

Multi-GNSS Demonstration Campaign

THE FRAMEWORK OF MULTI-GNSS ASIA



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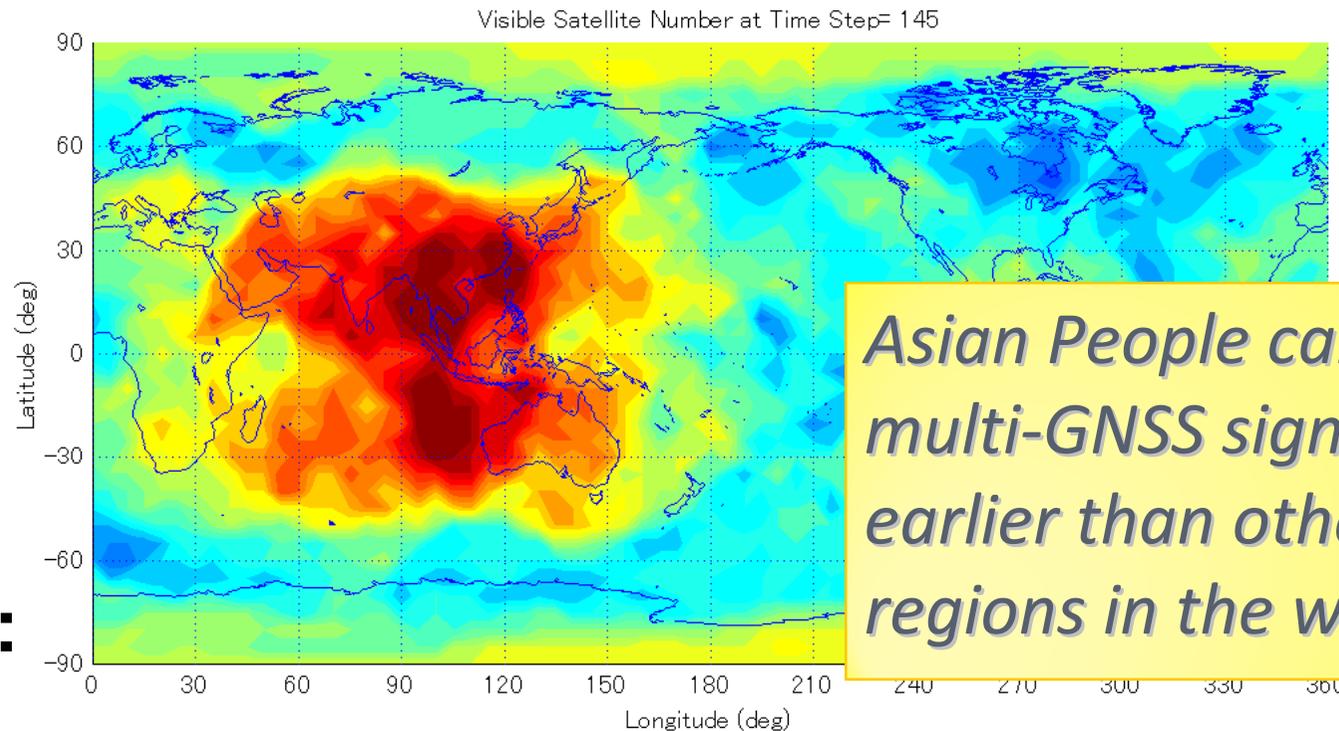
- Background of Multi-GNSS Demonstration Campaign
- What is Multi-GNSS Asia?
- Framework of MGA
- Three activities of MGA
 - What is MGM?
 - 2nd Call for Joint Experiment
 - 4th AOR WS on Multi-GNSS

BACKGROUND

SHOWCASE OF NEW GNSS ERA



Visible satellite number (mask angle 30 degrees)



Asian People can use multi-GNSS signals earlier than other regions in the world

2020:

Asia Oceania Multi-GNSS Demonstration Campaign

MGA was established by JAXA in 2010.



BACKGROUND - USER BENEFITS -

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



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



Emerging of new applications and expansion of existing applications are expected.

*This the background of
Multi-GNSS Asia Campaign.*

Multi-GNSS Demonstration Campaign



- *Multi-GNSS Asia (MGA)” is an international organization to promote and support activities of the “Asia Oceania Multi-GNSS Demonstration Campaign”*
- *We started the activity by holding the first workshop in 2009.*



ORGANIZATION OF MGA

MGA Member

Co Chairs

Prof. Akio Yasuda, Tokyo University of Marine Science and Technology

Prof. Chris Rizos, University of New South Wales

Steering Committee

Secretariat

JAXA

Observers

Government agencies and international organizations related to GNSS utilization in the region

Network Sub-Committee for MGM

Working Groups

Precise Positioning WG

Disaster Management WG

ITS WG

Team Tsunami Monitoring

Team GNSS Meteorology

Team Landslide Monitoring

New WG:

Capacity building and Education on GNSS



in either group or committee

Multi-GNSS Demonstration Campaign



- *As for the educational organization for foreign students, we are working intensively to establish university consortium to teach following items and also seeking fund.*
- *GNSS, Geographic Information System, Remote Sensing, System Management*
- *GNSS teaching materials, such as high performance software receiver and positioning software tools are already prepared by the staffs at Tokyo University of Marine Science and Technology.*



PARTICIPANTS IN MGA

- The organizations which have interests in GNSS utilization in Asia Oceania region are expected to participate.:
 - Government agencies,
 - Universities, and research institutes
 - International organizations
 - Industries such as receiver manufacturer, service providers
 - GNSS providers

Please visit to

http://www.multignss.asia/howto_join_mga.html

ORGANIZATIONS



No	Organizations	Countries
1	Beach Building & Civil Group (BBCG)	Australia
2	RMIT University (RMIT)	Australia
3	Japan Aerospace Exploration Agency (JAXA)	Japan 
4	University Putra Malaysia (UPM)	Malaysia
5	National Cheng Kung University (NCKU)	Taiwan
6	Asian Institute of Technology (AIT)	Thailand
7	Chungnam National University (CNU)	Korea
8	Singapore Land Authority (SLA)	Singapore
9	The University of Nottingham Ningbo China (UNNC)	China
10	Tokyo University of Marine Science and Technology (TUMSAT)	Japan 
11	National Electronics and Computer Technology Center (NECTEC)	Thailand
12	Ministry of Science and Technology (MOST)	Vietnam
13	National Agriculture and Food Research Organization (NARO)	Japan
14	Earthquake Research Institute, the University of Tokyo (ERI)	Japan
15	Research Faculty of Agriculture, Hokkaido University (AGHU)	Japan
16	National Space Agency of Malaysia (ANGKASA)	Malaysia
17	Hanoi University of Science and Technology	Vietnam

Multi-GNSS Demonstration Campaign



THREE MAIN ACTIVITIES

1. Multi-GNSS Monitoring Network



2. Application Demonstration

Disaster Mitigation



Precise Positioning



ITS



LBS



Others, ionospheric observation etc

3. Regional Workshop

3rd Workshop, Nov. 2011
@ Jeju, Korea:



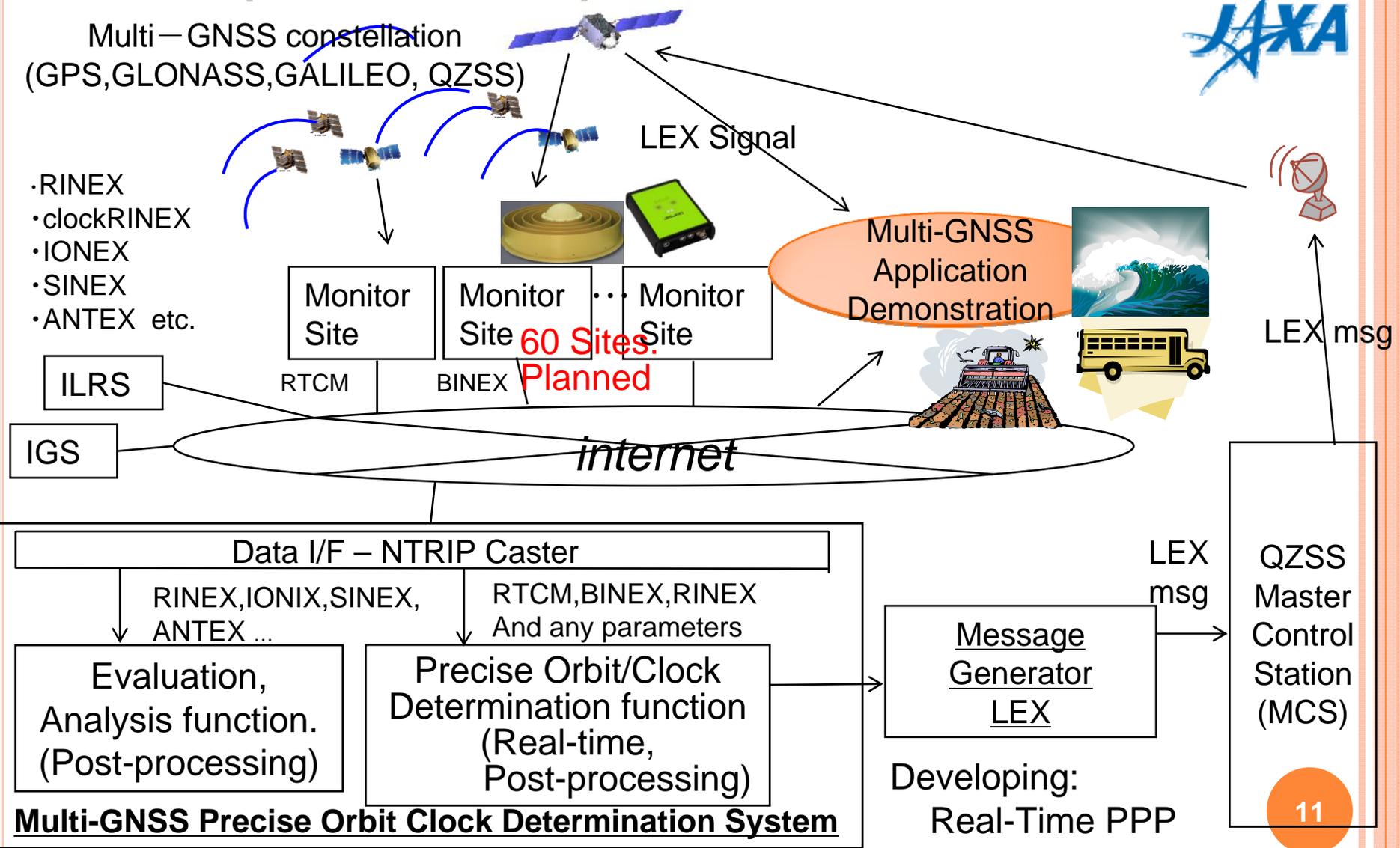
2nd Workshop, Nov. 2010
@ Melbourne, Australia



1st Workshop on GNSS,
JAN. 2010, @ Bangkok,
Thailand



MONITORING NETWORK(MGM-NET) (ACTIVITY ①)



MADOCA : Multi-gnss Advanced Demonstration tool for Orbit and Clock Analysis



GPS ORBIT/CLOCK ERROR COMPARISON WITH IGS ANALYSIS CENTERS

IGS AC	Analysis Software	# of Stas	Orbit RMS (cm)				Clock (ns)	
			R	A	C	3D	STD	RMS
	MADOCA 0.3.0	77	0.89	1.10	1.12	1.81	0.109	0.131
ESA	NAPEOS 3.5	110	0.97	1.33	1.09	1.98	0.116	0.183
CODE	Bernese 5.1	231	1.01	1.36	1.14	2.04	0.075	0.089
NGS	arc, orb, pages, gpscom	199	0.95	1.46	1.41	2.24	-	-
GFZ	EPOS.P.V2	191	1.15	1.64	1.59	2.56	0.146	0.169
MIT	GAMIT 10.33, GLOBK 5.16	263	1.37	2.12	1.39	2.88	0.277	0.316
NRCa n	GIPSY/OASIS-II 5.0	91	2.58	1.72	1.77	3.57	0.128	0.148
JPL	GIPSY/OASIS-II 5.0	142	2.62	1.67	1.98	3.68	0.168	0.226
SIO	GAMIT 10.20, GLOBK 5.08	258	2.42	2.26	1.77	3.75	-	-
GRG	GINS, DYNAMO	134	2.47	2.80	1.74	4.12	0.172	0.212

2011/1/1 - 12/31 (365 days), interval 900/300 s, wrt IGS Final

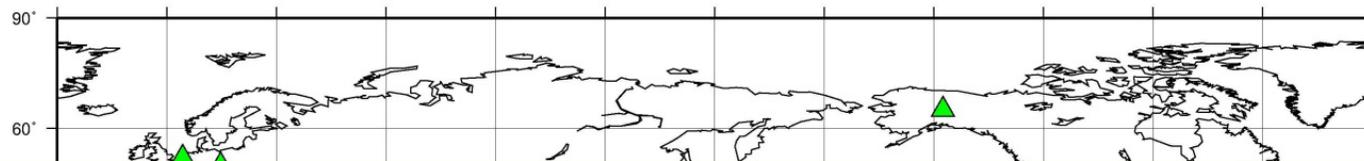


Multi-GNSS Monitoring Network : Current Status

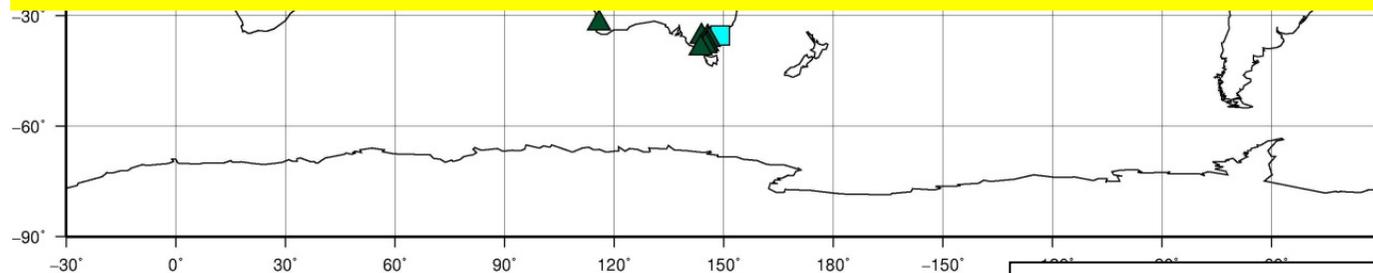
33 sites have been selected, and are under constructions. (Goal : 60 sites, all over the world)

- Several organizations such as *Australian Victoria*, *Curtin University* have been selected as monitor stations of the network with own receiver sets.

2012/9/26



MGM may correspond to the Chinese iGMAS. Collaboration between them must enhance the efficiency of orbit/clock estimation.



Layout drawing of JAXA's MGM-net

■ QZSS MS	(8)
▲ MGM-net Accepted [Hosting Sites]	(18)
▲ MGM-net Accepted [Data Sharing Partner]	(7)

ACTIVITY 2: PROPOSED MULTI-GNSS JOINT EXPERIMENTS



- 8 Experiments were endorsed to be implemented

1	Evaluation of Multi-GNSS for Precision Agriculture in Korea, Chungnam National University	Korea
2	Sustainable Resource Utilization by Precision Farming of Oil Palm	Malaysia
JAXA will prepare the Multi-GNSS receivers.		
3	Automated rice transplanter guided by using Multi-GNSS including QZSS , Agricultural Research Center , National Agriculture Research Organization	JAPAN
4	"Joint QZSS/GPS positioning using L1/L5 band signals“, National Cheng Kung University,	Taiwan
5	"Multi-GNSS Experiment at RMIT University in Melbourne“, RMIT University	Australia
6	Evaluation of QZSS-LEX and L1-SAIF signals based positioning compared to DGPS and IGS PPP, positioning for Thailand	Thailand
7	Exploiting the use of QZSS and GNSS for navigational and high precision applications and their performance assessment (EQUATOR)	China
8	Development of Driver Behavior Measurement Method for Level of Safety Estimation from High Precision and High Resolution Global Positioning System with Quasi-Zenith Satellite System (QZSS)	Thailand

DEVICES FOR MULTI-GNSS EXPERIMENT



- Multi-GNSS Receiver and Antenna

GNSS	Tracking and Positioning	Tracking
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	L1C, L2C, L5



- Software

Calling for the Next Proposals for 2013

g tools)

REGIONAL WORKSHOP ON GNSS



- Purpose

Discussion about new application experiments of GNSS and Information sharing of the results of the current status of the activities of Multi-GNSS Asia.

- Date 8-10th Dec. 2012

- Venue Kuala Lumpur, Malaysia



- We would like to invite Chinese
- delegate to Kuala Lumpur in next
- month.

Registration site open until 15th Nov.

<http://www.multignss.asia>

THE CURRENT STATUS OF MULTI GNSS MONITORING NETWORK



	City	Country
1	Bulit Kayu Arang	Brunei
2	Jakarta	Indonesia
3	Daejeon	Korea
4	Putrajaya	Malaysia
5	Waigani	Papua New Guinea
6	Taguig city	Philippines
7	Hanoi	Vietnam
8	Ondrejov	Czech Republic
9	Delft	Netherland
10	Tainan	Taiwan
11	Singapore	Singapore
12	Alaska	U.S.A.
13	Yanbu	Saudi Arabia
14	General Santos	Philippine

Call for application has been opened continuously until enough number of sites are selected.

-  Selected Sites (showed in above table)
-  Applied and under selection process arrangement



SUMMARY

- Back Ground of Multi-GNSS
- Introduction of MGA
- Introduction of MGM
- Still calling for Monitoring Sites globally.
- 2nd Call for Joint Experiment
- The 4th AOR WS on GNSS

Thank you for your attention!

Please visit to

<http://www.multignss.asia/>

Key word : multignss