U.S. Report on GPS/GNSS Activities in the Asia-Pacific

21ST APRSAF
ASIA-PACIFIC REGIONAL SPACE AGENCY FORUM
JAPAN

APRSAF-21 in Japan
from December 2-5, 2014

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U.S. National Space Policy

Space-Based PNT Guideline: Maintain leadership in the service, provision, and use of GNSS

- Provide civil GPS services, free of direct user charges
  - Available on a continuous, worldwide basis
  - Maintain constellation consistent with published performance standards and interface specifications
  - Foreign PNT services may be used to complement services from GPS
- Encourage global ***compatibility*** and ***interoperability*** with GPS
- Promote transparency in civil service provision
- Enable market access to industry
- ***Support international activities to detect and mitigate harmful interference***

U.S. Objectives in Working with Other GNSS Service Providers

- Ensure **compatibility** — ability of U.S. and non-U.S. space-based PNT services to be used separately or together without interfering with each individual service or signal
  - Radio frequency compatibility
  - Spectral separation between M-code and other signals
- Achieve **interoperability** – ability of civil U.S. and non-U.S. space-based PNT services to be used together to provide the user better capabilities than would be achieved by relying solely on one service or signal
- Promote fair competition in the global marketplace

Pursue through Bilateral and Multilateral Cooperation

Planned GNSS

- Global Constellations
  - GPS (24+3)
  - GLONASS (24+)
  - GALILEO (24+3)
  - BDS/BEIDOU (27+3 IGSO + 5 GEO)

- Regional Constellations
  - QZSS (4+3)
  - IRNSS (7)
- Satellite-Based Augmentations
  - WAAS (3)
  - MSAS (2)
  - EGNOS (3)
  - GAGAN (2)
  - SDCM (3)

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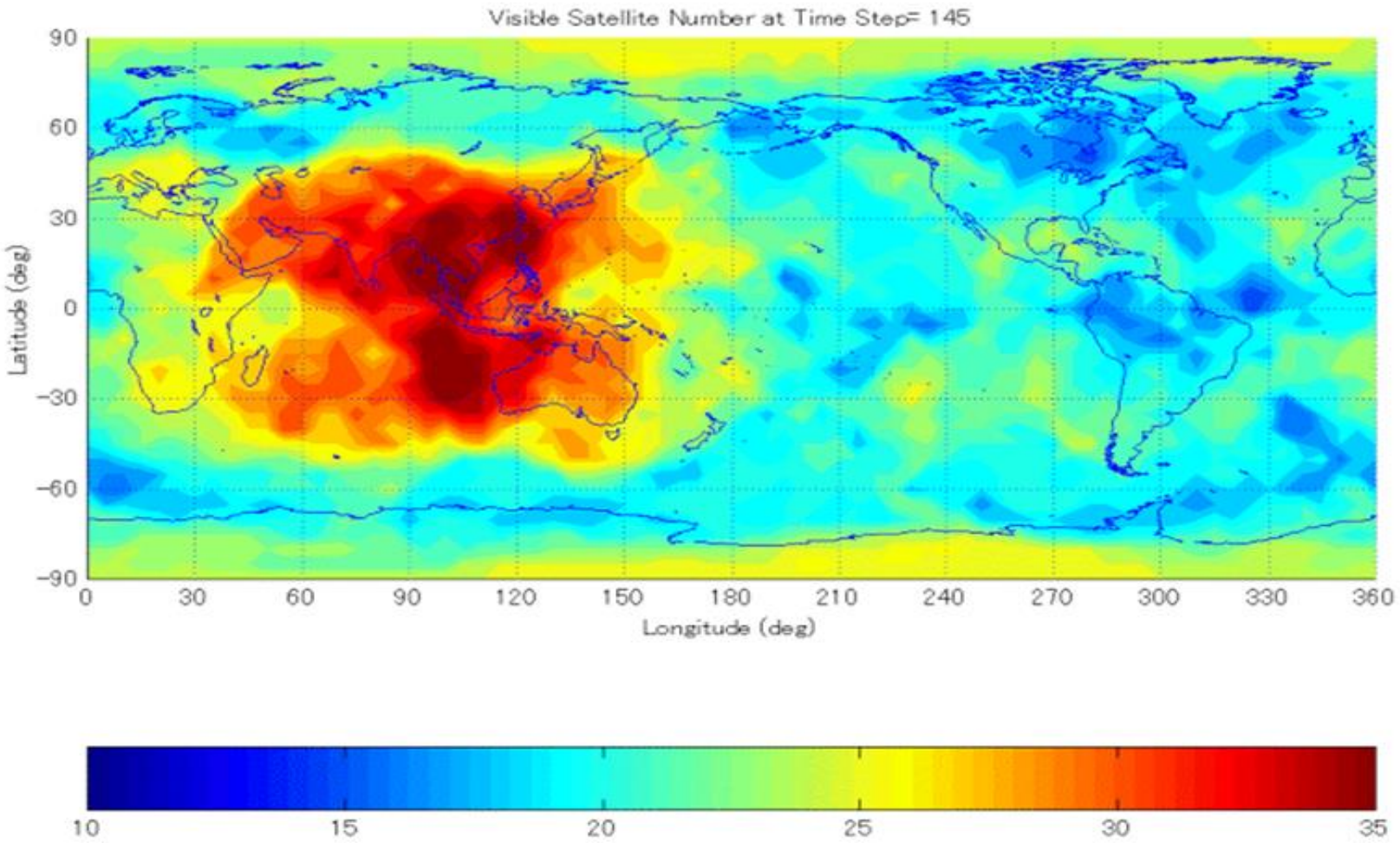
GNSS Satellites in View



Bilateral Cooperation: Japan

- Presidential/Prime Minister level Joint Statement signed in 1998
- Cooperation focuses on compatibility and interoperability between GPS and Japan's Quasi-Zenith Satellite System (QZSS)
- U.S. continues to host QZSS monitoring stations in Hawaii and Guam
- GPS-QZSS Technical Working Group met in May, September and November 2014 to discuss compatibility coordination under ITU auspices
- Second U.S.-Japan Comprehensive Dialogue on Space held in Washington, D.C., May 2014
  - Included GNSS discussions

Bilateral Cooperation: China

- First bilateral space-based PNT related meeting to discuss civil cooperation topics held 19 May 2014 in Beijing
  - Topics of discussion included: interoperability, service monitoring, interference detection, spectrum protection, and civil aviation applications
  - Agreement to establish a civil satellite navigation cooperation working group for additional discussions on topics of mutual interest
  - Joint Statement signed

Bilateral Cooperation: India

- U.S.–India Joint statement signed in 2007
  - Cooperation on GPS and augmentations
  - Expanded effort to ensure interoperability between GPS/WAAS and GAGAN
- ITU compatibility coordination – Meeting in early 2013
- U.S.-India Civil Space Joint Working Group (CSJWG) bilateral meeting held in Washington, DC in March 2013

Additional Bilateral Cooperation

- *Australia* – Joint Delegation Statement on Cooperation in the Civil Use of GPS in 2007
  - Last bilateral dialogue held in Oct. 2010
  - Resulting Joint Announcement on expanded space cooperation included GNSS and applications
- *Republic of Korea* – 1st bilateral civil space dialogue took place in July, 2014
  - Korea's interest in developing/deploying an SBAS and potential cooperation discussed
- *Russia* – GPS-GLONASS discussions since 1996, Joint Statement issued December 2004
  - Technical working groups on GNSS compatibility/interoperability and MEOSAR capabilities
- *Vietnam* – GNSS applications among several areas of potential cooperation under discussion

International Committee on Global Navigation Satellite Systems (ICG)

- Emerged from 3rd UN Conference on the Exploration and Peaceful Uses of Outer Space July 1999
  - Promote the use of GNSS and its integration into infrastructures, particularly in developing countries
  - Encourage compatibility and interoperability among global and regional systems
- Members include:
  - **GNSS Providers** (**U.S.**, EU, Russia, China, India, Japan)
  - Other Member States of the United Nations
  - International organizations/associations

http://www.oosa.unvienna.org/oosa/en/SAP/gnss/icg.html

ICG-9 Meeting in Prague - Nov 9-14, 2014

- Interference Detection and Mitigation (IDM)
  - Nations should evaluate & implement existing/emerging IDM capabilities and work with the telecom industry on standards for crowd sourcing IDM techniques
  - The ICG Secretariat and IDM taskforce will organize UN-sponsored workshops on RNSS spectrum protection and IDM for user community member nations
  - IDM Task Force initiated a discussion on GNSS as critical infrastructure that continued through WG-A and was presented to the Committee
- International Multi-GNSS monitoring (IGMA)
  - Existing civil service centers should establish a link to a new ICG web portal allowing users to easily find GNSS monitoring information and products
  - IGMA Task Force should conduct a workshop in 2015 focused on the purpose of multi-GNSS open service monitoring, the parameters to be monitored, and an appropriate organizational approach
- Interoperability Task Force and System Providers continue to assess industry feedback received at 4 interoperability workshops
- Providers should develop a booklet defining the characteristics of a fully interoperable space service volume
- Providers will consider further discussion on GNSS "Market Access"

ICG-10 - November 1-6, 2015

- **U.S. will host in Boulder, Colorado**
  - 45 km from Denver
- Meeting Venue: University Corporation for Atmospheric Research (UCAR)
  - Consortium of more than 100 member colleges and universities focused on atmospheric research and Earth system sciences
  - UCAR manages the National Center for Atmospheric Research (NCAR) on behalf of the National Science Foundation

- **Tour Sites being Considered**
  - National Oceanic and Atmospheric Administration, National Space Weather Prediction Center
  - UNAVCO: University NAVSTAR Consortium, which facilitates geoscience research and education using space geodesy

UCAR Center Green Facility

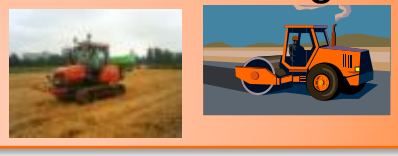
Overviews of Asia Oceania Multi-GNSS Demonstration Campaign

Establishment of Multi-GNSS Monitoring Network

Application Demonstrations

Disaster Mitigation

Precise Positioning



ITS

LBS

Other, ionospheric observation etc

Regional Workshops

6th Workshop, Oct. 2014
Phuket, Thailand

5th Workshop, Dec. 2013,
Hanoi, Viet Nam

4th Workshop, Dec. 2012
Kuala Lumpur, Malaysia

3rd Workshop, Nov. 2011
Jeju, Korea

2nd Workshop, Nov. 2010
Melbourne, Australia

1st Workshop Jan. 2010
Bangkok, Thailand

42 organizations from 15 countries/regions as of Nov.

APEC GNSS Implementation Team (GIT)

- Established in 2002
- Reports to Transportation Working Group (TPT-WG) through the ITS and Inter-modal Experts Group (IIEG)
- Adopted a strategy designed to promote implementation and adoption of GNSS technologies, including regional augmentation systems, throughout the Asia Pacific region, focusing on seamless intermodal transportation
- 19th GIT meeting held April 2014 in Christchurch, New Zealand
  - Much Interest in Multi-GNSS demonstration for ITS applications and GNSS interference, detection, and mitigation (IDM) capability

Summary

- U.S. policy encourages the worldwide use of GPS/GNSS
- Signal availability from multiple global and regional navigation satellite systems and SBAS is especially high in the Asia Pacific
- International cooperation to ensure compatibility, interoperability, and transparency is an important priority

For Additional Information…

www.gps.gov