# *Report on a Multi-GNSS Demonstration project in the Asia/Oceania region*

## - Asia Oceania is the “Showcase of New GNSS Era” -

Japan Aerospace Exploration Agency

ICG 5@Turin, Italy

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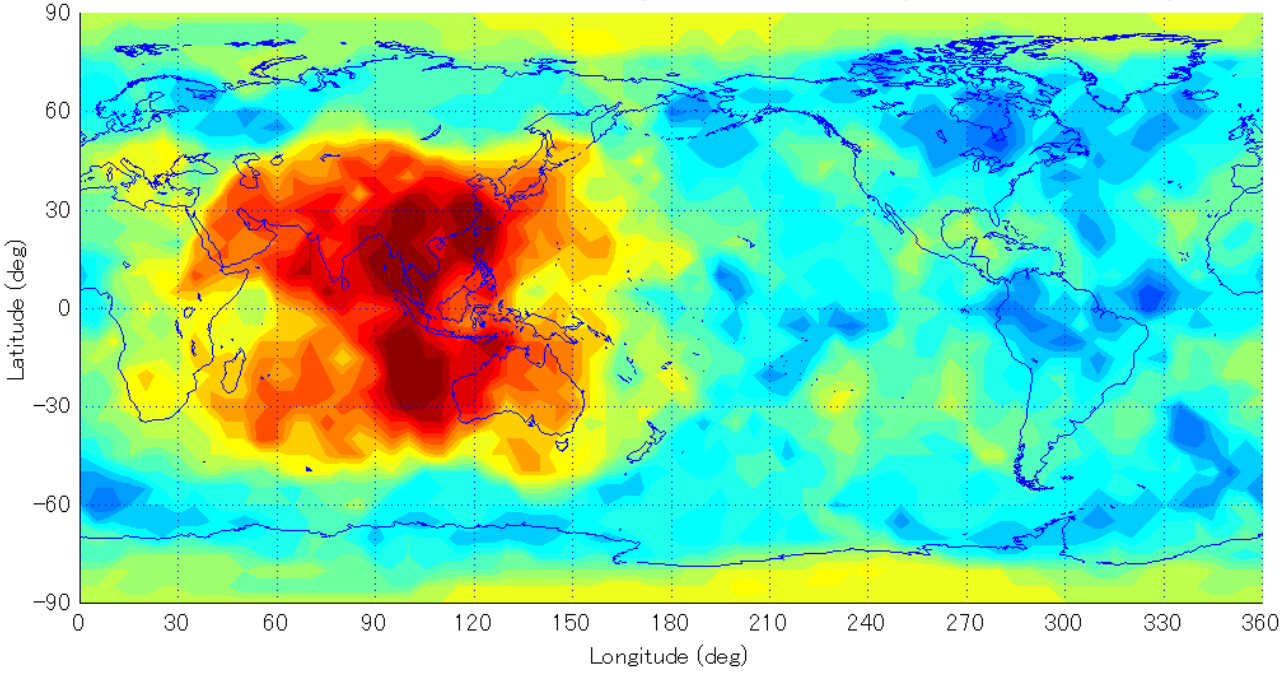
# Background
# Showcase of New GNSS Era

Visible satellite number (mask angle 30 degrees)




**2020:**

**GPS(27)+Glonass(24)+Galileo(30)+COMPASS(35)+IRNSS(7)+QZSS(3)+SBAS(7)**

# Background
# Showcase of New GNSS Era

- **In Asia Oceania region, we can utilize**

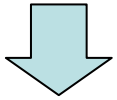
  Four major global systems
  - GPS (24 SVs in nominal constellation, currently 32 SVs)
  - GLONASS (24 SVs)
  - Galileo (27 + spare 3 = 30 SVs)
  - Future COMPASS (35 SVs)

  Plus two regional satellite PNT systems and SBAS
  - QZSS (3 SVs)
  - IRNSS (7 SVs)
  - MSAS, GAGAN (2 SVs, respectively)

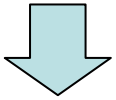
- **New modernized GNSS signals, multi-frequency and multi-GNSS signals can be utilized earlier rather than other region in the world**

# Background
# Showcase of New GNSS Era

- User benefits from Multi GNSS
  - Increase in usable SVs, signals and frequencies



  - Increase in availability and coverage
  - More robust and reliable services
  - Higher accuracy in bad conditions
  - Less expensive high-end services



Emerging new and expanding existing applications are to be expected.

# Multi-GNSS Demonstration Campaign

Objectives

- Encourage and promote the introduction and utilization of satellite PNT services in the Asia and Oceania region through assistance with the integration of GNSS services into their infrastructures;
- Promote new multi-GNSS utilization and applications in the region and feedback needs and requirements related to interoperability from user communities to GNSS providers
- Encourage GNSS provider and users in Asia Oceania region to develop new applications and carry out experiment or demonstration jointly.

# Multi-GNSS Demonstration Campaign

*Asia Oceania Multi-GNSS Demonstration Campaign*

- *is a series of activities for five years from 2010*
- *comprises the following parts*

1. *Multi-GNSS Monitoring Network*
   - *CORS* (Continuously Operating Reference System), *Data center*, *Analysis Center*
   - *Sharing resources and observed data among participated organization*
2. *Applications Development & Demonstration*
   - *Development of multi GNSS applications*
   - *Carrying out Experiments and Demonstrations*
3. *Regional Work Shop*
   - *Annual base Workshop in Asia Oceania region*
   - *Announcement of joint experiment plans and reporting results of the experiments*

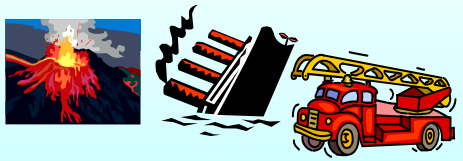
## *Multi-GNSS Demonstration Campaign*

# *Planned Applications*

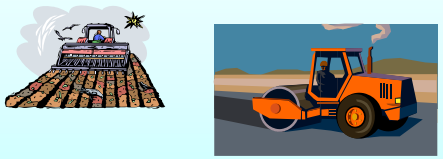
### *Monitoring Network*

### *Application Demonstration*

#### *Disaster Mitigation*



#### *Precise Positioning*



#### *ITS, Mapping, LBS*

#### *Other, ionospheric observation etc*

### *Regional Workshop*

*1st Asia Oceania Regional Workshop on GNSS, 25,26 JAN, 2010, Bangkok*


*195 Participants, 18 Countries, 95 Organizations*

***Next is 21,22 Nov. 2010 @ Melbourne, Australia***

# Progress after the previous ICG(1/3)

- *The concept of "Multi-GNSS demo. Campaign" was presented at ICG-4 and obtained endorsements from Two WGs (WG-A and D)*
- *The first regional Workshop was held at Bangkok, Thailand on January 25-26, 2010 successfully.*
  - *195 participants from 18 countries*
  - *4 discussion groups were established for future joint experiments*
    1. *Multi-GNSS observation network*
    2. *Disaster Mitigation and Management*
    3. *Precise Positioning*
    4. *ITS&LBS*

# Progress after the previous ICG(2/3)

- *JAXA is developing 30 multi-GNSS receivers for the establishment of multi-GNSS observation network.*
  - *Commercial-base 3G receiver is being modified to track and process QZSS signals.*
  - *Those receivers will be used for domestic technical demonstration in Japan in 2011, will provide IGS stations and/or relevant institutes in Asia and Oceania region.*
- *Participation in APEC GIT meeting at Seattle on June 21-24, 2010.*
  - *The proposal was adopted as one of new project on the GIT work plan.*

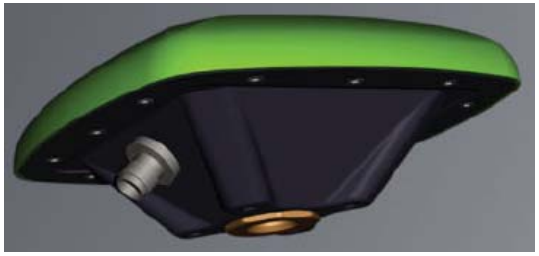
# *User Receivers / JAXA's approach*
# *Receiver Distribution*

***JAXA is developing and will distribute (rents out) receivers.***

***The receivers and antennas are based on the followings.***

- JAVAD Delta-G3T
  - 216 channels
  - 0.4kg


- JAVAD GrANT-G3T
  - 0.5kg



# *User Receivers / JAXA's approach*

# *Receiver Specification*

| GNSS | Signal | Reception |
|---|---|---|
| GPS | L1-C/A, L2C, L5 | ○ |
| | L1P, L2P(Y) | ○ |
| | L1C | ○ |
| GLONASS | L1-C/A, L1P, L2-C/A, L2P | ○ |
| GALILEO | E1, E5a | ○ |
| QZSS | L1-C/A, L1-SAIF, L2C, L5 | ○ |
| | L1C | ○ |

- Interface
  - TNC (~Antenna)
  - BNC (~Reference Frequency input)
  - Ethernet、USB、RS232C(~PC)
- Output data format
  - NMEA0183 v2.3, v3.0~
  - RINEXv2.11, v3.0
  - RTCMv2.3, v3.0~
  - BINEX

Update of above data formats which includes QZSS is being investigated with IGS and related organization.

# Progress after the previous ICG(3/3)

- *Participation in IGS Workshop at Newcastle, UK on June 27- July 2, 2010*
  - *IGS adopted the recommendation to support the proposal.*
  - *Investigation on some data exchange formats, such as RINEX, BINEX, RTCM etc. was started to include QZSS into those formats as a new constellation.*

# 2nd Asia Oceania Regional GNSS Workshop

- *The 2nd Workshop is to be held in Melbourne, Australia on November 21-22, 2010.*
  - *To discuss future joint demonstration projects*
    - *Multi-GNSS Monitoring NW*
    - *Disaster Mitigation*
    - *Precise Positioning*
    - *Intelligent Transportation System (ITS)*
    - *Mapping, Location Based System*


  - *JAXA will announce the launch of MGA (Multi-GNSS Asia) which is framework, organization to manage the proposed activities*

**http://www.multignss.asia/**

# Next Steps

- *More close communications with ICG*
  - *Frequent activity reports and discussion during each ICG and Providers forum.*
  - *Inviting ICG WG-A and D co-chairs to be members of the steering committee in MGA.*
- *To be more attractive and aggressive activities*
  - *Call for contributions from other providers and industry*
    - *Multi-GNSS receiver for*
      - *Monitoring Network*
      - *Applications demonstration*
    - *Proposal for joint applications demonstration*