EUMETSAT Satellite Programmes

Data and Services provided by EUMETSAT
The European Organisation for Exploitation of Meteorological Satellites

Meteosat

Metop

Jason

EUMETSAT Satellite Programmes

... The primary objective is to establish, maintain and exploit European systems of operational meteorological satellites.

A further objective is to contribute to the operational monitoring of the climate and the environment as well as the detection of global climatic changes.

EUMETSAT Headquarter

EUMETSAT Satellite Programmes

EUMETSAT's Members

EUMETSAT Satellite Programmes

Member States

- Austria
- Belgium
- Denmark
- Finland
- France
- Germany
- United Kingdom
- Greece
- Ireland
- Italy
- Luxembourg
- The Netherlands
- Norway
- Croatia
- Portugal
- Slovak Republic
- Spain
- Sweden
- Switzerland
- Turkey

Cooperating States

- Bulgaria
- Slovenia
- Czech Republic
- Hungary
- Iceland*
- Latvia
- Lithuania
- Poland
- Romania
- Serbia & Montenegro*

*Pending Ratification

EUMETSAT Satellite Programmes

Goal: Maintain continuity and develop the operational meteorological and climate data services with adequate satellite and ground infrastructure, and associated user services

EUMETSAT Satellite Programmes

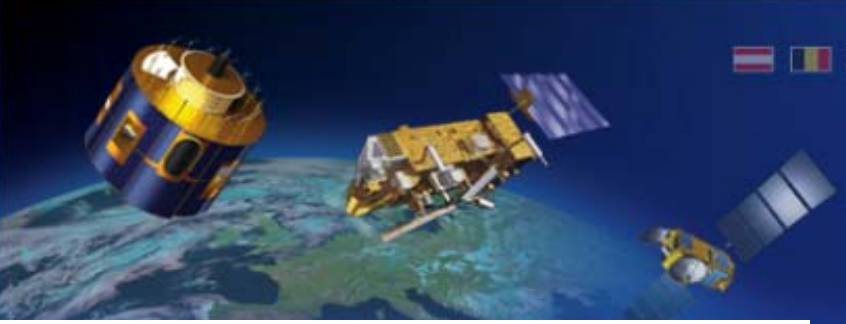
MFG: Meteosat First Generation

MSG: Meteosat Second Generation

EPS: EUMETSAT Polar System

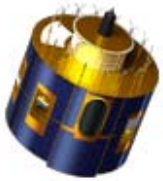
OSTM: Ocean Surface Topography Mission

EUMETSAT Satellite Programmes



Meteosat

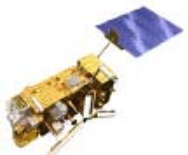
0° Service
Indian Ocean
Rapid Scan



MSG

Meteosat 8
Meteosat 9
Meteosat 10
Meteosat 11

MTG



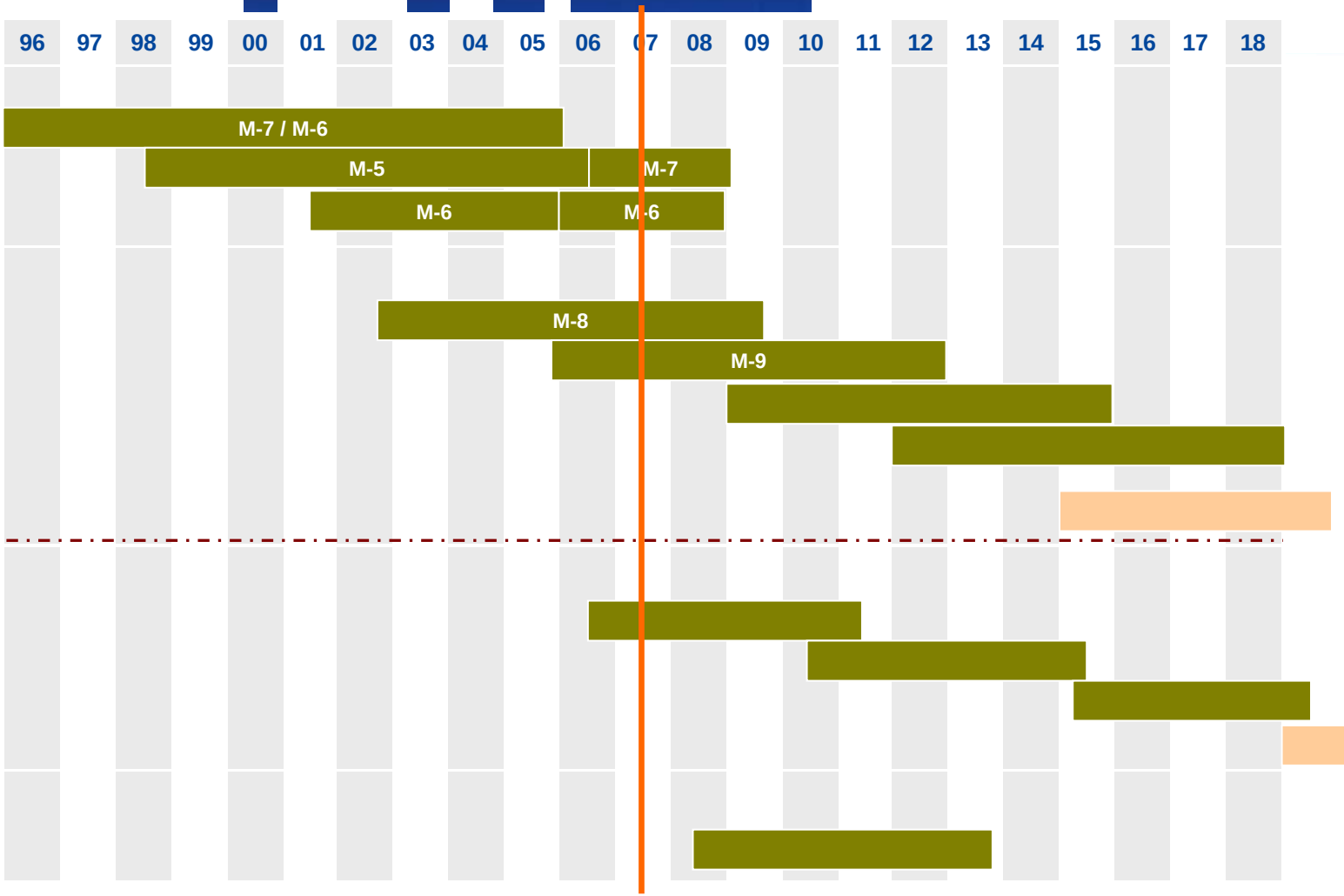
EPS

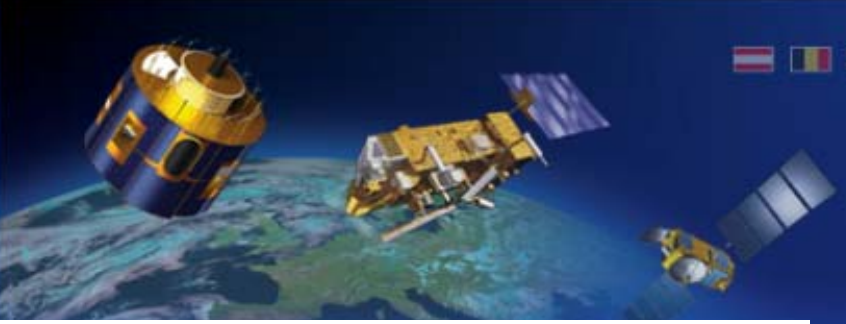
Metop-A
Metop-B
Metop-C

Post-EPS

OSTM

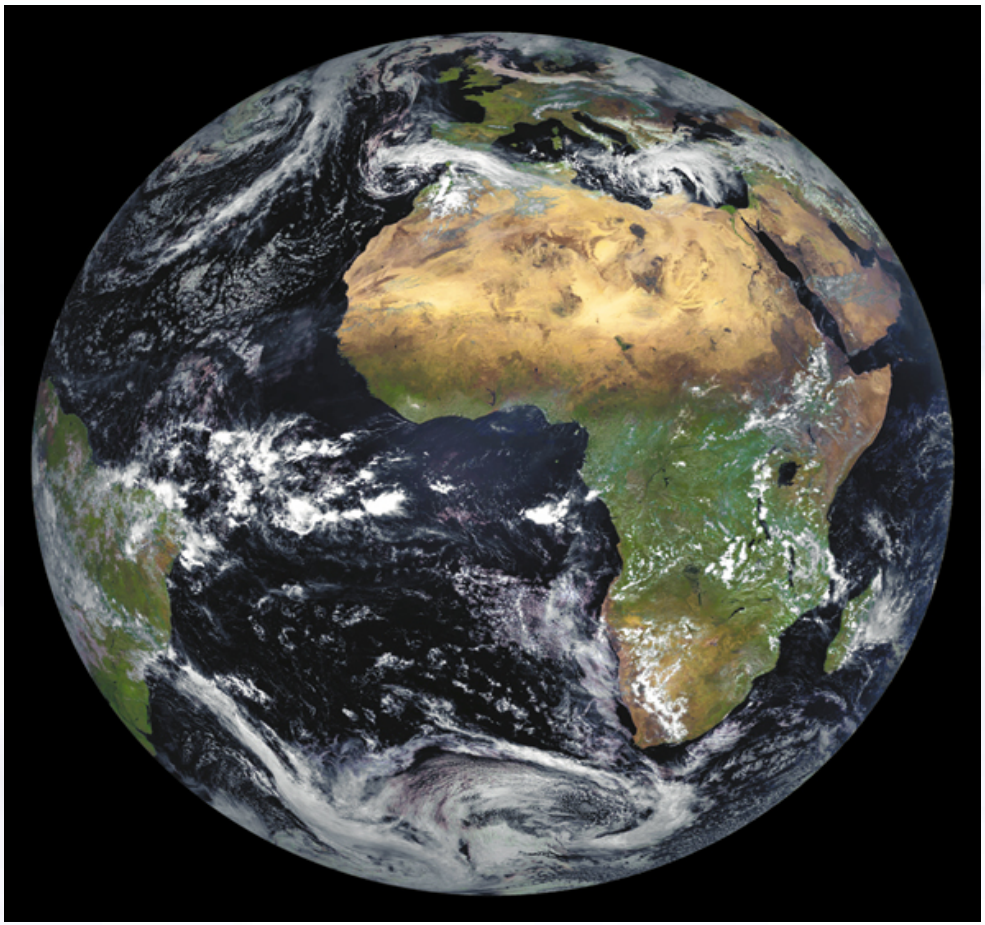
Jason-2





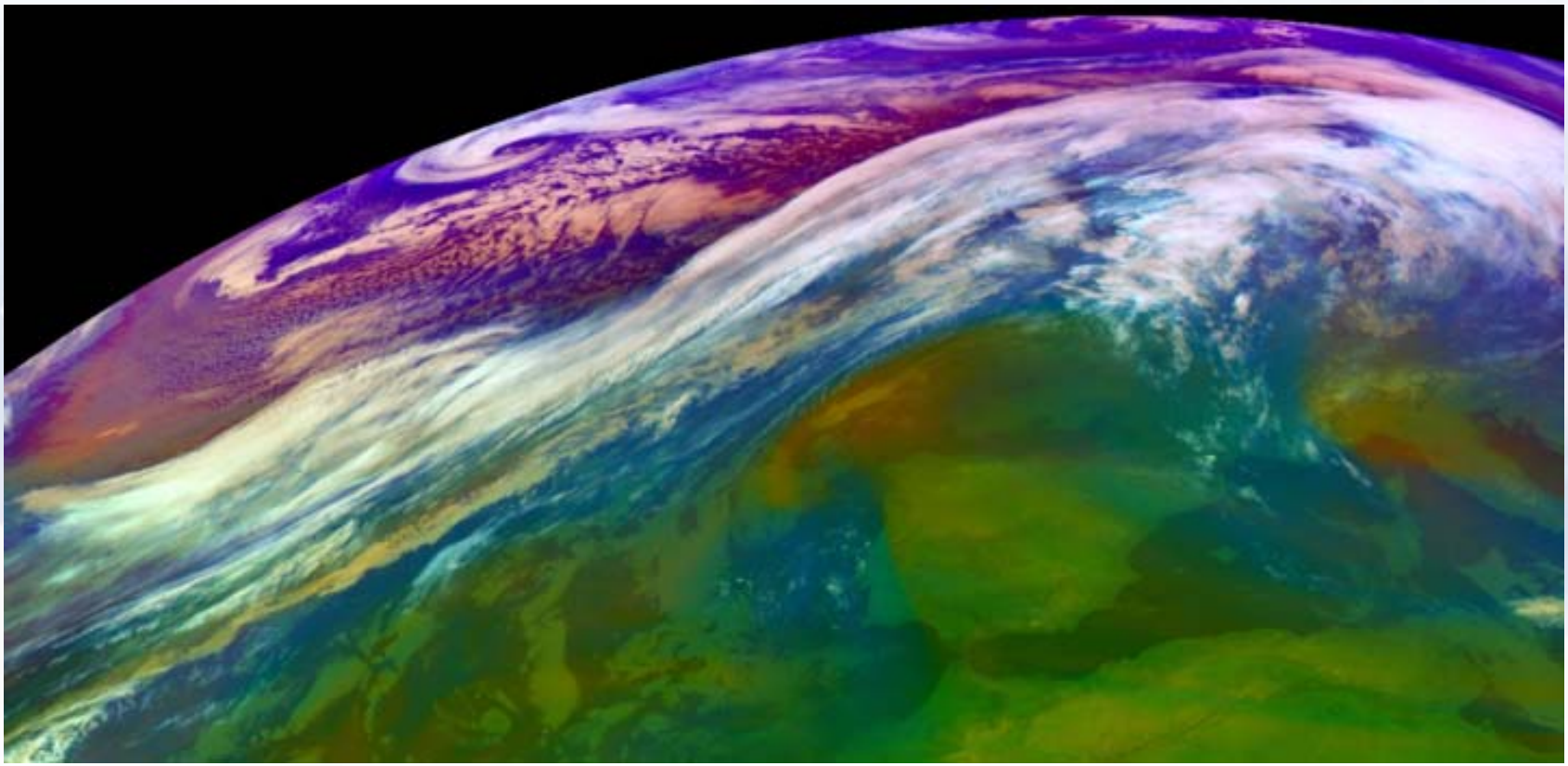
Meteosat - Status

- Meteosat-6: Launched on 20 November 1993, since May 2007 at 67.5E as stand-by over the Indian Ocean
- Meteosat-7: Launched on 2 September 1997, operational at 57.5E in support of the Indian Ocean Data Coverage Service
- Meteosat-8 (MSG-1): Launched on 28 August 2002, stand-by at 3.4W since 11 April 2007; will be used for a rapid scanning service (trials in summer 2007 – operational from spring 2008 onwards at a new position of 9.5E)
- Meteosat-9 (MSG-2): Launched on 22 December 2005, operational at 0.0 degree since 11 April 2007



Meteosat Second Generation

Example of a Multi-Channel RGB loop from Meteosat-8



Metop - A

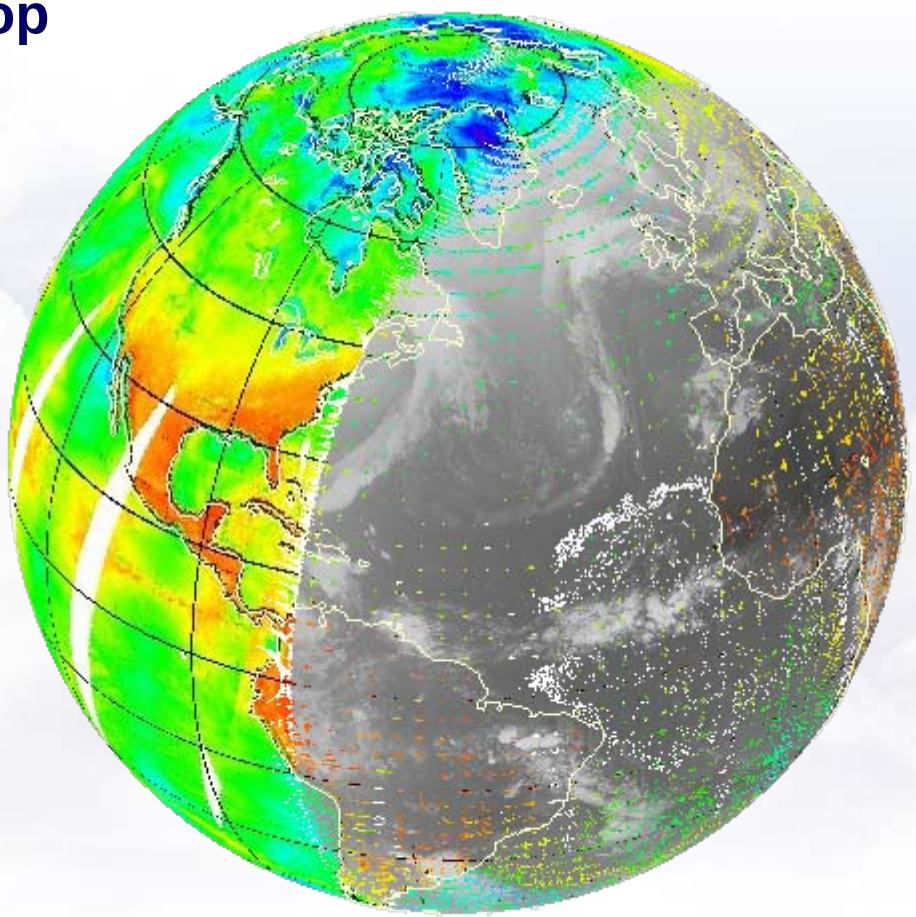
EUMETSAT Satellite Programmes

Launch from the Baikonour Cosmodrome with Sojuz/Fregat the 19th October 2006

We have a really global view now...

EUMETSAT Satellite Programmes

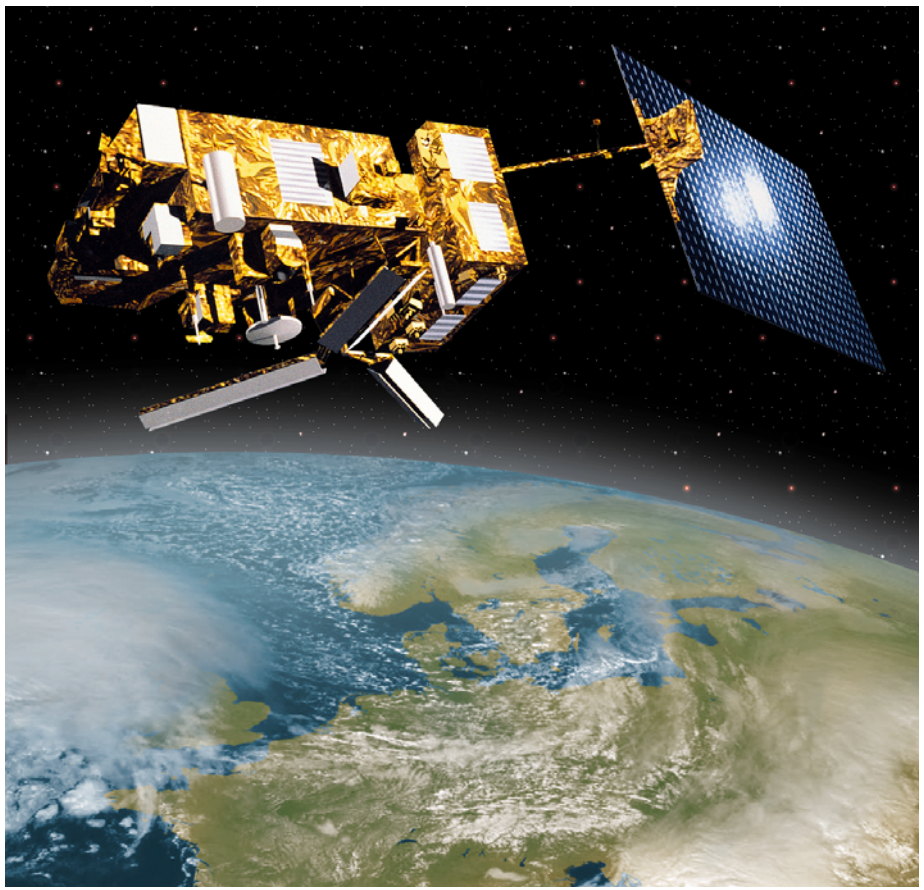
MHS on Metop



Meteosat 8

Prepared with **IDV** by Roesli, 2006

EPS: The EUMETSAT Polar System with its Metop Satellites

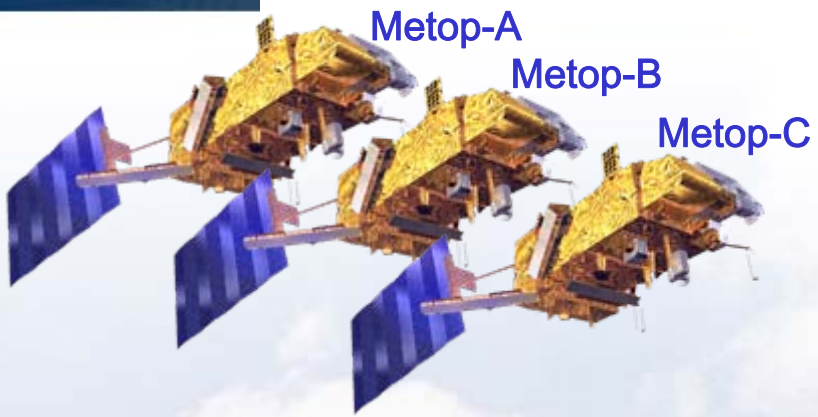


EPS Programme Elements

EUMETSAT Satellite Programmes

Polar Stations
Svalbard, 78 deg Nord

Launcher Service
(Soyuz/Fregat)



LEOP Service
(ESOC)

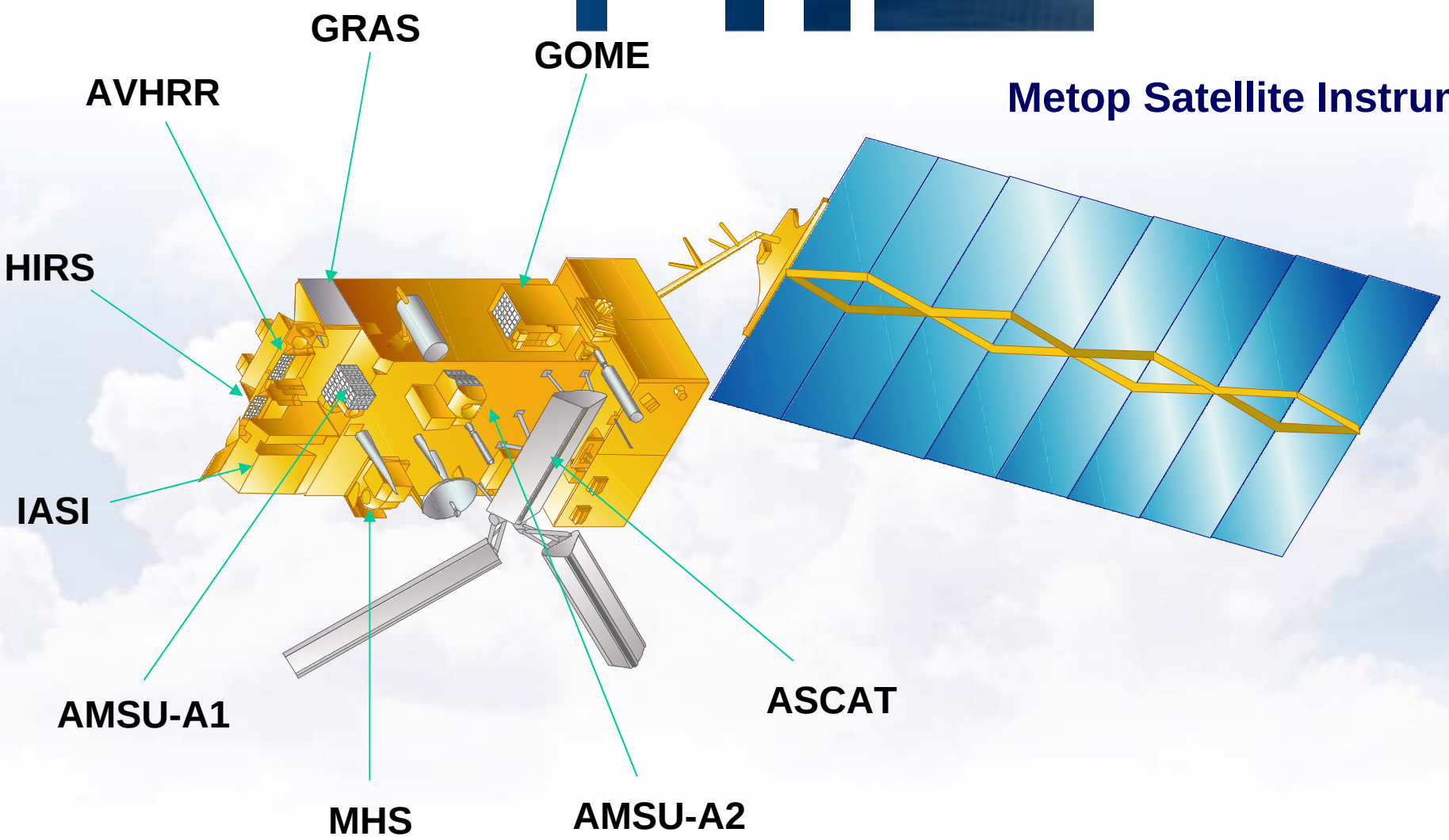
EUMETSAT
Mission Control Centre

Satellite Application
Facilities
(SAF)
8 Meteorological
themes

- Metop-A launched 19th October 2006
- Sun-synchronous Orbit
- 820 km, 9h30 LST,102 min
- Only polar data source from mid-morning orbits
- 11 Instruments
- Metop-B and Metop-C recurrent models
- Soyuz launcher service (Baikonour)
- LEOP Service from ESOC (Darmstadt)
- Central and distributed Ground Segment components
- 14 years of operations

EUMETSAT

Metop Satellite Instruments

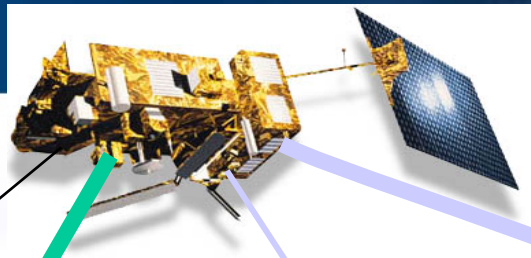


The EPS Services

EUMETSAT Satellite Programmes

Local mission : real-time transmission of imaging and sounding data to local user stations.

Global mission : delivery of global measurements to Met Services and NOAA within 2¼ hours of the instant of observation (GTS, EUMETCast)



Search and Rescue service (S&R).

ARGOS mission of in-situ observational data.

Data Dissemination

EUMETCast: Full NRT data stream

GTS: Subset

IASI TEC

CNES Toulouse

CalVal of IASI

Monitoring of IASI

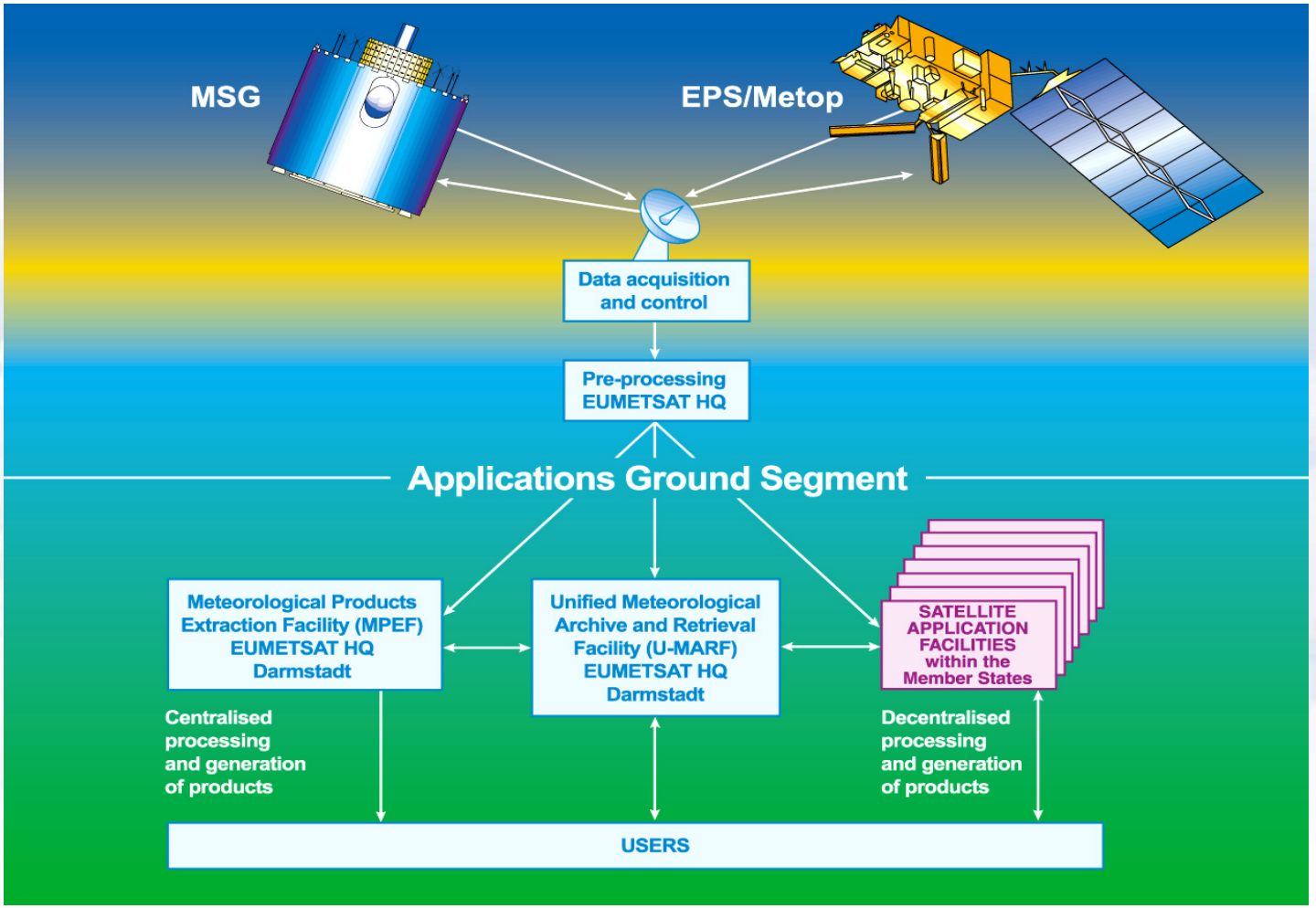
Archiving & Retrieval

All data and products are archived in the **UMARF**

EUMETSAT

EUMETSAT Data Flows

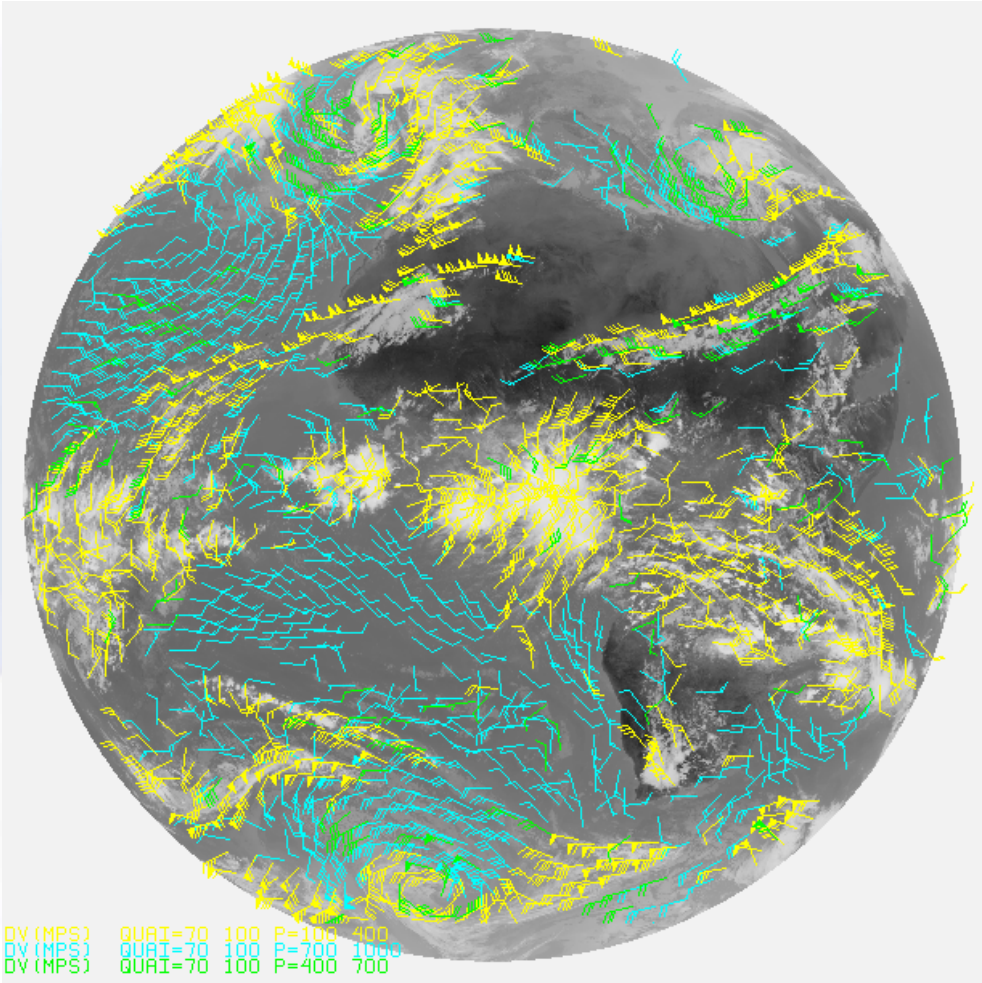
EUMETSAT Satellite Programmes



The SAF Network

EUMETSAT Satellite Programmes

Meteorological Products: Wind Vector Example



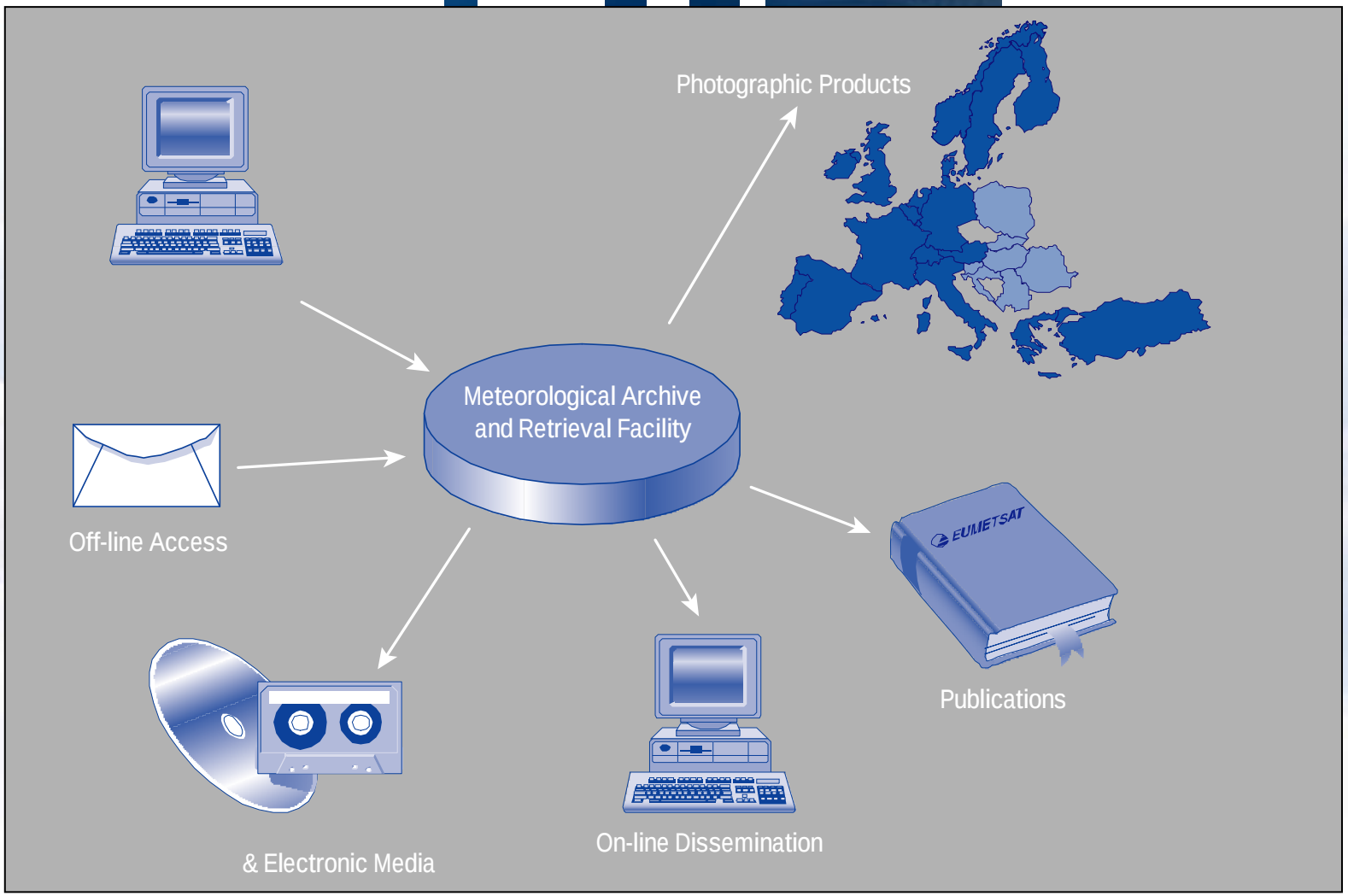
24 February 2003, 12:00 UTC wind vectors

low / medium / high

EUMETSAT

Archive of Imagery and Products

EUMETSAT Satellite Programmes

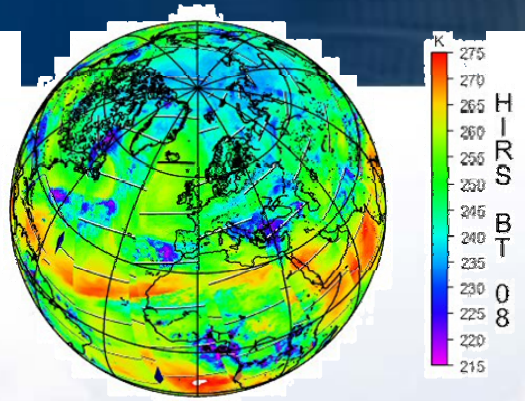


ATOVS and AVHRR:

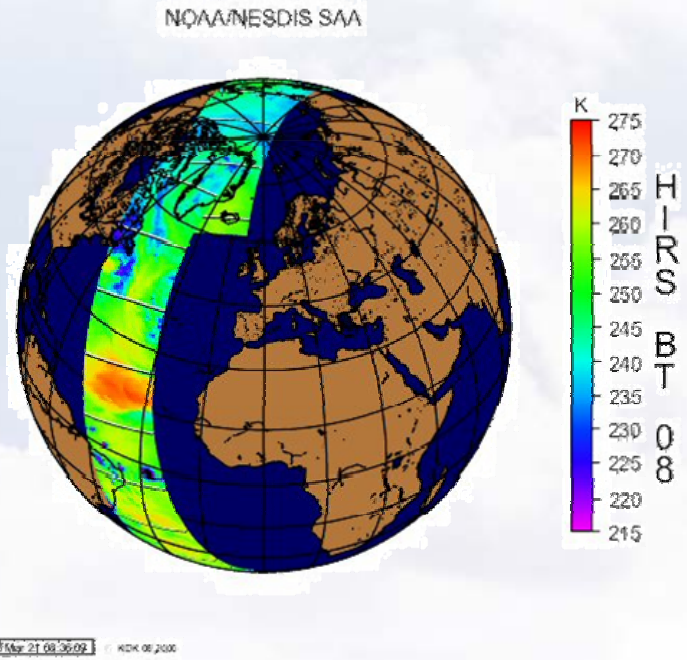
Continuity and Commonality

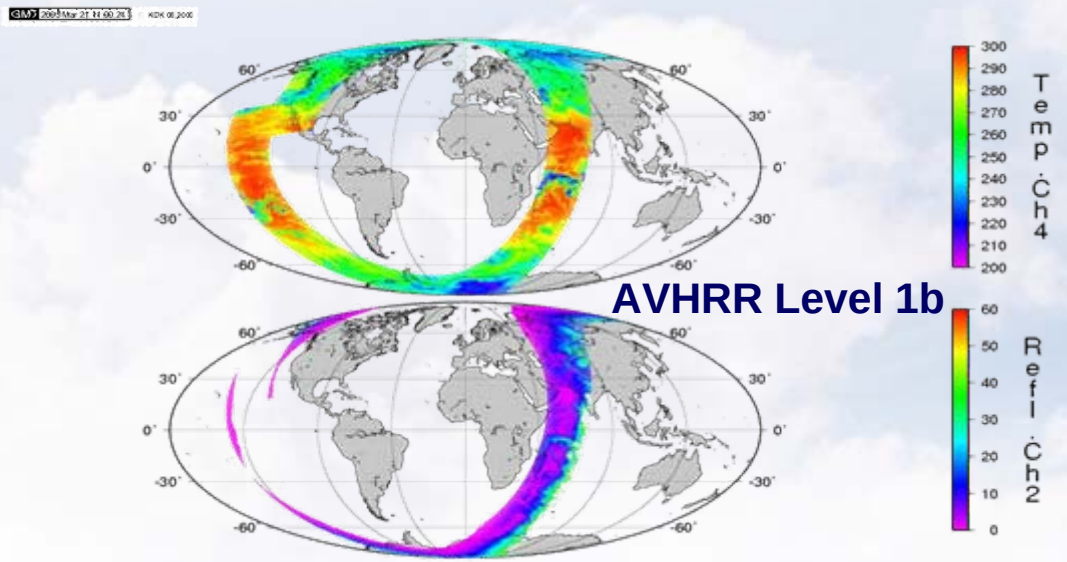
EUMETSAT Satellite Programmes

Level 1 NRT Products (2h15min)
Level 2 NRT Products (3h)
Global Sounding: Global Products are dump-based



Composite of 14 level-1b products of one day from HIRS covering the Earth twice





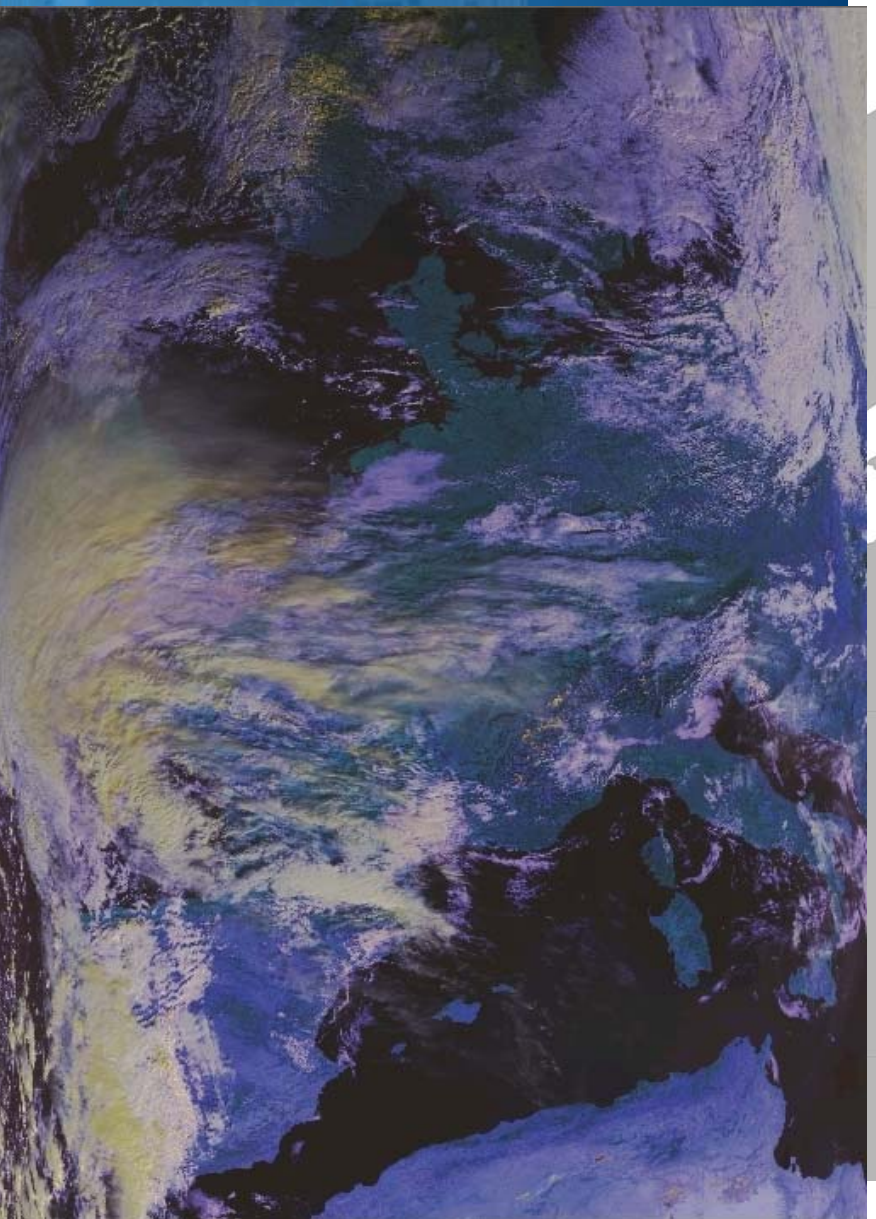
AVHRR Level 1b

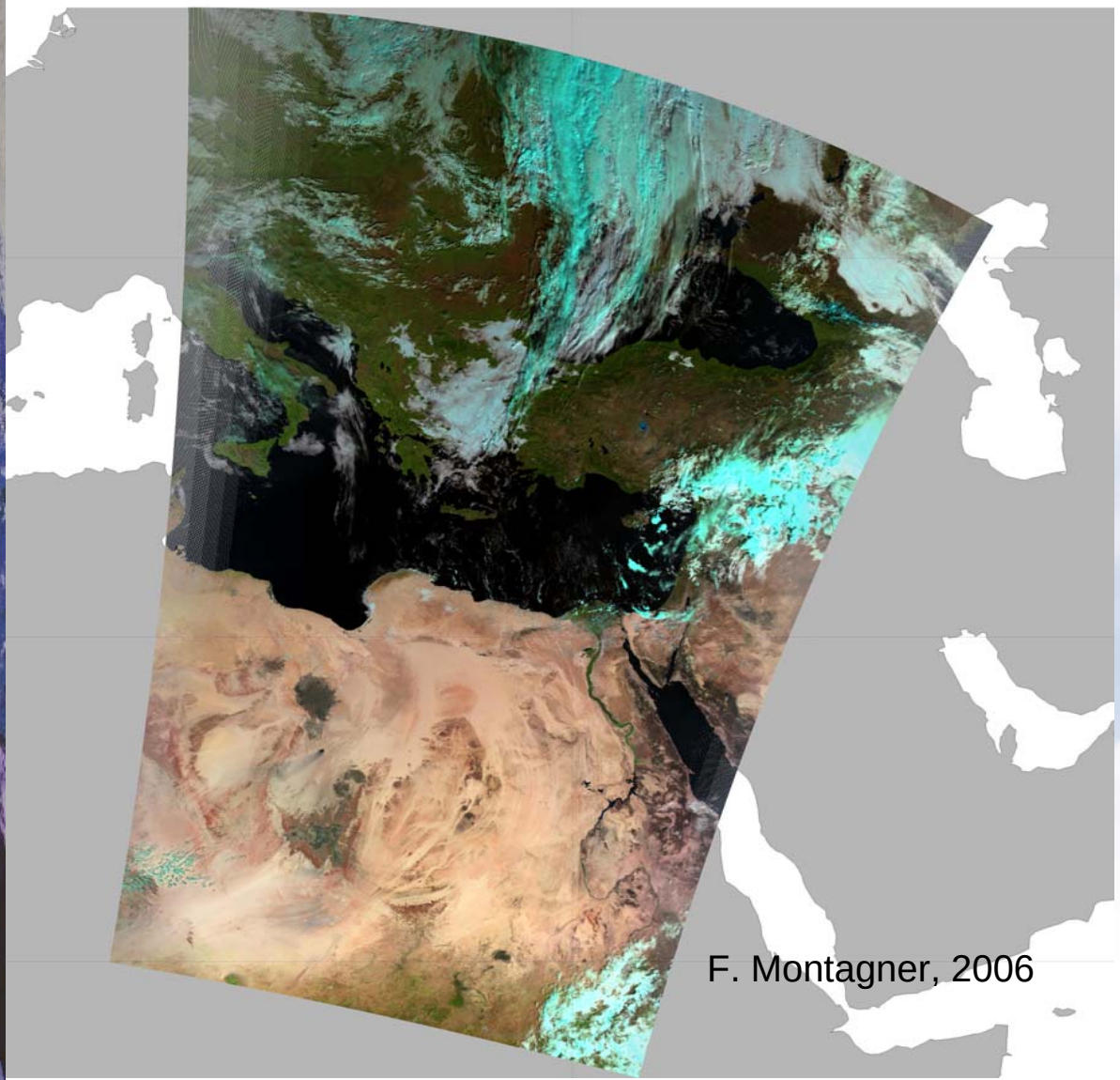
Continuity is based on ATOVS and AVHRR Level 1b and Level 2 products

EUMETSAT

Processing of AHRPT data by Meteo-France and EUMETSAT (right)

EUMETSAT Satellite Programmes



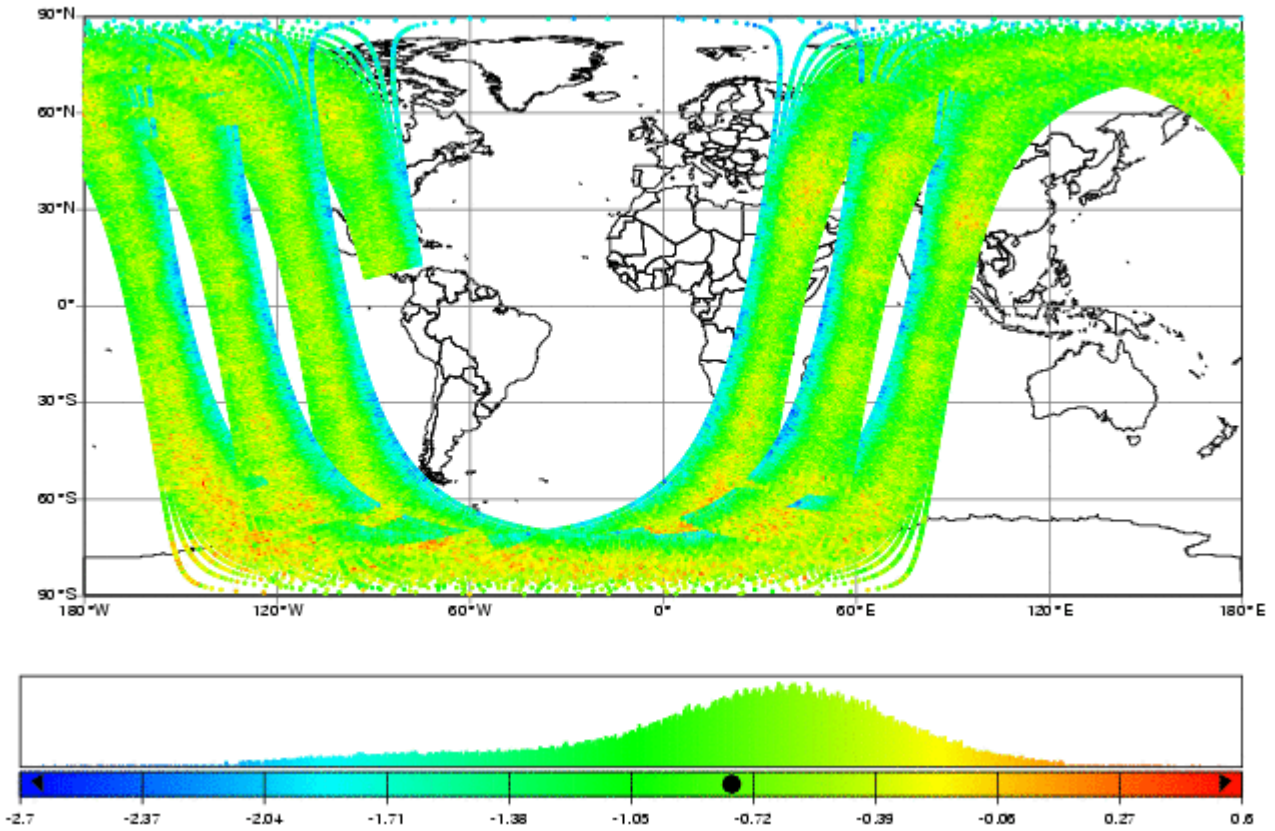


AMSU-A L1

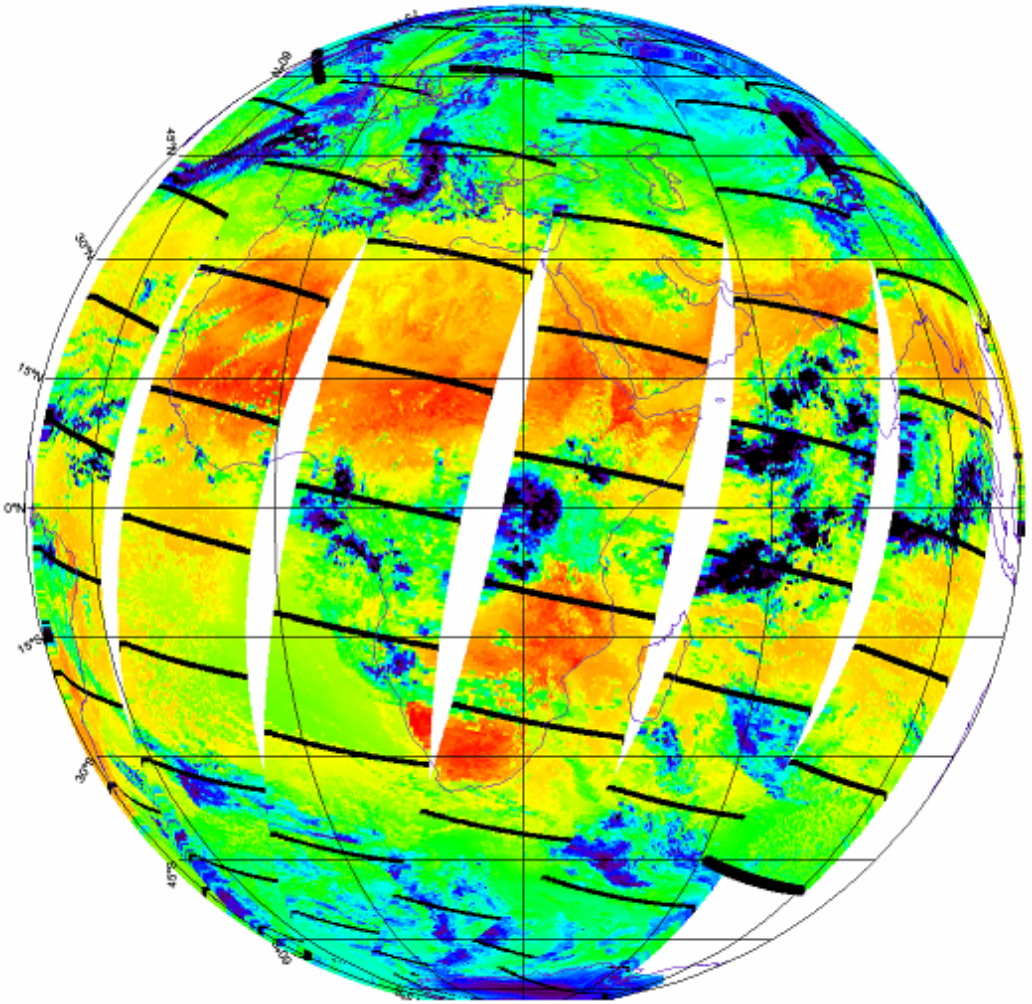
Trial dissemination of L1 started 31 October 2006

First evaluations by ECMWF

First guess departures



HIRS Channel 8



21 November 2006

EUMETSAT

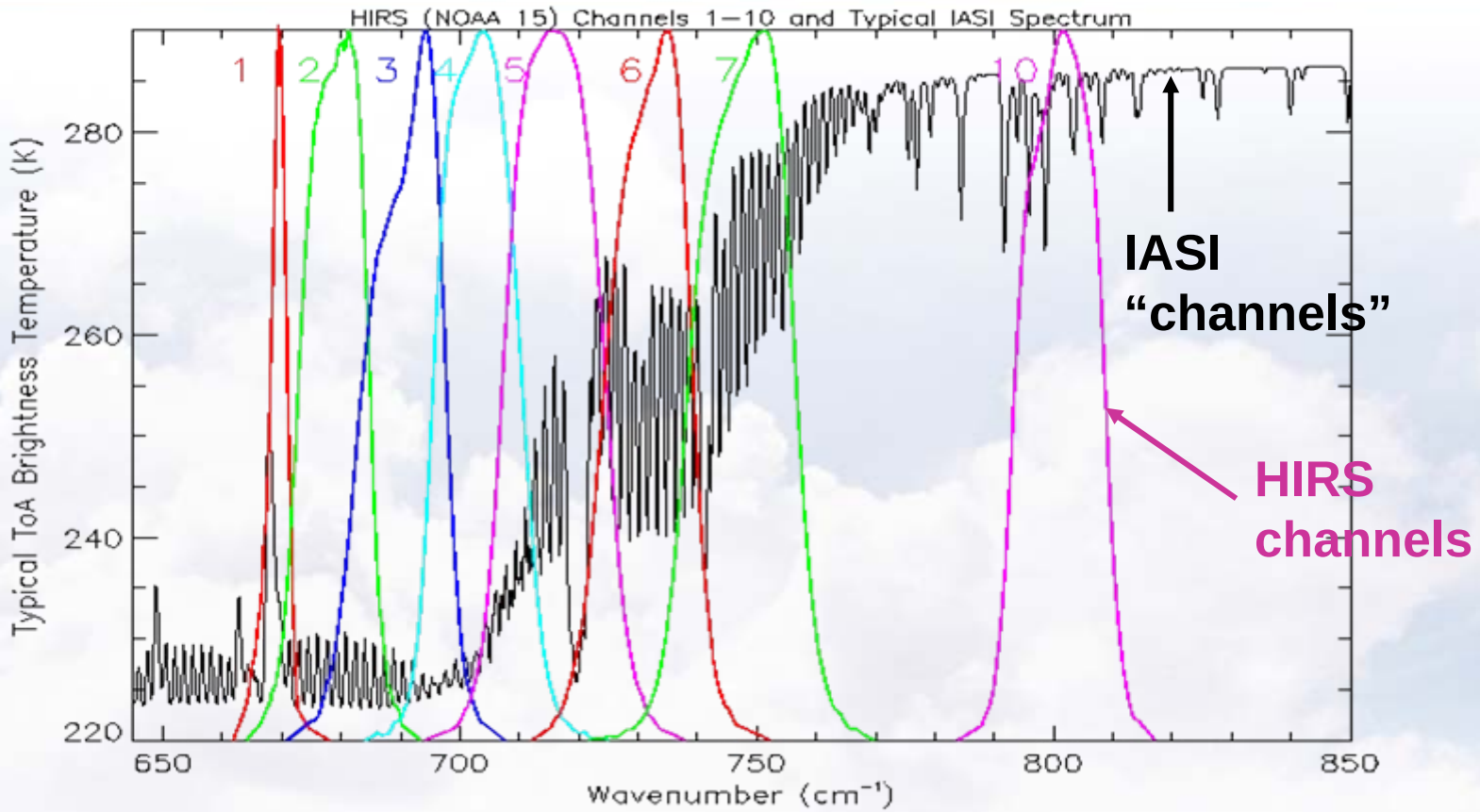
Infrared Atmospheric Sounding Interferometer (IASI)

Fourier Transform Spectrometer based on a Michelson interferometer

(8461 channels)

– IASI developed by CNES, under CNES-EUMETSAT cooperation
– Operational level 1 processor developed and delivered by CNES
– IASI TEC at Toulouse
– IASI SIOV and Cal/Val level 1 performed by CNES

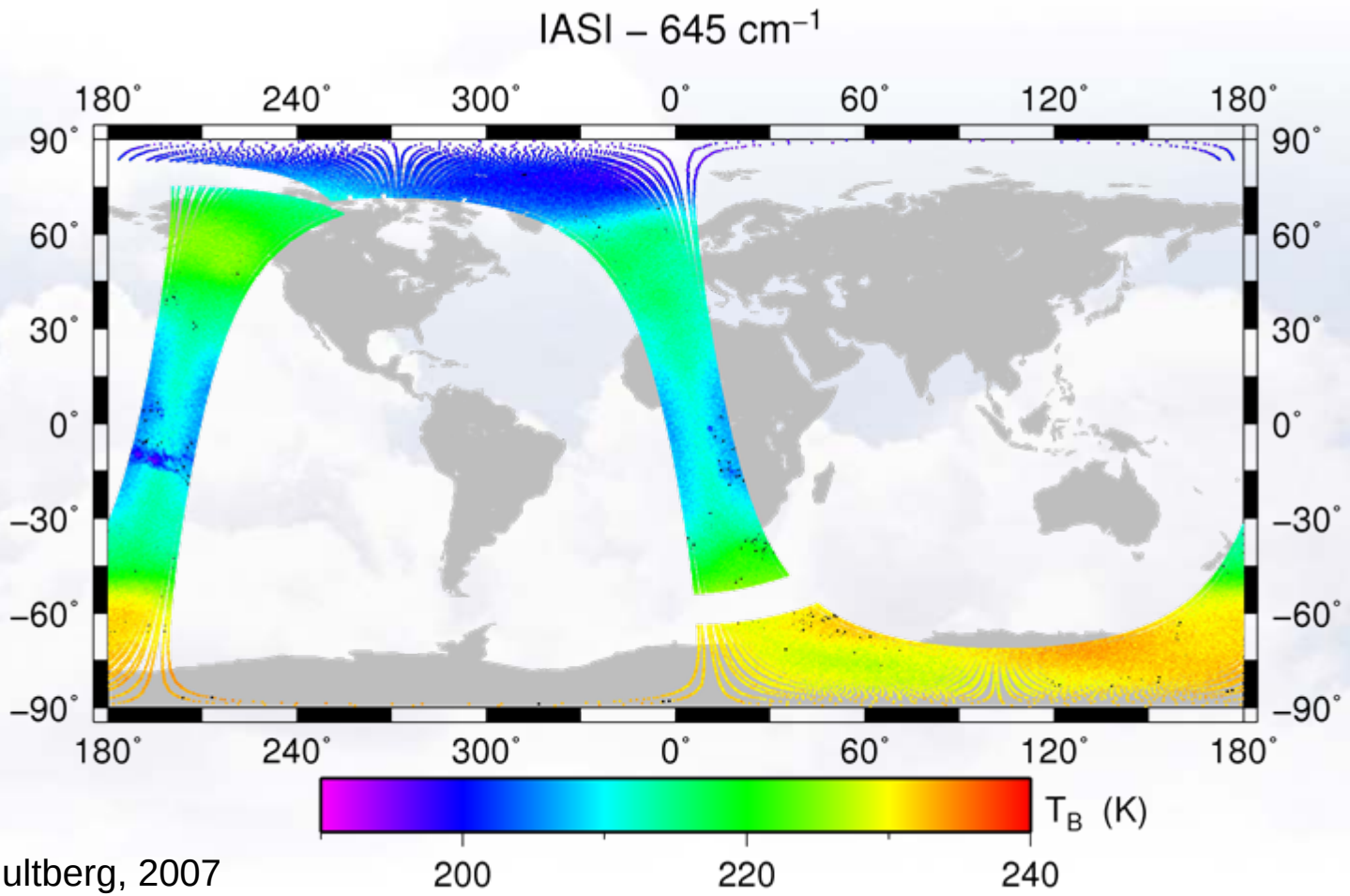
Image from EPS Web Site



HIRS 19 channels vs IASI 8461 spectral samples

IASI brightness temperatures 645 cm^{-1}

15 January 2007, 19:50 – 21:30 UTC

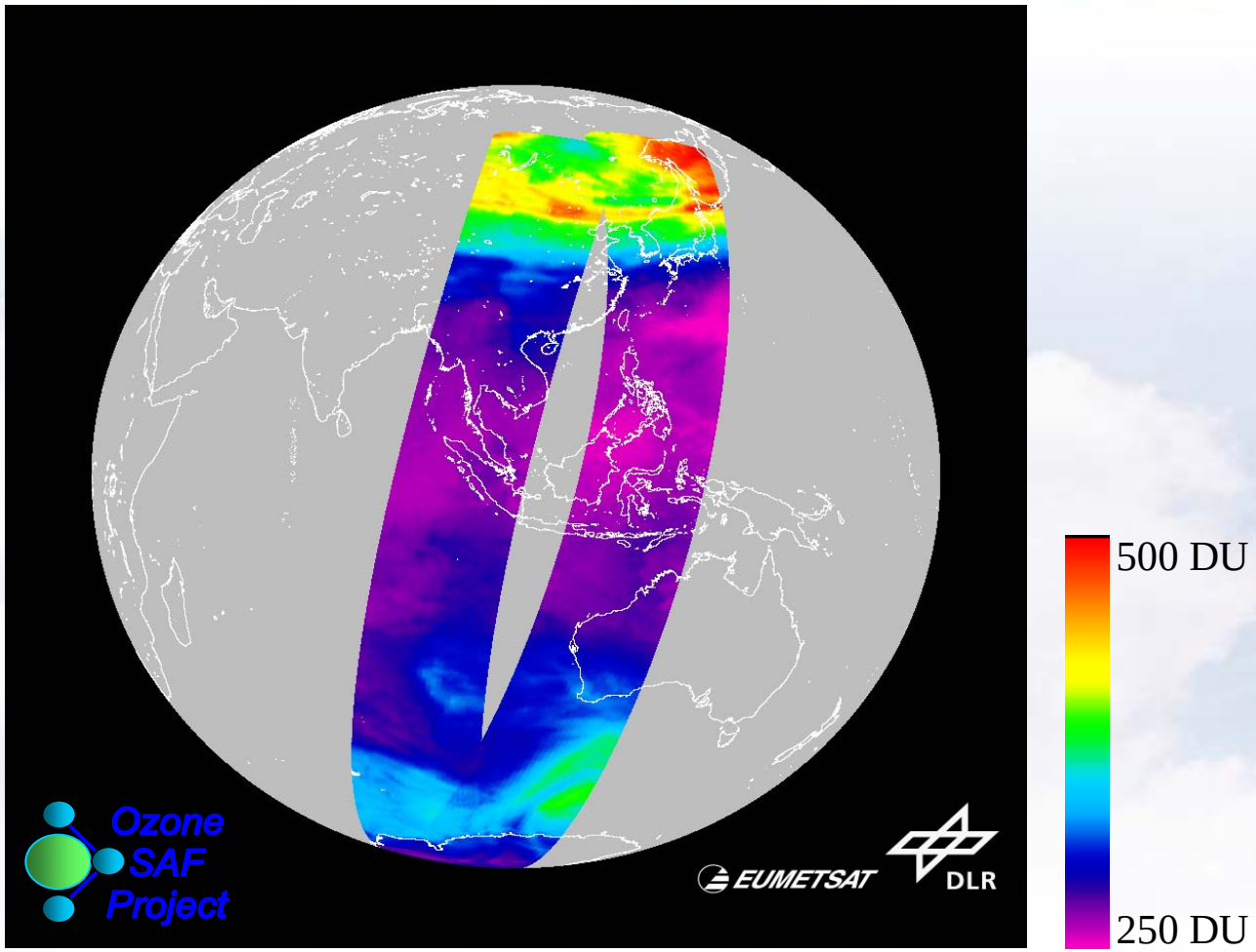


Schlüssel and Hultberg, 2007

GOME-2

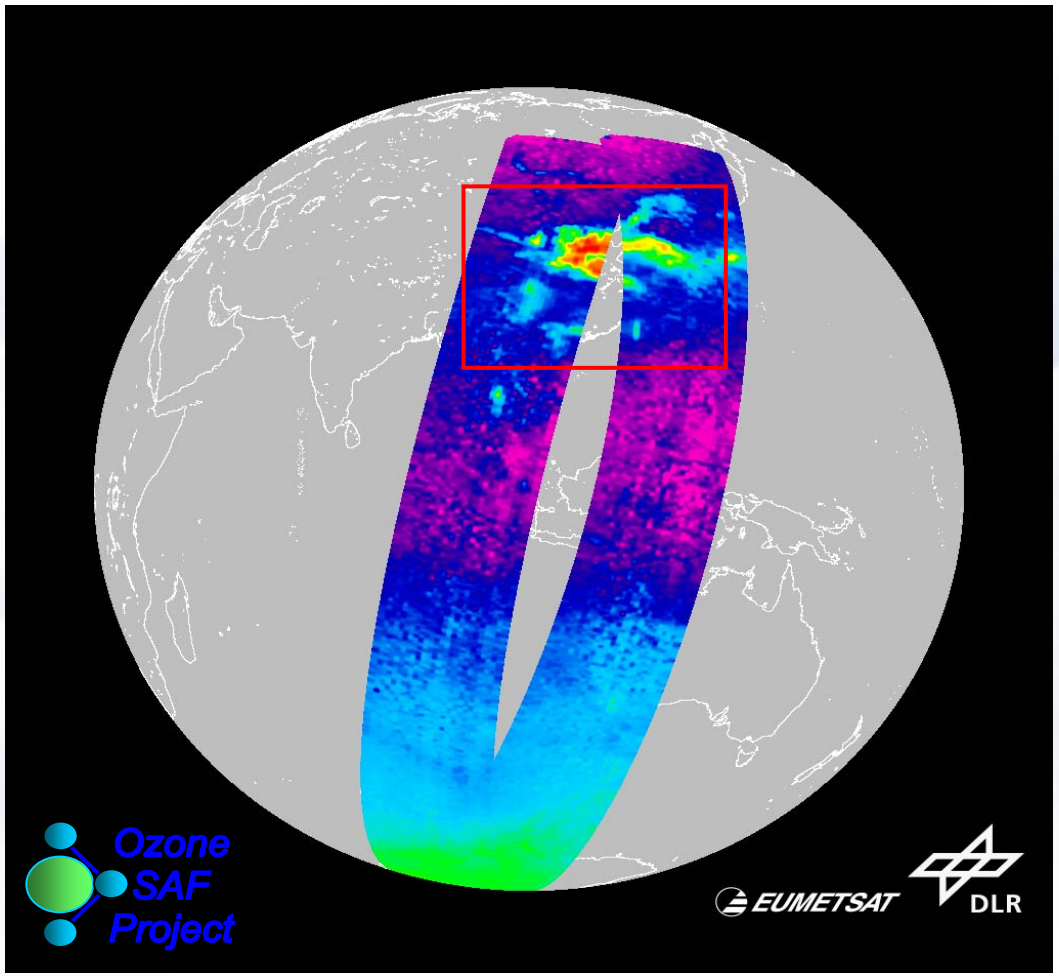
Image from EPS Web Site

First GOME-2 Ozone Total Column



Loyola, 2007

First GOME-2 Nitrogen Dioxide Total Column

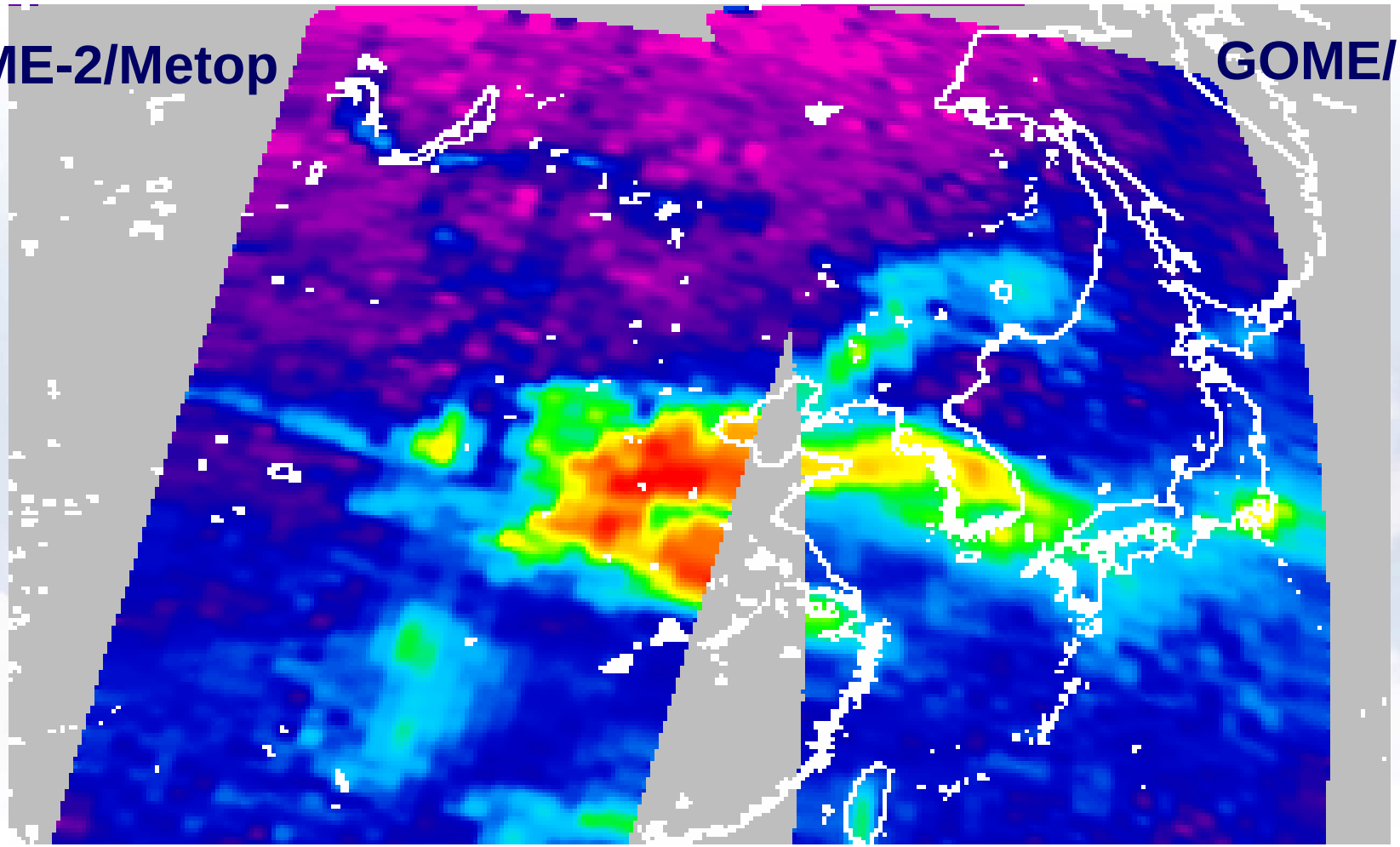


Loyola, 2007

GOME-2 Nitrogen Dioxide Total Column shows the improvement by GOME-2

GOME-2/Metop

GOME/ERS-2



Loyola, 2007

Advanced Scatterometer (ASCAT)

Wind vectors at the ocean surface - 25km and 12.5km

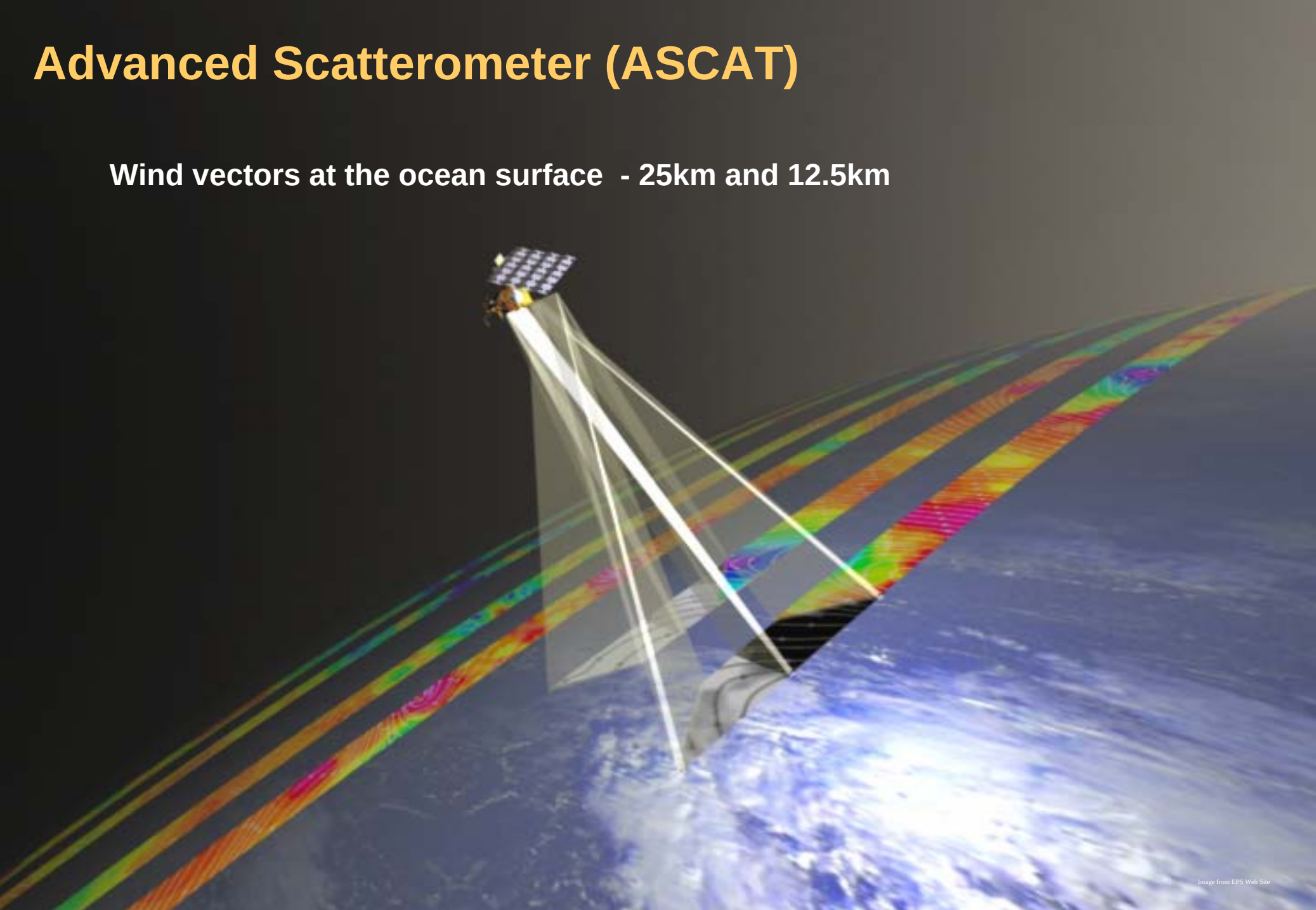
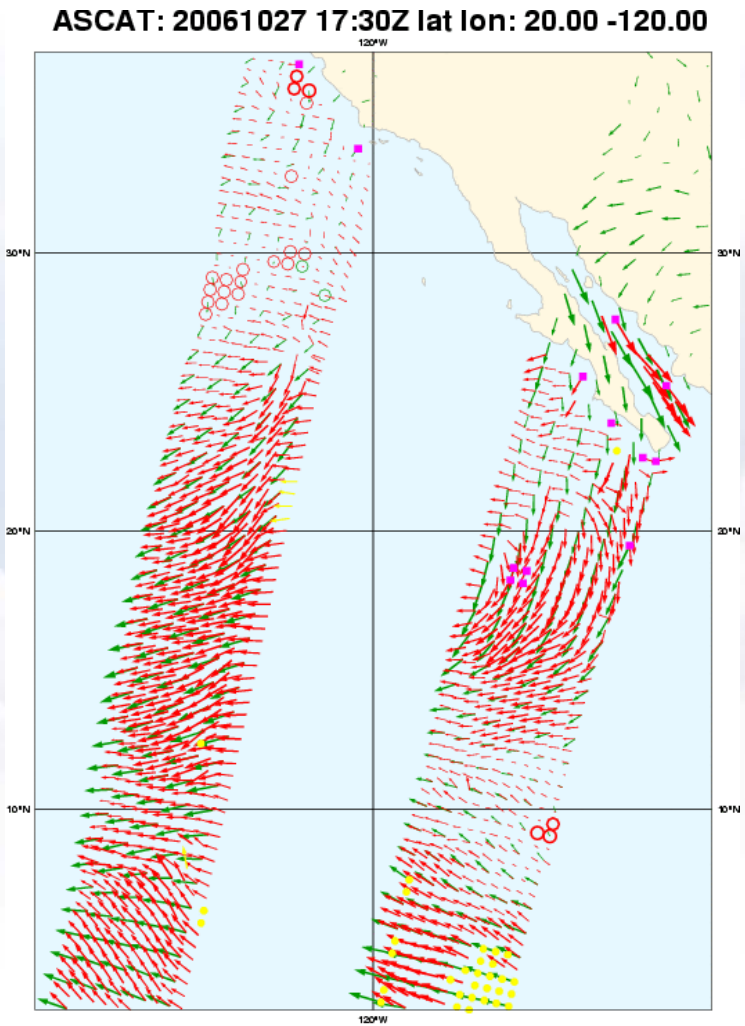


Image from EPS Web Site

Ocean winds by ASCAT

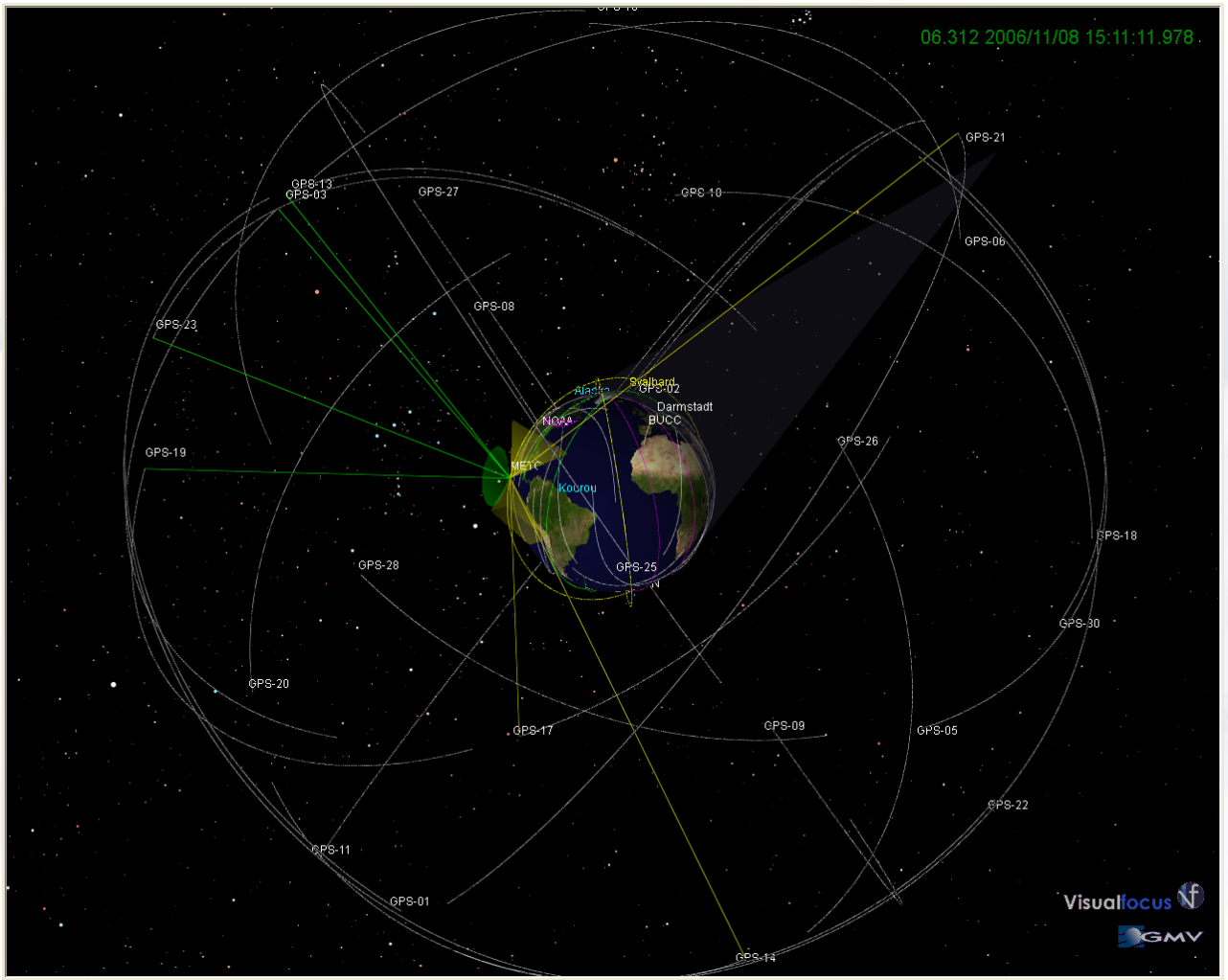


Ocean winds, produced by KNMI from ASCAT data

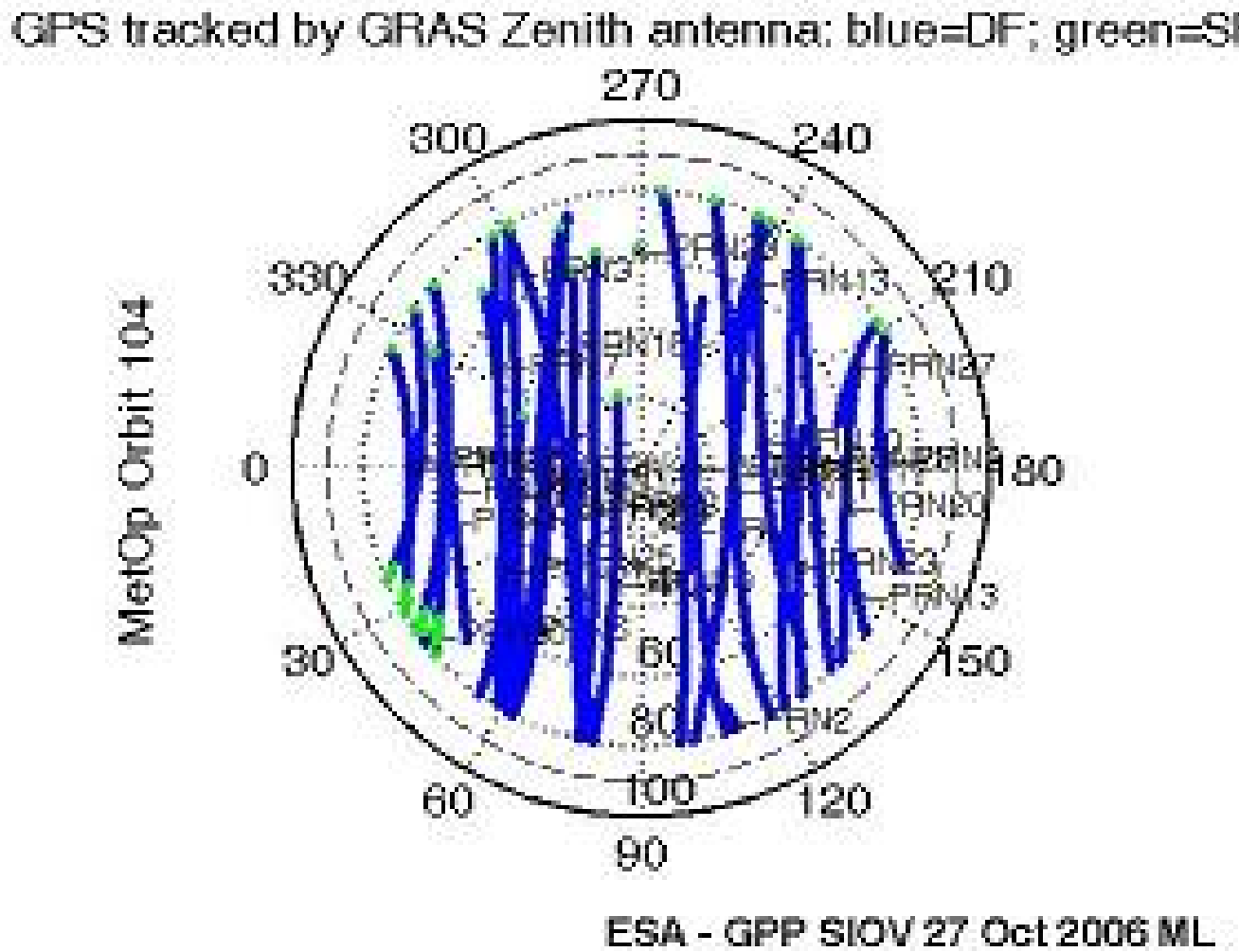
Compared with ECMWF winds (FG)

H. Hersbach, 2006

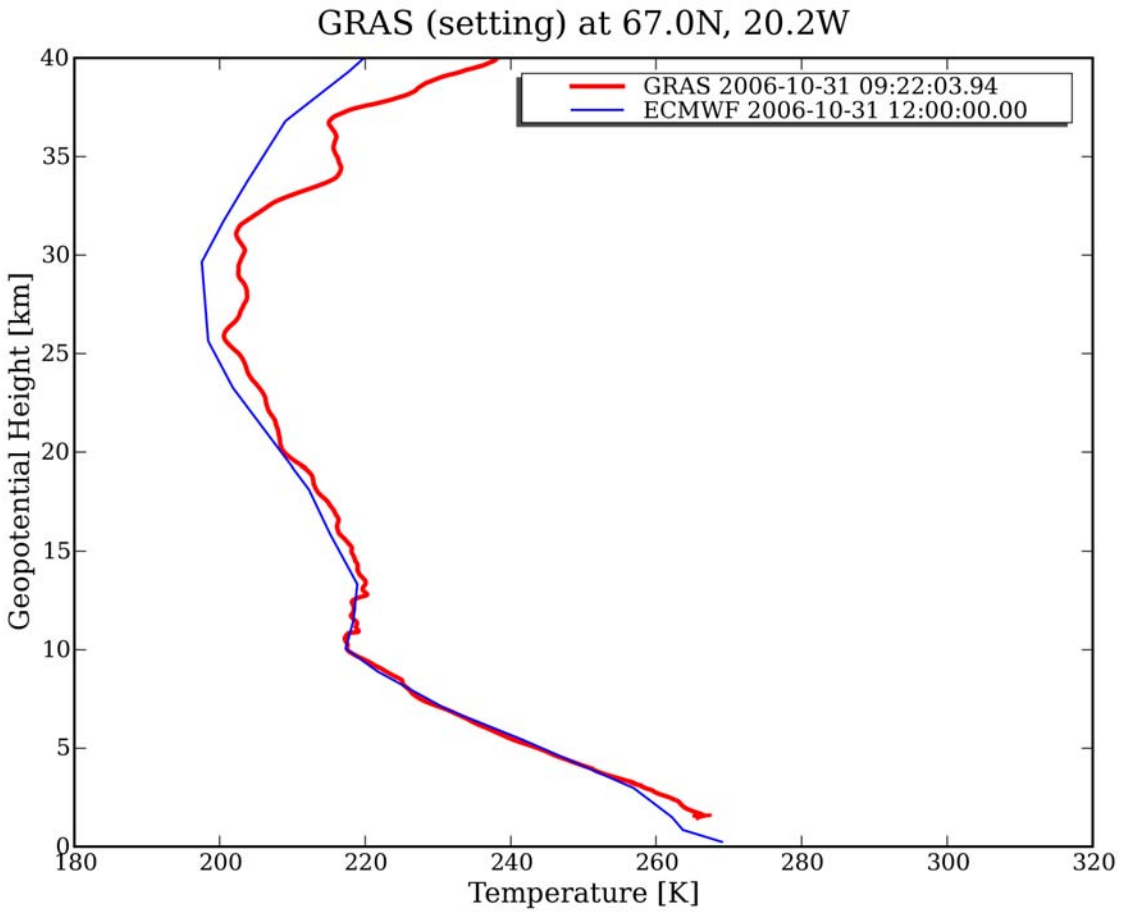
Tracking GPS satellites with GRAS



GPS tracked by GRAS



First GRAS retrievals – Setting occultations



- **"No frills" measurement reconstruction & dry temperature retrieval**
- **No raw sampling**
- **Initialised with CIRA climatology**
- **Compared with ECMWF operational analysis on 21 standard pressure levels**
- **Higher altitude biases related to known CIRA biases**

C. Marquardt
and the GRAS Team

Toward
MTG

MTG will provide continuity of EUMETSAT Services

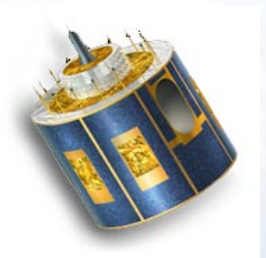
EUMETSAT Satellite Programmes

1977 — 2002 — 2015

MOP/MTP

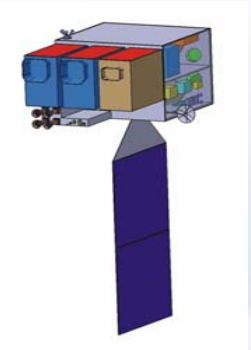
1 observation mission:
-MVIRI: 3 channels
-**Spinning** satellite
800 kg

MSG



2 observation missions:
- SEVIRI: 12 channels
- GERB
- **Spinning** satellite
Class 2-ton

MTG



3 or 4 observation missions:
- Combined Imager: 16 channels
- Infra-Red Sounder
- Lightning Imager ?
-**3-axis stabilised** satellite(s)
Class 3-ton

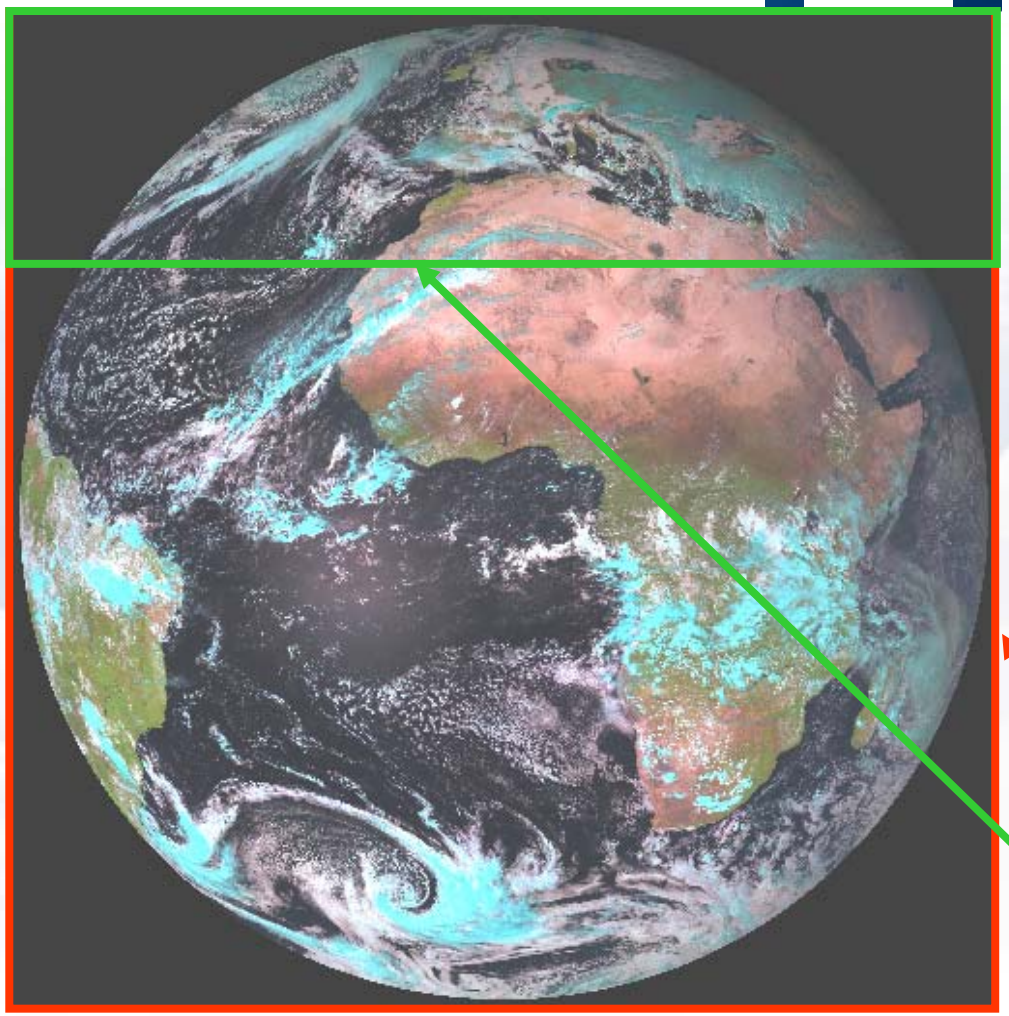
Implementation of the EUMETSAT Mandate for the Geostationary Mandatory Programme

... 30 years of continuous operations achieved ...

Possible Chemistry Mission UVS coordinated with ESA for implementation via GMES Sentinel 4/5

EUMETSAT

EUMETSAT Satellite Programmes



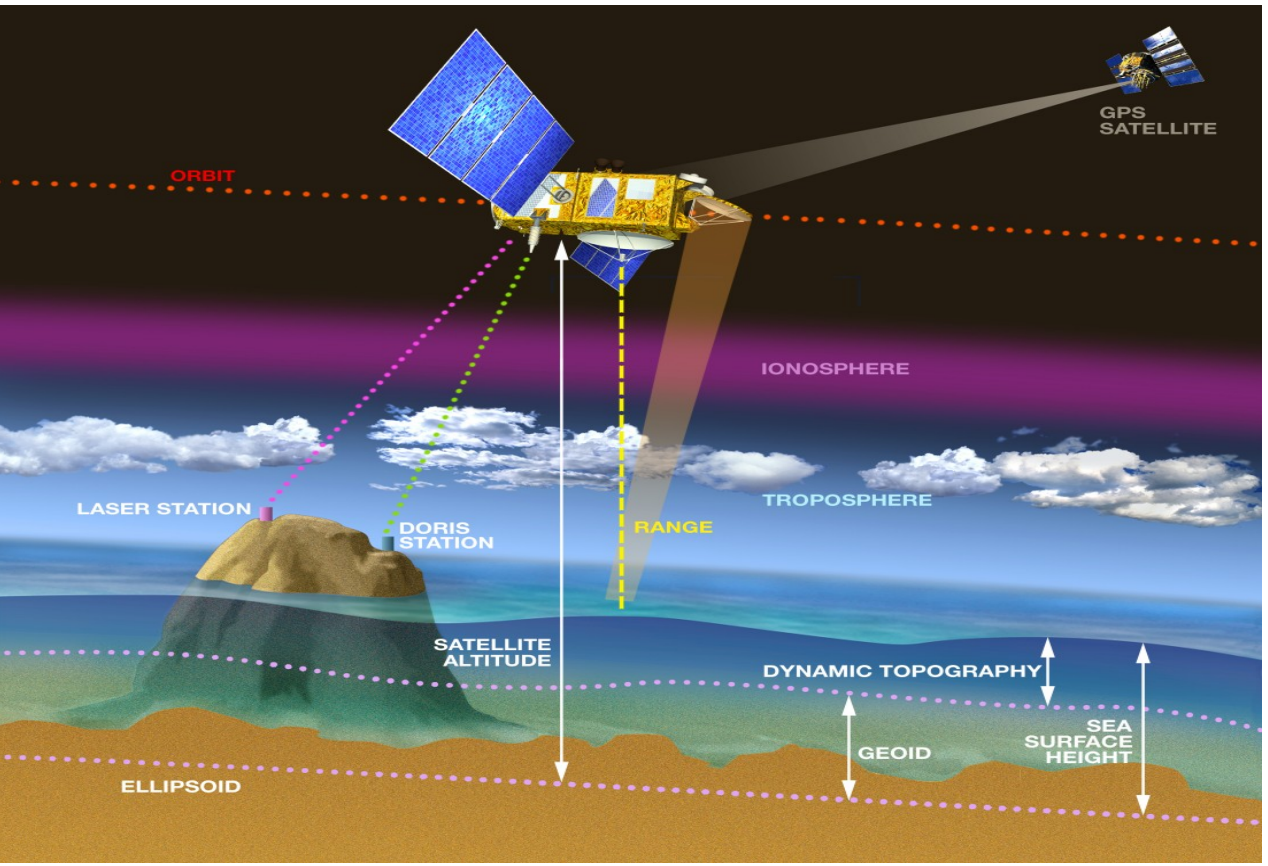
- MTG imagery missions served by a Flexible Combined (FC) imager
- Use of in-orbit spare satellite for rapid scan

FDHSI mission (continuation of MSG-SEVIRI):
FC imager on the operational satellite in Full Disk mode with 10 min repeat cycle

HRFI mission (continuation of Rapid Scan):
FC imager on fully commissioned in-orbit hot stand-by in Rapid Scan mode over ¼ of Full Disk with 2.5 min repeat cycle

	Coverage	Repeat cycle
FDHSI mission	Full Disk	10 min
HRFI mission	1/4 FD	2.5 min

EUMETSAT



Jason-2

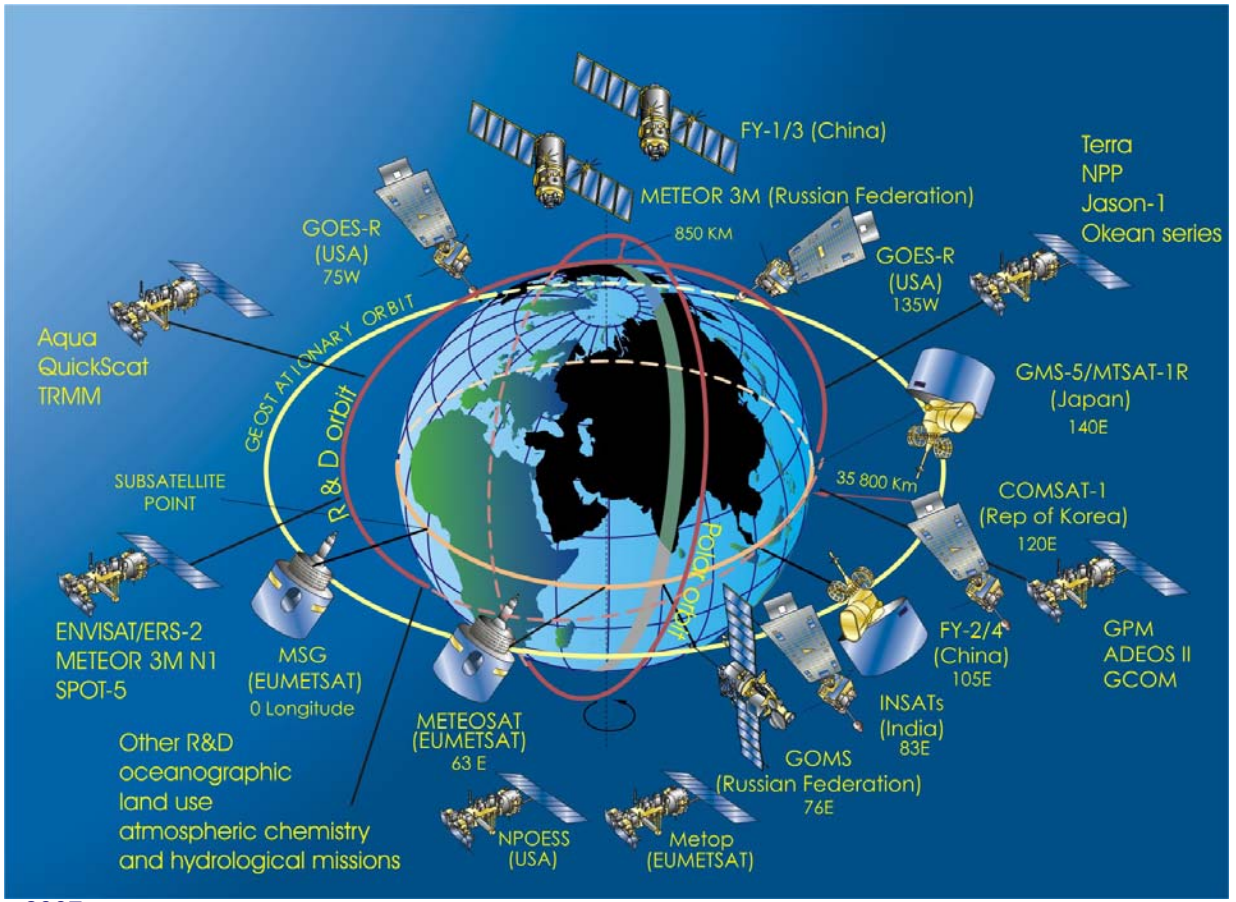
Precise and continuous altimetry data (in support of operational activities in marine meteorology, seasonal forecasting and oceanographic services) through laser technology

EUMETSAT Satellite Programmes

Goal: Ensure that the EUMETSAT activities are part of a coherent WMO global system

WMO system is designed to meet needs of our Member and Co-operating States

Recognition of European contribution to this global system



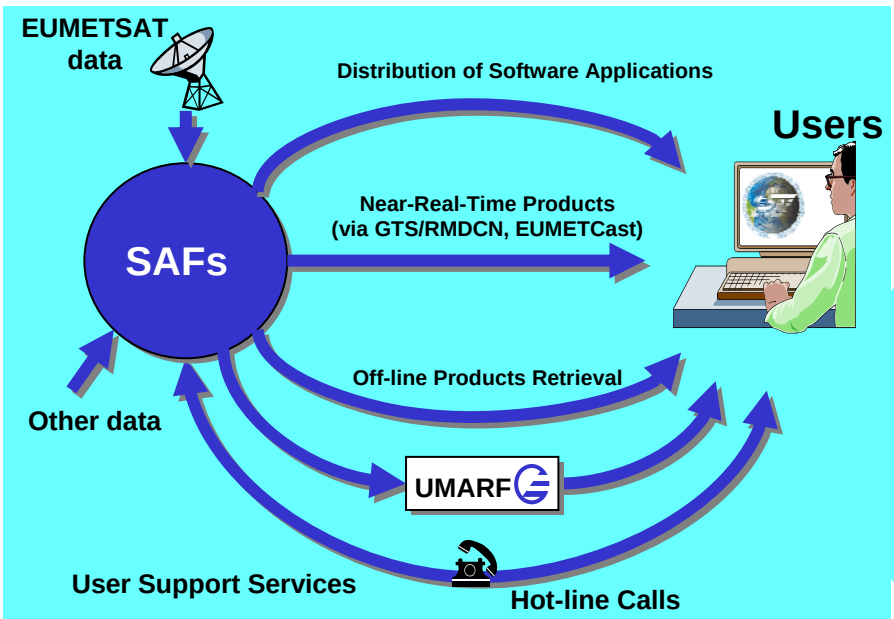
Key message:
Remain a recognised global actor

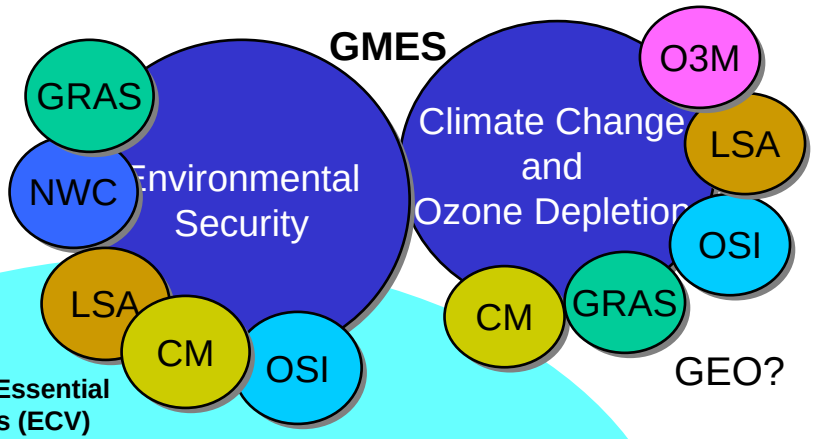
EUMETSAT Satellite Programmes

Goal: Maximise the use and ensure the maximum benefit is delivered from the EUMETSAT systems

Key Message:
Promote the use of key EUMETSAT infrastructures

SAF Interactions with Users





GCOS focus on Essential Climate Variables (ECV)

- **Currently feasible for global implementation**
- **High impact on the UNFCCC requirements**
- **New parameters to be added after on-going research**

GCOS related activities:

OSI SAF: Global Sea Ice
OSI SAF: Global Sea Surface Temperature
OSI SAF: Sea Ice Reprocessing
CM SAF: Global Humidity Product
Cross-SAF: Integrated SAF product

EUMETCast

EUMETSAT's Broadcast System for Environmental Data

- A multi-service dissemination system based on standard Digital Video Broadcast (DVB) technology
- Using commercial telecommunication geostationary satellites to multicast files (data and products) to a wide user community
- EUMETCast is now available for use by Global Earth Observation System of Systems (GEOSS), the European Global Monitoring for Environmental and Security (GMES) initiatives and other environmental data providers
- EUMETCast is also a EUMETSAT contribution to the Integrated Global Data Dissemination Service (IGDDS), a component of the World Meteorological Organization Information System (WIS)

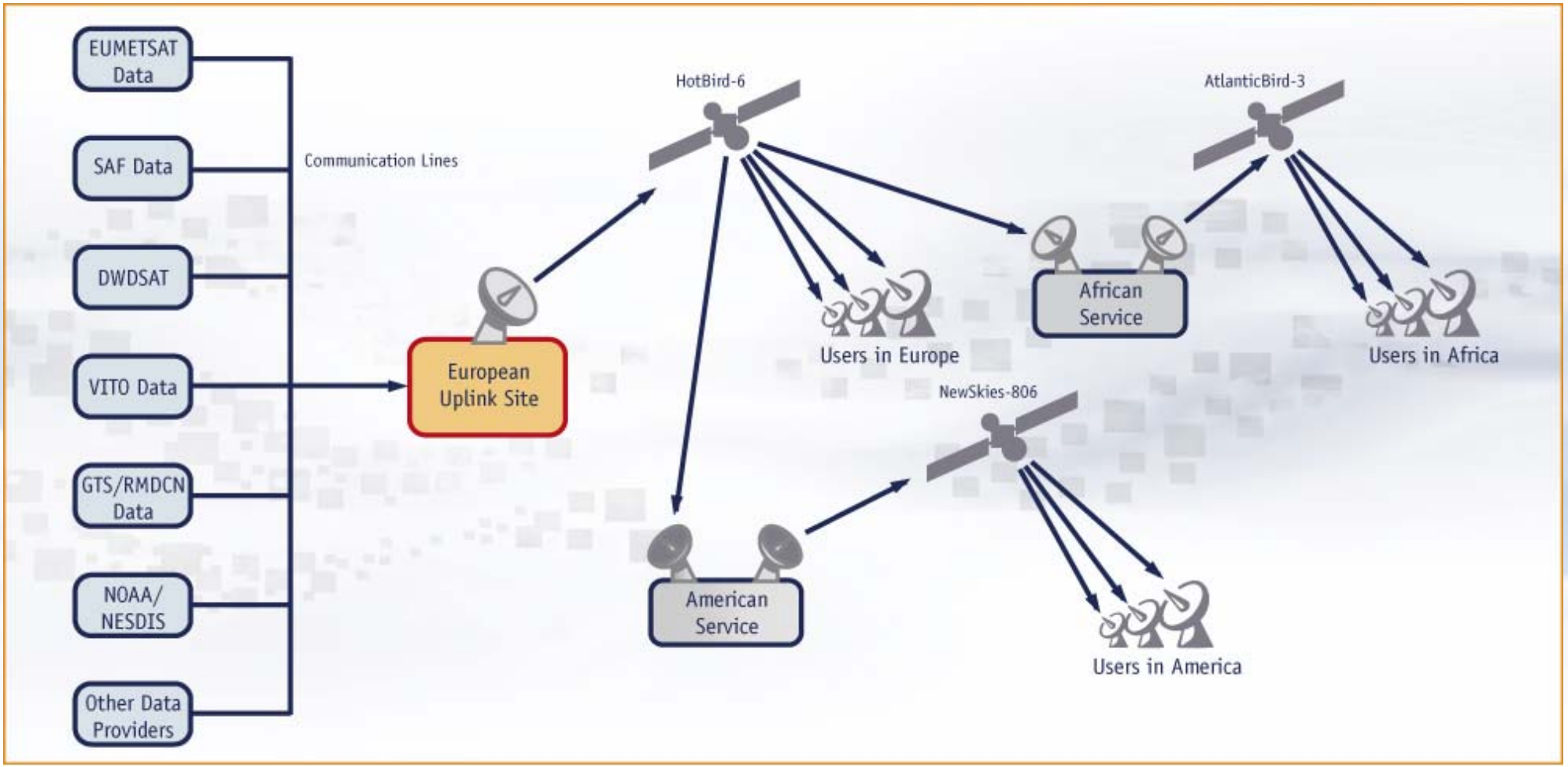
EUMETSAT

EUMETCast
Technical Approach & Standards

- Generic, multi-mission dissemination systems based on standard DVB multicast technology
- Uses commercial broadcast channels on TV, DTH telecommunication satellites
- Off-the shelf, commercially available reception equipment
- IP over DVB standard coding
- Use of standard formats/encoding - XRIT, BUFR, GRIB, HDF
- Secure access control at individual file and group of Users level
- Open, flexible, scalable architecture

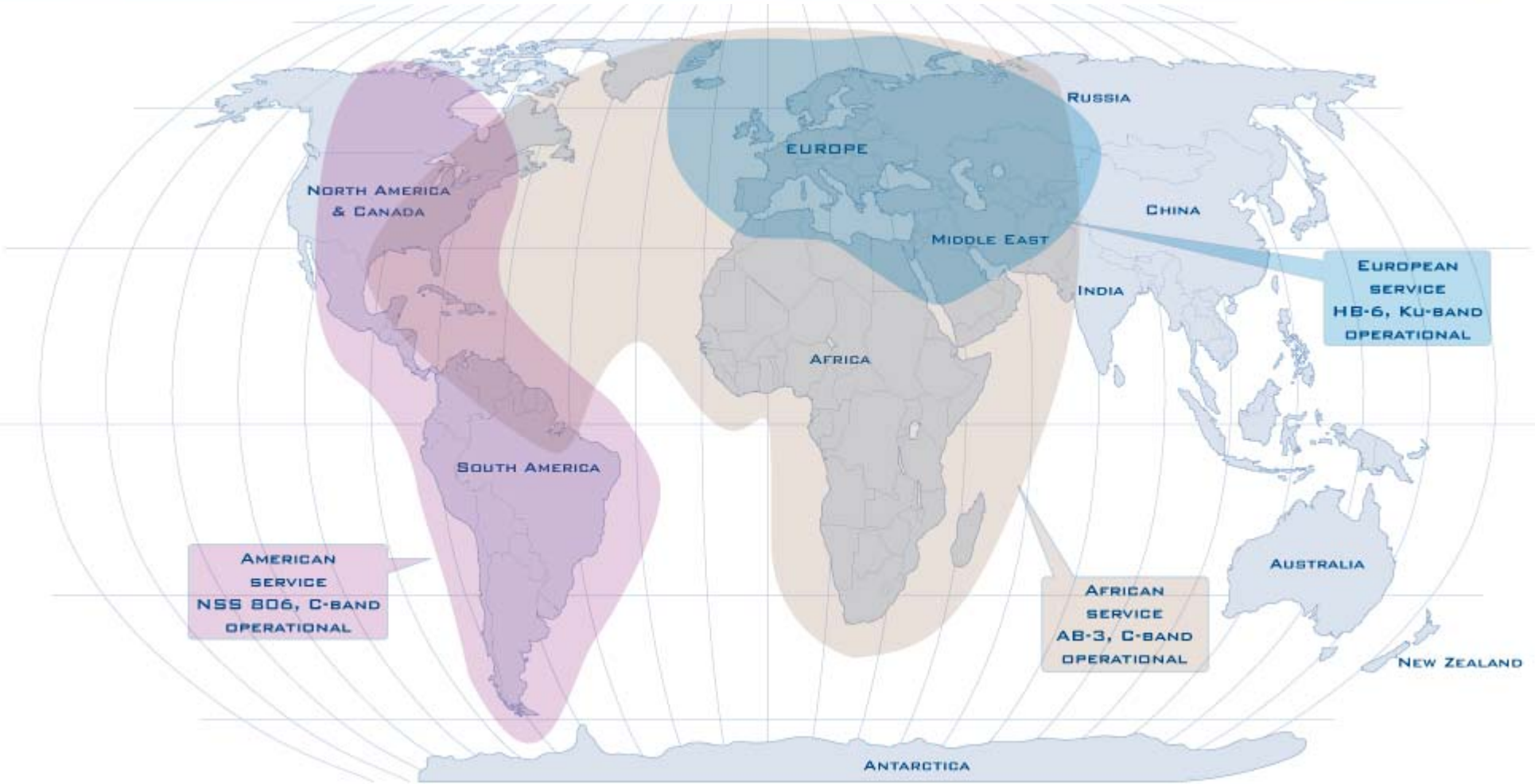
EUMETCast Overview

EUMETSAT Satellite Programmes



EUMETCast Coverage

EUMETSAT Satellite Programmes



EUMETSAT

EUMETCast (DVB) Standard Hardware - indicative costs

LNB/Feedhorn, Antenna	200 EUR
2 x PC, Hard Disk, Ethernet	2000 EUR
DVB PCI Card	100 EUR
EUMETCast Client Software	60 EUR
EUMETCast Key Unit (EKU)	40 EUR
Total (2 PCs)	2400 EUR
Total (1 PC)	1400 EUR

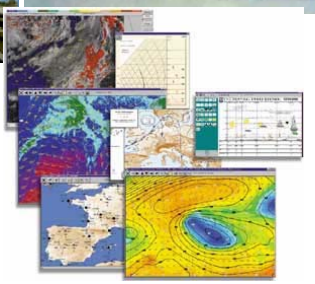
EUMETSAT

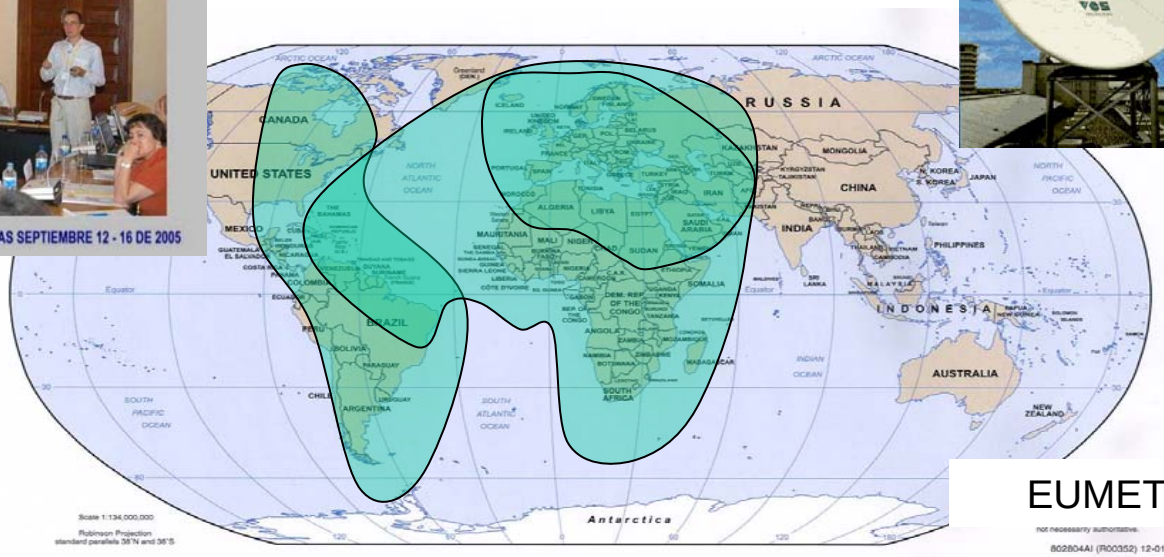
EUMETSAT Satellite Programmes

Goal: Extend the EUMETSAT user base through collaboration in research, training support and assistance to countries in Europe and the developing world in the exploitation of EUMETSAT data

Key Message:
Broaden the user communities

PUMA





EUMETCAST

The Role of EUMETSAT in Training

- To act as a catalyst, promoting training in use of satellite data in Member & Cooperating States
- No competition with training institutes of larger Member State but close cooperation (Germany, UK, France etc.)
- Expertise from Member or Cooperating States often used at EUMETSAT training courses, workshops, etc.
- EUMETSAT often takes the lead when the scope of a training activity is too big for one country: EUMeTrain, SATMANU, MSG Interpretation Guide, etc.

EUMETSAT's training is achieved through:

- Classroom courses
- Preparation of training material (e.g. CAL modules)
- Distant learning activities (e.g. VisitView)
- Preparation of Web content

The EUMETSAT distance learning Web Page at:

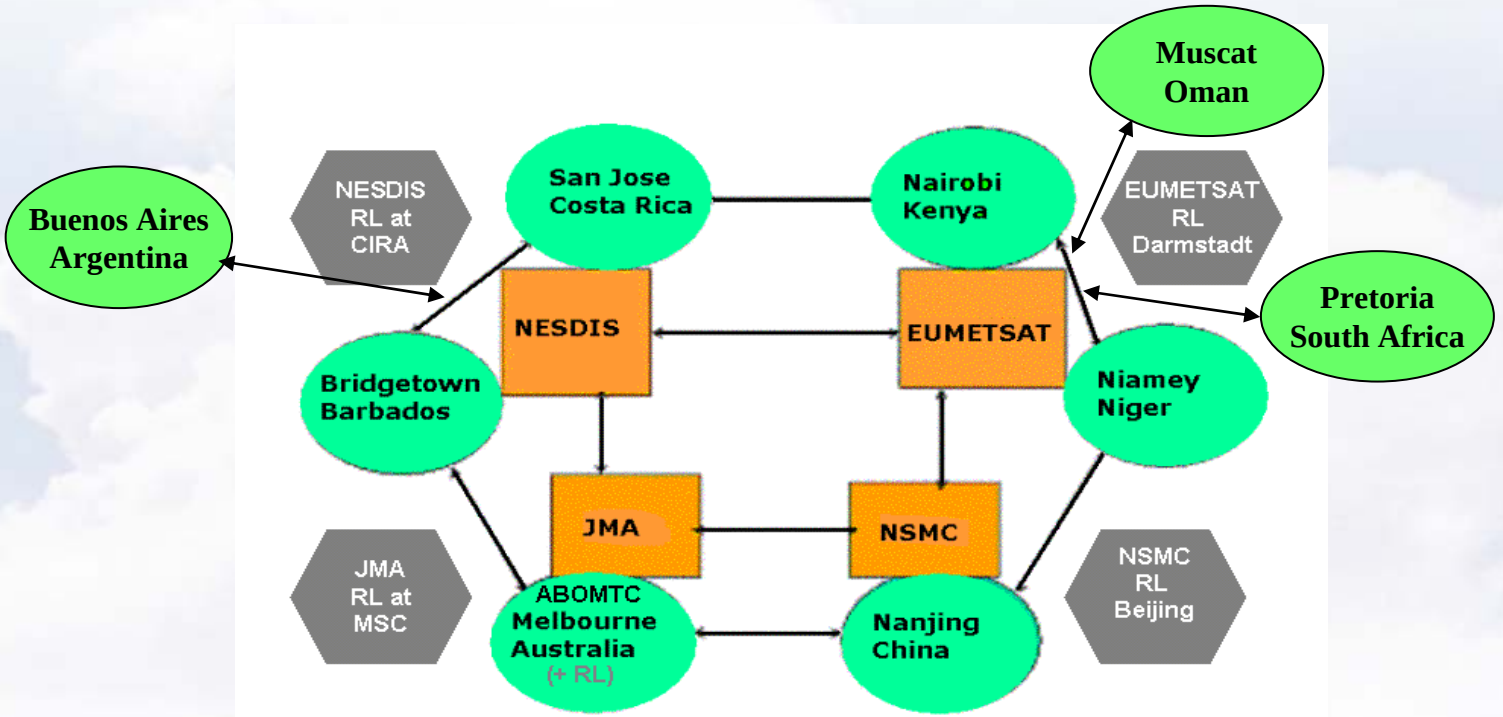
http://www.eumetsat.int/idcplg?IdcService=SS_GET_PAGE&nodeId=532&l=en

EUMETSAT Satellite Programmes

- EUMETSAT's training activities focus primarily on operational personnel from weather services of Member States and Co-operating States.
- Training outside Member States is coordinated in Europe through EUMETCAL and worldwide with the WMO.
- International Training Cooperation with NOAA and COMET.

EUMETSAT Satellite Programmes

EUMETSAT like NOAA, JMA and CMA contributes to the WMO Virtual Laboratory for Education and Training.

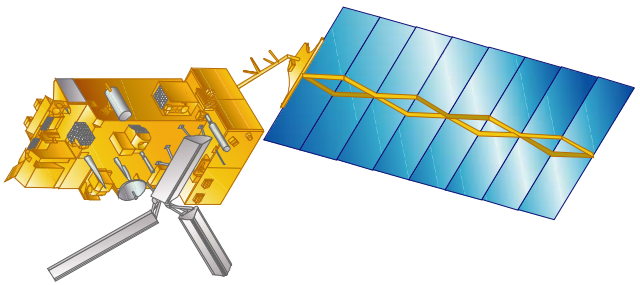


EUMETSAT Satellite Programmes

Goal: Identify partners for potential EUMETSAT optional or third party programmes or for enhancement of future mandatory Programmes.

Post-EPS partners.

USA, Canada



Group on Earth Observation
Objective: to put in place a Global Earth Observation System of Systems (GEOSS).

EUMETSAT wants to be part of this global system and contribute directly (i.e. GEONETCast)

Key Message:
Build EUMETAST global player profile through international partnerships

Potential Areas of Cooperation with UNIDATA:

- Joint training efforts, especially in Africa (e.g. Sahel Conference 2007)
- Investigations of archive interoperability (e.g. THREDDS server at EUMETSAT ?)
- Data distribution to universities (using LDM ?)
- Interest in usage of the IDV tools for training and scientific cooperation

Thank you
for your attention !