN 0033-4553, pp. 1301-1611.

Fernández, J., 2004. Geodetic and geophysical effects associated with seismic and volcanic hazards. Introduction. *Pure and Applied Geophysics*, vol 161, nº 7, 1301-1303, DOI: 10.1007/s00024-004-2505-6.

Fernández, J., F. J. González-Matesanz, J. F. Prieto, A. Staller, G. Rodríguez-Velasco, A. Alonso-Medina and M. Charco, 2004. GPS Monitoring in the N-W part of the Volcanic Island of Tenerife, Canaries, Spain. Strategy and results. *Pure and Applied Geophysics*, vol 161, nº 7, 1359-1377, DOI: 10.1007/s00024-004-2509-2.

Tiampo, K.F., Fernández, J., Jentzsch, G., Charco, M., and Rundle, J.B., 2004. New results at Mayon, Philippines, from a joint inversion og gravity and deformation measurements. *Pure and Applied Geophysics*, vol 161, nº 7, 1433-1452, DOI: 10.1007/s00024-004-2513-6.

Charco, M., Fernández, J., Tiampo, K.F., Battaglia, M., Kellogg, L., McClain, J., and Rundle, J.B., 2004. Study of volcanic sources at Long Valley Caldera, California, using gravity data and a genetic algorithm inversion technique. *Pure and Applied Geophysics*, vol 161, nº 7, 1399-1413, DOI: 10.1007/s00024-004-2511-8.

Tiampo, K.F., Fernández, J., Jentzsch, G., Charco, M., and Rundle, J.B., 2004. Inverting for the parameters of a volcanic source using a genetic algorithm and a model for magmatic intrusion in elastic-gravitational layered Earth models. *Computers & Geosciences*, 30/9-10 pp. 985-1001.

Fernández, J., Romero, R.; Carrasco, D., Tiampo, K.F., Rodríguez-Velasco, G., Aparicio, A., Araña, V., González-Matesanz, F.J., 2005. Detection of displacements in Tenerife Island, Canaries, using radar interferometry. *Geophysical Journal International*, 160, 33-45. doi: 10.1111/j.1365-246X.2005.02487.x.

Tiede, C., Tiampo, K.F., Fernández, J., Gerstenecker, C., 2005. Deeper Understanding of Non-Linear Geodetic Data Inversion Using a Quantitative Sensitivity Analysis. Nonlinear Processes in Geophysics, 12, 373ï 379.

Tiede, C., A. G. Camacho, C. Gerstenecker, J. Fernández, and I. Suyanto (2005), Modeling the density at Merapi volcano area, Indonesia, via the inverse gravimetric problem, Geochem. Geophys. Geosyst., 6, Q09011, doi:10.1029/2005GC000986.

Fernández, J., Tiampo, K.F., Rundle, J.B., Jentzsch, G., 2005. On the interpretation of vertical gravity gradients produced by magmatic intrusions. *Journal of Geodynamics*, 39/5, 475-492. doi: 10.1016/j.jog.2005.04.005.

Fernández, J. Charco, M., Rundle, J. B., Tiampo, K. F., 2006. A revision of the FORTRAN codes GRAVW to compute deformation produced by a point magma intrusion in elastic-gravitational layered Earth models. *Computers & Geosciences*, 32/2, 275-281. doi:10.1016/j.cageo.2005.06.015.

Charco, M., Fernández, J., Luzón, F., and Rundle, J. B., 2006. On the relative importance of self-gravitation and elasticity in modelling volcanic ground deformation and gravity changes. *Journal of Geophysical Research*, 111, B03404, doi:10.1029/2005JB003754.

Gottsmann, J., Wooller, J., Martí, J., Fernández, J., Camacho, A., González, P., García, A., Rymer, H., 2006. New evidence for the reawakening of Teide volcano. *Geophysical Research Letters*, 33, L20311, doi:10.1029/2006GL027523.

Gottsmann, J., Camacho, A.G., Tiampo, K.F., Fernández, J., 2006. Spatio-temporal variations in vertical gravity gradients at the Campi Flegrei caldera (Italy): A case for source multiplicity during unrest. *Geophysical Journal International*, 167, 1089-1096.

Nunes, J.C., Camacho, A.G., Franca, Z., Montesinos, F.G., Alves, M., Vieira,R., Velez,E. and Ortiz, E. Gravity anomalies and crustal signature of volcano-tectonic

structures of Pico Island (Azores) *Journal of Volcanology and Geothermal Research*, 156, 55-70, 2006

INSTITUTE OF EARTH SCIENCIES "JAUME ALMERA", BARCELONA

***Working group*:** Group of Volcanology

Members of the working group
Joan Martí, Professor
Carlos Soriano Clemente, Tenured Scientist
María José Jurado Rodriguez, Tenured Scientist
Fidel Costa, Tenured Scientist
Arnau Folch, Tenured Scientist
Joachim Gottsmann, Tenured Scientist
Alicia Felpeto, Post-dcotoral reserarcher
Antonio Ordoñez, post-graduate fellowhip
Adelina Geyer Traver, post-graduate fellowhip
Joan Andújar Fernández, post-graduate fellowhip
Fabio Teixidó Benedí, post-graduate fellowhip

Research interests:
Mineralogy and Petrology, Geochemistry, Experimental petrology, Volatile and fluid inclusions, Volcanism and tectonic setting, Explosive volcanism and pyroclastic deposits, Eruptive mechanisms, Volcanic hazards, Geophysical structural studies, Physical modeling of volcanic processes.

Scientific programme during the period 2003-2006
a) Experimental and numerical modelling of volcanic and related processes oriented to the quantitative assessment of the parameters controlling volcanic processes in active areas.
b) Determination of the pre-eruptive conditions of magmas. This action complements the previous one with experimental petrology methods and residence times of magmas studies, and aims to characterize the conditions for explosive volcanism.
c) Development of automatic systems oriented to volcanic hazard assessment and risk management.
d) Studies on Physical Volcanology in areas of particular interest in Spain, such as Canary Islands, Cabo de Gata and Catalonia and elsewhere (Costa Rica, Mexico, Iceland, Italy).

List of Publications

GOTTSMANN, J and RYMER, H.: Deflation during caldera unrest::: constraints on subsurface processes from gravity-height data. Bulletin of Volcanology (2003) 64, 338-348

GOTTSMANN, J., BERRINO, GGG., RYMER, H., WILLIAM-JONES, G.: Hazard assessment during caldera unrest in Campi Flegrei, Italy: A contribution from gravity-heights gradient. Earth and Planetary Science Letters (2003) 211: 295-309.

FOLCH, A and MARTI, J. Geometrical and mechanical constrains on the formation of ring fault calderas. Earth and planetary science letters (2004), 221: 215-225

CODINA, R., and FOLCH, A..: A stabilized finite element predictor-corrector scheme for the incompressible Navier-Stokes equations using a nodal based implementation. International Journal for Numerical Methods in Fluids (2004) 221: 215-225.

GOTTSMANN, J., N. FOURNIER, and H. RYMER. log4PDA: An application for continuous monitoring of gravity using LaCoste&Romberg Aliod 100 systems and Palm OS® run handheld computers, Computers and Geosciences (2004), 30, 553-558.

GOTTSMANN, J., A.J.L. HARRIS, and D.B. DINGWELL, Thermal history of Hawaiian pahoehoe lava crusts at the glass transition: implications for flow rheology and emplacement, Earth and Planetary Science Letters, (2004) 228 (3-4), 343-353.

PITTARI, A., CAS, R. A. F and MARTÍ, J. The occurrence and origin of prominent massive, pumice-rich ignimbrite lobes within the late Pleistocence Abrigo Ignimbrite, Tenerife, Canary Islands. Journal of Volcanology and Geothermal Research (2005), 139: 271-293

MARTI, J. and ERNST, G.J. Volcanism and Environment. Cambridge University Press (2005): 471pp

MARTI, J and FOLCH, A. Anticipating volcanic eruptions. In MARTI, J and Ernst, G.J. (eds) Volcanism and Environment, Cambridge University Press (2005): 90-130

GALINDO, I., SORIANO, C., MARTI, J. and PEREZ, N. Tectonic structure and evolution of the Las Cañadas edifice (Tenerife, Canary Islands): implications for active diffuse degassing. Journal of Volcanology and Geothermal Research (2005), 144: 73-87.

MACEDONIO, G., NERI, A., MARTI, J. and FOLCH, A. Temporal evolution of flow conditions in sustained magmatic explosive eruptions. Journal of Volcanology and Geothermal Research (2005), 143: 153-172.

PITTARI, A., CAS, R.A.F., EDGAR, C.J., NICHOLS, H.J., WOLFF., J.A. and MARTI, J. Influence of palaeotopography on the pyroclastic flow processes and facies architecture of the lithic-rich ignimbrite in a high-gradient setting: the Abrigo ignimbrite, Tenerife, Canary Islands. Journal of Volcanology and Geothermal Research (2006), 152(3-4), 273-315.

SORIANO, C., GALINDO, I., WOLFF, J. A. and MARTI, J. Vent complexes and related proximal deposits in the Las Cañadas caldera, Tenerife, Canary Islands, Bulletin of Volcanology (2006), 69 (2): 217-231

GOTTSMANN, J., WOOLLER, L., MARTI., FERNANDEZ, J., CMACHO, A., RYMER, H. and GARCÍA, A. Gravity changes mark reaweakeing of Spanish volcano after 100 years of dormancy. Geophysical Research Letters (2006), 33:

L20311, doi 10.1029/2006GL027523

GEYER, A., FOLCH, A. and MARTI, J. A relationship between caldera collapse and magma chamber withdrawal: an experimental approach. Journal of Volcanology and Geothermal Research (2006), 157: 375-386.

UNIVERSIDAD COMPLUTENSE DE MADRID

DEPARTAMENTO DE PETROLOGÍA Y GEOQUÍMICA. UNIVERSIDAD COMPLUTENSE DE MADRID (UCM) ï INSTITUTO DE GEOLOGÍA ECONÓMICA. CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS (CSIC) ï UNIVERSIDAD REY JUAN CARLOS (URJC)

***Working group*:** VOLCANISM

***Members of the working group*:**

Eumenio Ancochea Soto, Professor UCM
Mercedes Muñoz García Professor UCM
Sledad Frnández Sntín Lecturer UCM
Mrina Nvidad de la Cruz Lecturer UCM
María José Huertas Coronel Lecturer UC
MJuana Sagredo Ruiz Tenured Scientist CSIC
José Luis Brändle Matesanz Tenured Scientist CSIC
Cristina de Ignacio San José Assistant Professor URJC
Raquel Herrera Espada Assistant Profesor URJC

***Research interests*:**

Mineralogy and Petrology, Geochemistry, Radioactive isotopes and geochronology, Volcanism and tectonic setting, Explosive volcanism and pyroclastic deposits, Eruptive mechanisms, Volcanic hazards, Paleovolcanism.

Scientific programme during the period 2003-2006

1. The growth and evolution of large volcanic edifices: Canary and Cabo Verde islands
2. Lithological association of the sub-volcanic roots of the large volcanic edifices: Canary and Cabo Verde islands
3. Paleovolcanism of the Pyrenees.

***List of publications*:**

Acosta, J., Ancochea, E., Canals, M., Huertas, M.J. y Uchupi, E. 2004. Early Pleistocene Volcanism in the Emile Baudot Seamount, Balearic Promontory (Western Mediterranean Sea). Marine Geology, 207, 247-257.

Ancochea E., Brändle J.L., Huertas M.J., Cubas C.R. y Hernán F. 2003. The felsic dikes of La Gomera (Canary Islands): Identification of cone sheet and radial dike swarms. Journal of Volcanology and Geothermal Research. 120, 197-206.

Ancochea, E. 2004. Canarias y el vulcanismo neógeno peninsular (Editor). En: òGeología de Españaò. Ed.: J.A.Vera. Ed.: SGE-IGME, Madrid, 637-682.

Ancochea, E. y Huertas, M.J. 2004. Age and composition of the Amanay seamount (Canary Islands). Marine Geophysical Researches, 24,161-169.

Ancochea, E., Hernán, F., Huertas, M.J., Brändle, J.L. y Herrera, R. 2006 A new chronostratigraphy and evolutionary model for La Gomera in the framework of the canarian archipiélago. Journal of Volcanology and Geothermal Research. 157, 271-293.

De Ignacio, C., Castiñeiras, P., Márquez, A., Oyarzun, R., Lillo,J. y López, I. 2003. El Chichon volcano (Chiapas volcanic belt; Mexico) transitional calc-alkaline to adakitic-like magmatism: petrologic and tectonic implications for the middle Central ï American arc International. Geological Review. 45, 1020-1028.

De Ignacio, C., Muñoz, M., Sagredo, S., Fernández-Santín, S. y Johansson, Å.2006 Isotope geochemistry and FOZO mantle component of the alkaline-carbonatitic association of Fuerteventura (Canary Islands, Spain). Chemical Geology. 232 99 - 113.

López Plaza, M., Peinado, M., López-Moro, F.J.,Rodríguez-Alonso, M.D.,Carnicero, A., Franco, M.P., Gonzalo, J.C. y Navidad, M. (2006) Contrasting mantle sources and processes envolved in a peri-Gondwanan Terrane: A case study of pre-Variscan mafia intrusive from the Autochthon of the Central Iberian Zone. Geological Society of America. Special paper. (in press)

Muñoz, M., Sagredo, J., De Ignacio, C., Fernández-Suárez, J. y Jeffries, T.E. 2005. New data (U-Pb, K-Ar) on the geochronology of the alkaline-carbonatitic association of Fuerteventura, Canary Islans, Spain. Lithos. 85 140-153.

Triboulet, C. Guitard, G. Katona, I. y Navidad, M. (2006) Evolution presión-temperature des amphibolites de la zone axiale au tours du métamorphisme hercynien des Pyrénées orientales G.R.Geoscience vol 337 1244-1249

Vera, J.A.; Ancochea, E.; Barnolas, E.; Bea, F.; Calvo, J.P.; Civis, J.; De Vicente, G.; Ferná nandez- Gianotti, J.; García-Cortés, A.; Pérez-Estaún, A.; Pujalte, V.; Rodríguez-Fernández, L.R.; Sopeña, A. y Tejero, R. (2004) Edit. ñGeología de Españaò. SGE-IGME, Madrid, 710 pp.

INSTITUTO GEOGRÁFICO NACIONAL

***Working group*:** Group of Volcanology

Members of the working group
Carmen López, tenured scientist
María José Blanco, tenured scientist
Rafael Quirós, tenured scientist
Enrique Rodríguez, tenured scientist
Manuel Moreno, tenured technician
Benito Casas, tenured technician
Rubén López, post-graduate fellowship
Juan Guzmán, tenured technician
Benito Casas, tenured technician

Research interests:
Geophysical surveillance of active volcanoes, Geophysical structural studies, Geodetical, Geomagnetical, Gravimetrical surveillance of active volcanoes.

Scientific programme during the period 2003-2006
a) Analysis of seismic data recorded on the broadband and short period seismic networks in the Canaries.
b) Maintenance of the geomagnetical observatory in Tenerife (GUI). Analysis of geomagnetic data.
c) Design, construction, observation and analysis of data from the levelling network at Tenerife.
d) Design of the levelling network of La Palma island.
e) Design of the volcanic monitoring system of Tenerife island with a multidisciplinary approach: seismology, geodesy, geomagnetism, thermometry, visual, é (Fig.1). Investment of 1.5Mú in instrumentation for the monitoring network.
f) A paleomagnetic and self-potential techniques are being developed for the Canaries.

List of Publications

Blanco, M.J. and López, C.: Crisis sismo-volcánica de Tenerife en 2004. Vigilancia volcánica del Instituto Geográfico Nacional en Canarias: situación actual y futura. III Jornadas Canarias de Geología (2006), 3-20.

Fernández, J., Yu, T.-T., Rodríguez-Velasco, G., Gonzalez-Matesanz, F.J., Romero, R., Rodríguez, G., Quirós, R., Dalda, A., Aparicio, A., and Blanco, M.J., 2003. New Geodetic Monitoring System in the Volcanic Island of Tenerife, Canaries, Spain. Combination of InSAR and GPS Techniques. *Journal Volcanology and Geothermal Research*, 124/3-4, 241-253.

Fernández, J., Yu, T.-T., Rodríguez-Velasco, G., Gonzalez-Matesanz, F.J., Romero, R., Rodríguez, G., Quirós, R., Dalda, A., Aparicio, A., and Blanco, M.J., 2003. New Geodetic Monitoring System in the Volcanic Island of Tenerife, Canaries, Spain. Combination of InSAR and GPS Techniques. Journal Volcanology and Geothermal Research, 124/3-4, 241-253.