



## International Committee on Global Navigation Satellite Systems (ICG)

*A forum to discuss global navigation satellite systems to benefit people around the world*

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## Introduction: Office for Outer Space Affairs

- ❑ Implements the decisions of the General Assembly and of the Committee on the Peaceful Uses of Outer Space (COPUOS);
- ❑ Performs functions of the Secretariat of COPUOS and its subsidiary bodies: Scientific & Technical Subcommittee and Legal Subcommittee;
- ❑ Coordinates the inter-agency cooperation within the United Nations on the use of space technology (UN-SPACE);
- ❑ Implements the United Nations Programme on Space Applications
- ❑ Performs functions of the Executive Secretariat of the International Committee on Global Navigation Satellite Systems (ICG) , its Providers' Forum and its Working Groups

## Background

- **2001 – 2004:** Action Team on GNSS (Italy and United States)
- **2005:** Establishment of ICG (noted by UNGA 61/111 of 14 December 2006)
  - *Promote the use of GNSS and its integration into infrastructure, particularly in developing countries;*
  - *Encourage compatibility and interoperability among global and regional systems*

*ICG participation is open to all countries and entities that are either GNSS providers or users of GNSS services, and are interested and willing to actively be engaged in ICG activities*



## ICG Membership

- **Members: 9 nations & the European Union**
  - *Current and future core, regional or augmentation system providers: China (BeiDou), EU (Galileo/EGNOS), Russia (GLONASS/SDCM), USA (GPS/WAAS), India (IRNSS/GAGAN), and Japan (QZSS/MSAS)*
  - *State Members of the United Nations with an active programme in implementing or promoting a wide range of GNSS services and applications (Italy, Malaysia, UAE)*
- **Associate Members and Observers: 21 organizations**
  - *International & regional organizations and associations dealing with GNSS services and applications (UN system entities, IGOs, NGOs)*



## ICG Annual Meetings

UNOOSA, Vienna (2006), India (2007), United States (2008), Russian Federation (2009), Italy & EU (2010), Japan (2011), China (2012), United Arab Emirates (2013), European Union (2014), United States (2015), Russian Federation (2016), Japan (2017)

2006: Terms of Reference and Workplan

2007: Establishment of Providers' Forum

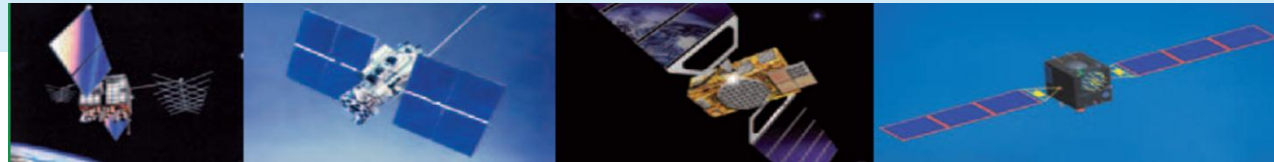
2015: Tenth Meeting of the ICG



## ICG Workplan

- **Compatibility and Interoperability (US and Russia):** *Focused discussion on compatibility and interoperability, encouraging development of complimentary systems; Exchange detailed information on systems and service provision plans*
- **Enhancement of GNSS Service Performance (India and ESA):** *Focused on system enhancements (multipath, integrity, interference, etc.) to meet future needs*
- **Information Dissemination and Capacity Building (UNOOSA):** *Focused on training/workshops, promoting scientific applications, space weather*
- **Reference Frames, Timing and Applications (IAG, IGS and FIG):** *Focused on monitoring and reference station networks*

## Providers' Forum



- **2007: Establishment**
  - Members: Current and future GNSS and Satellite based Augmentation Systems (SBAS) providers
- **2008: Terms of Reference & Workplan**
  - Focused discussions on compatibility and interoperability, encouraging development of complimentary systems;
  - Exchange detailed information on systems and service provision plans;
  - Exchange views on ICG workplan and its activities.
- **Fifteenth Meeting, 1 – 6 November 2015, Boulder, Colorado, USA**
  - Open Service Information Dissemination, Open Service Performance, Spectrum Protection (IDM)

## ICG Working Groups Recommendations



- Evaluation and development of Interference Detection and Mitigation (IDM) capabilities
  - *To evaluate existing and implement existing/emerging IDM capabilities and work with the telecom industry on standards for crowdsourcing IDM techniques*
  - *Organize the workshop on RNSS spectrum protection and IDM for user community member nations (14 – 18 December 2015, Vienna)*
- Open Service Monitoring Information Portal
  - *Existing civil service centres should establish a link to the ICG info portal allowing users to easily find GNSS monitoring information and products*



## ICG Working Groups Recommendations



- Interoperable GNSS Service Volume (SSV) Characterization Outreach
  - *Providers should develop a booklet defining the characteristics of a fully interoperable SSV*
- NeQuick Ionospheric Model
  - *To assess the performance and usability of a NeQuick ionospheric correction algorithm for the single frequency users similar to the one adopted by Galileo in view of its expected good performance compared with other models, i.e. at low latitudes:*  
[http://www.gsc-europa.eu/system/files/galileo\\_documents/Galileo\\_Ionospheric\\_Model.pdf](http://www.gsc-europa.eu/system/files/galileo_documents/Galileo_Ionospheric_Model.pdf)
- Capacity Building and GNSS Outreach Activities in South-East Asia
  - *To organize workshops and technical seminars in the field of GNSS and its applications in SEA region*

## ICG Working Groups Recommendations



### ■ Improving the Accuracy of Multi-GNSS Orbits Determination by IGS

- GNSS Providers consider the possibility of making available the following list (or a sub-set) of satellite data for better orbit dynamics modelling:
  - ✓ Primary list: Surface geometry and dimensions; surface optical properties (or material types); nominal attitude model; transmitted power in all signals (and direction if relevant); solar panel construction information (thickness, conductivity, power draw), position and power output of radiators; thermal properties of multi-layered insulation;
  - ✓ More detailed list: structural data/drawings of the satellite with dimensions (surface only); optical properties (reflectivity, specularity) of the surface materials; identification of what is covered in multi-layered insulation (MLI) or “thermal blankets” ; attitude model of the satellite; power of all transmitted signals; construction data of the solar panel; etc.
  - ✓ Other Necessary Information

ICG Working Groups Website: <http://www.unoosa.org/oosa/en/ourwork/icg/working-groups.html>

## Tenth Meeting of the ICG, 1 – 6 November 2016



Local Host: University Corporation for Atmospheric Research (UCAR), Boulder, Colorado

- Consortium of more than 100 member colleges and universities focused on research and training in the atmospheric and related Earth system sciences
- UCAR manages the National Centre for Atmospheric Research (NCAR) on behalf of the National Science Foundation

### Site Tours

- National Oceanic and Atmospheric Administration (NOAA), National Space Weather Prediction Centre (SWPC);
- University NAVSTAR Consortium (UNAVCO), which facilitates geoscience research and education using space geodesy;
- National Institute of Standards and Technology (NIST)

ICG-10 Website:

<http://www.unoosa.org/oosa/en/ourwork/icg/meetings/ICG-2015.html>

## Information Dissemination

*2007: The way forward to provide positioning, navigation and timing globally*

*2010: Report on planned or existing global navigation satellite systems and on relevant policies and procedures*

*2011: Achievements of providers and users of positioning, navigation, and timing services, under the umbrella of the United Nations, in promoting GNSS over the past 10 years*

*2012: Education Curriculum and Glossary of GNSS Terms*

ICG Information Portal: <http://www.unoosa.org/osa/en/ourwork/icg/resources.html>



## Programme on GNSS applications

- Regional Workshops on GNSS Applications
- Promoting the use of GNSS technologies as tools for scientific applications
- Information Centres for ICG



## Regional Workshops on the Applications of GNSS

Zambia and China (2006), Colombia (2008), Azerbaijan (2009), Moldova (2010), UAE (2011), Latvia (2012), Croatia (2013), ICTP (2014), Russian Federation (2015), [Nepal \(2016\)](#)

- *Increase awareness among decision and policy makers of the benefits of GNSS and develop regional and national pilot projects on GNSS applications, and strengthen the networking of GNSS related institutions in the regions*
- ICG Experts Meeting on GNSS Services, 14 – 18 December 2015, Vienna, Austria
  - *Overview of GNSS: All system and augmentation system providers will present reports on the technical characteristics of their systems and services provided to GNSS users*
  - *GNSS applications: Leaders from industry, academia and organization representing users or producers will give a brief summary of their application sector*
  - *Seminar on GNSS Spectrum Protection: A seminar to educate national spectrum managers regarding international, regional and national regulations that affect GNSS*

## Promoting the use of GNSS technologies as tools for scientific applications

### Reference Frames/Systems:

*To provide technical knowledge on the operational and practical aspects and issues relating to references frames, more specifically, to facilitate a regional forum for geodetic agencies, improve data sharing (GNSS, levelling, tide gauge, gravity) and dense regional reference frame*

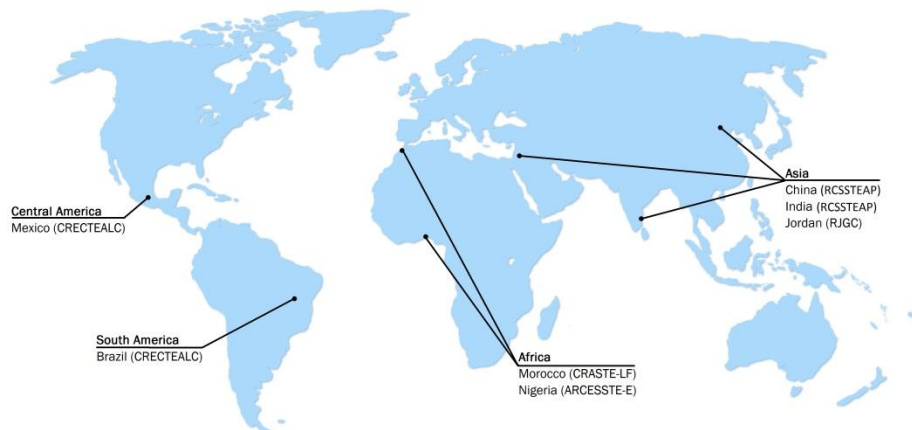
### Space Weather and its effects on GNSS (ICTP and Boston College):

*Ionospheric modelling is an effective approach for correcting the ionospheric range error and improving the GNSS positioning accuracy, in particular, the abundance of GPS measurements from worldwide distributed GPS reference networks, which provide 24-hour uninterrupted operational services to record dual-frequency GPS measurements provides an ideal data source for ionospheric modelling research*

United Nations/Italy Long-term Fellowship Programme on GNSS and Related Applications: *Master in Navigation and Related applications (MNA) Programme: <http://www.unoosa.org/oosa/en/ourwork/psa/gnss/fellowships.html>*

## Information Centres for ICG

Regional Centres for Space Science and Technology Education  
(affiliated to the United Nations)



**Africa:** Morocco and Nigeria

**Latin America and the Caribbean:** Brazil and Mexico

**Asia and the Pacific:** India and China

**Western Asia:** Jordan

- The Technical Level : explore the benefits of GNSS technologies for regions and to spread their applications; exchange information and knowledge
- The Cooperative level: facilitate collaboration with the GNSS providers (seminars/trainings and educational material), as well as communication and outreach to the wider community through the ICG information portal.





## Mission Statement (ICG-8, 2013)

- Promote voluntary cooperation on matters of mutual interest related to civil satellite-based positioning, navigation, timing, and value-added services
- Contribute to the sustainable development of the world
- Encourage coordination among GNSS Providers to ensure greater compatibility, interoperability, and transparency
- Promote the introduction and utilization of GNSS services in developing countries, by assisting with the integration into their infrastructure
- Assist GNSS users with their development plans and applications, by encouraging coordination and serving as a focal point for international information exchange



## Vision Statement (ICG-9, 2014)

The International Committee on Global Navigation Satellite Systems (ICG) strives

- to encourage and facilitate compatibility, interoperability and transparency between all the satellite navigation systems,
- to promote and protect the use of their open service applications and thereby benefit the global community.

Our vision is to ensure the best satellite based positioning, navigation and timing for peaceful uses for everybody, anywhere, any time.