



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

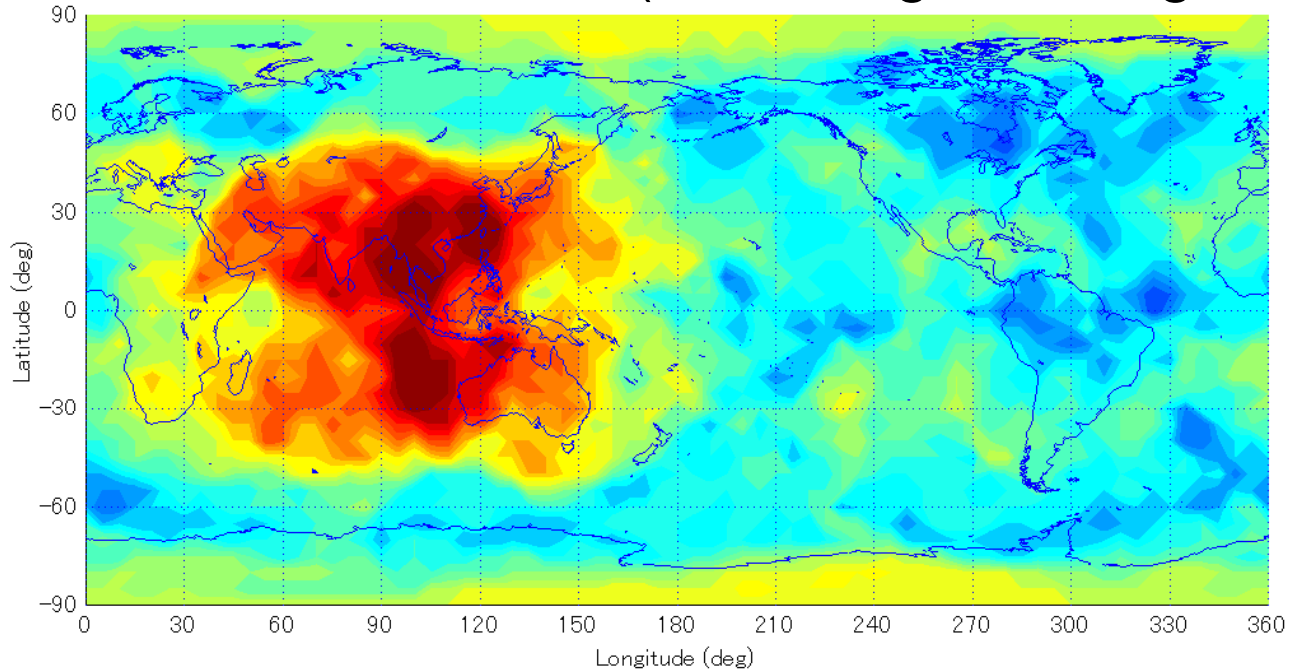
Contents

- Back Ground
- Multi-GNSS demonstration campaign
- Progress after the previous ICG at St. Petersburg
- Next Steps

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

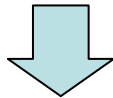
- QZSS (3 SVs)
- IRNSS (7 SVs)
- MSAS, GAGAN (2 SVs, respectively)

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

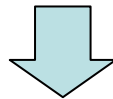
Background

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

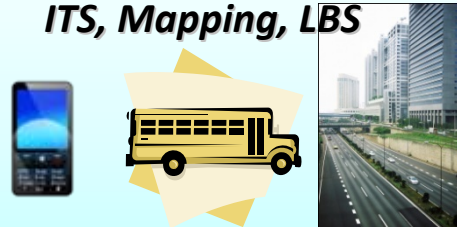
Disaster Mitigation



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



© Tourism Australia

© Tourism 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.

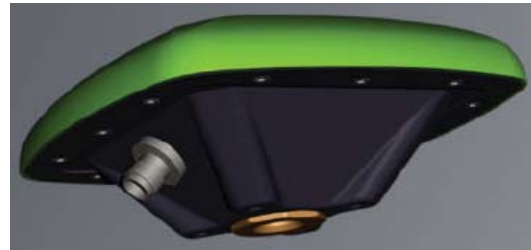
■ JAVAD Delta-G3T

- 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*