



# ***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

October 19, 2010

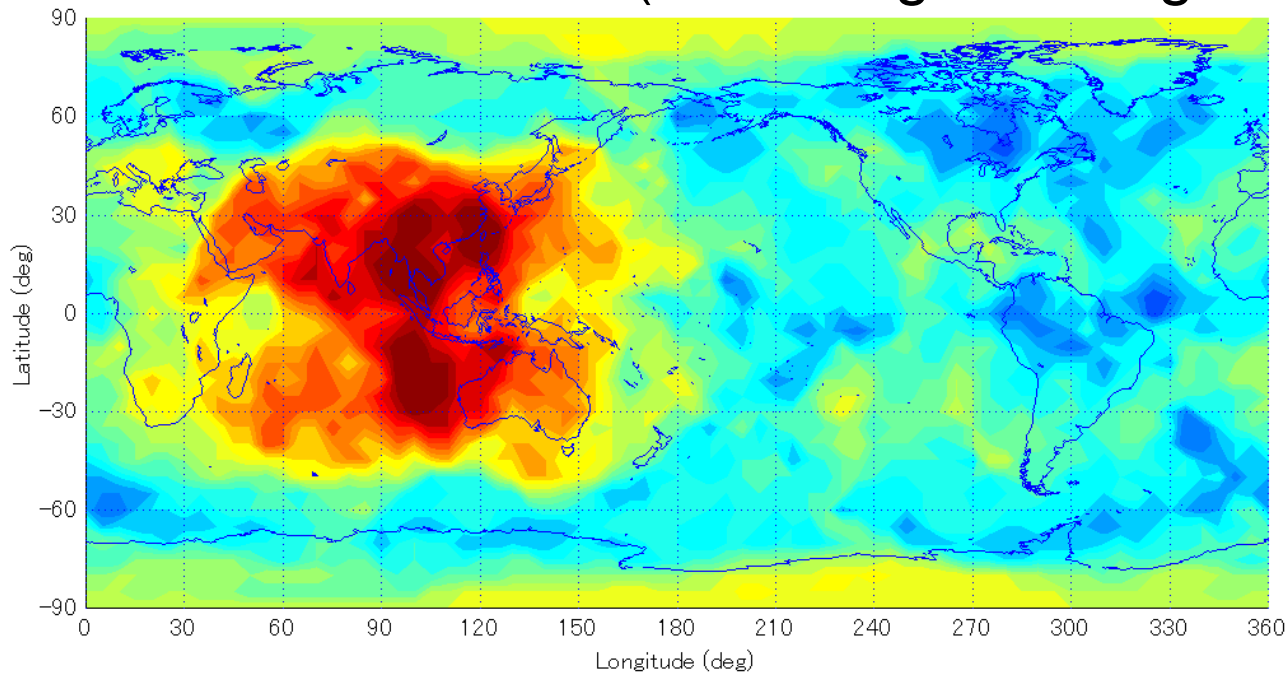
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# Background

## 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**

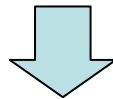
# Background

## 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

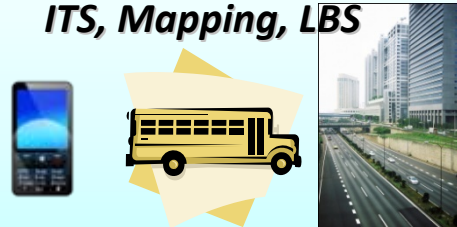
### Disaster Mitigation



### Precise Positioning



### ITS, Mapping, LBS



### Other, ionospheric observation etc

## Regional Workshop

**1<sup>st</sup> 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**



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# 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.***

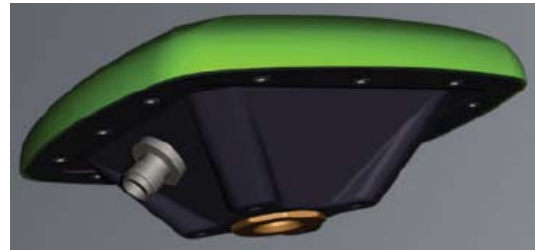
## ■ JAVAD Delta-G3T

- 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.*

# 2<sup>nd</sup> Asia Oceania Regional GNSS Workshop

- *The 2<sup>nd</sup> 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*