

European Space Solutions, 30 May – 3  
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# International Committee on Global Navigation Satellite Systems

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**UNITED NATIONS**  
Office for Outer Space Affairs



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## 2005 - 2015: 10 Years of Achievement

UNITED NATIONS  
OFFICE FOR OUTER SPACE AFFAIRS



“The establishment of ICG in 2005 ushered in an unprecedented era of cooperation for the United Nations. Over the past decade, ICG has achieved tangible and wide ranging progress”, *United Nations Secretary General, Ban Ki-moon.*

“Looking ahead, as co-chairs of the Action Team on GNSS, we believe that ICG will continue to strengthen its role as a major player in the multilateral arena, given that satellite positioning becomes more and more a multinational cooperative venture”, *Co-chairs of the Action Team on GNSS (2001 – 2004)*

“ICG has encouraged tangible international cooperation, and leading global satellite operators have coordinated their GNSS services to provide global coverage in satellite-based PNT, for the benefit of all”, *Director, Office for Outer Space Affairs*

<http://www.unoosa.org/oosa/en/ourwork/icg/documents/publications.html>



## Annual Meetings

- Since 2006 (UNOOSA) - **United States of America (2015)**, **Russian Federation (2016)**, Japan (2017), China (2018), India (2019)
- **2006**: Terms of Reference and Workplan
- **Systems, Signals and Services (United States & Russian Federation)**: Compatibility and spectrum protection; interoperability and service standards; system-of-system operations
- **Enhancement of GNSS Performance, New Services and Capabilities (India, China & European Space Agency)**: Future & novel integrity solutions; monitoring of techniques considered by application developers & external service providers; implementation of interoperable GNSS Space Service Volume (SSV) and its evolution; examination of performance of atmospheric models, establish dialogue with space weather/RS community
- **Information Dissemination and Capacity Building (UNOOSA)**: Focused on education and training programmes, promoting GNSS for scientific exploration (space weather specifically)
- **Reference Frames, Timing and Applications (IAG, IGS & FIG)**: Focused on monitoring and reference station networks



## Providers' Forum

### ▪ 2007: Establishment

- Members: Current and future global and regional satellite navigation systems and Satellite-based Augmentation Systems (SBAS) providers
- PF provides ways and means of promoting communication among system providers on key technical issues and operational concepts such as the GNSS spectrum protection, orbital debris, and orbit de-confliction
- Scientific and Technical Subcommittee of UNCOPUOS (UN GA Res. 62/217 of 1 February 2008) started consideration of an agenda item "Recent developments in GNSS"

### ▪ 2008: Terms of Reference and Workplan

- Agreement that all GNSS signals and services must be compatible and open signals and services should be interoperable to the maximum extent possible in order to maximize benefit to all GNSS users;
- Consensus reached on Principle of transparency - every GNSS provider should publish documentation that describes the signal and system information, the policies of provision and the minimum levels of performance offered for its open services

### ▪ 2016: Sixteenth meeting, 6 June, Vienna, Austria

- Open service information dissemination; Service performance monitoring; Spectrum protection, including IDM; Orbital debris; Space weather





## Working Groups: **Recommendations**

### ▪ **Interference Detection and Mitigation (IDM)**

- To establish a multi-year agenda item at STSC that will focus on national efforts to protect RNSS spectrum, and pursue GNSS IDM in States members in order to raise awareness of this issue among States members of COPUOS as part of efforts to achieve the overall goal of promoting effective use of GNSS open services by the global community, *53rd Session of the Scientific and Technical Subcommittee of COPUOS, 15 – 26 February 2016*
- *International GNSS IDM Workshop, 17 May 2016, Changsha, China* - The 2016 China Satellite Navigation Conference (CSNC2016), 18 - 20 May 2016
  - Update of IDM status by current providers; Interference detection and Geo-location techniques; Cell-phone crowdsourcing method; Spoofing detection

A wide-angle photograph of Earth from space, showing the curvature of the planet and the blue atmosphere against the blackness of space.

*ICG-10 Meeting, 2015, Boulder, Colorado, United States:  
Joint Statement*



## Working Groups: **Recommendations**

- **International GNSS Monitoring and Assessment (IGMA)**
  - To initiate a joint trial project with the International GNSS Service (IGS) to demonstrate a global GNSS monitoring and assessment capability after the completion of several preliminary items
- **Interoperable GNSS Space Service Volume (SSV)**
  - To implement an interoperable GNSS SSV and provide recommendations to Service Providers regarding possible evolution needs arising from users/application developers - **Providers will develop a booklet defining the characteristics of a fully interoperable space service volume**
  - **SSV** simulations will be carried out in a phased approach (3 phases in total)
- **Interim Meeting of the Working Group, 8 June 2016, Vienna, Austria**
  - SSV, Space Weather (Examine the performance of atmospheric models to correct single frequency measurements; To identify how GNSS can better support the advancement of Space Weather/RS products and vice versa)

*ICG-10 Meeting, 2015, Boulder, Colorado, United States:  
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## ICG Working Groups: **Recommendations**

### ▪ **Utilization of GNSS satellites in Eccentric Non-Nominal MEO Orbits**

- Providers will report to the Working Group on their experience utilizing satellites that are in eccentric, non-nominal MEO orbits in order to build a survey of these satellites for scientific research and Position, Velocity and Time (PVT) applications

### ▪ **Geodetic and Timing References for GNSS**

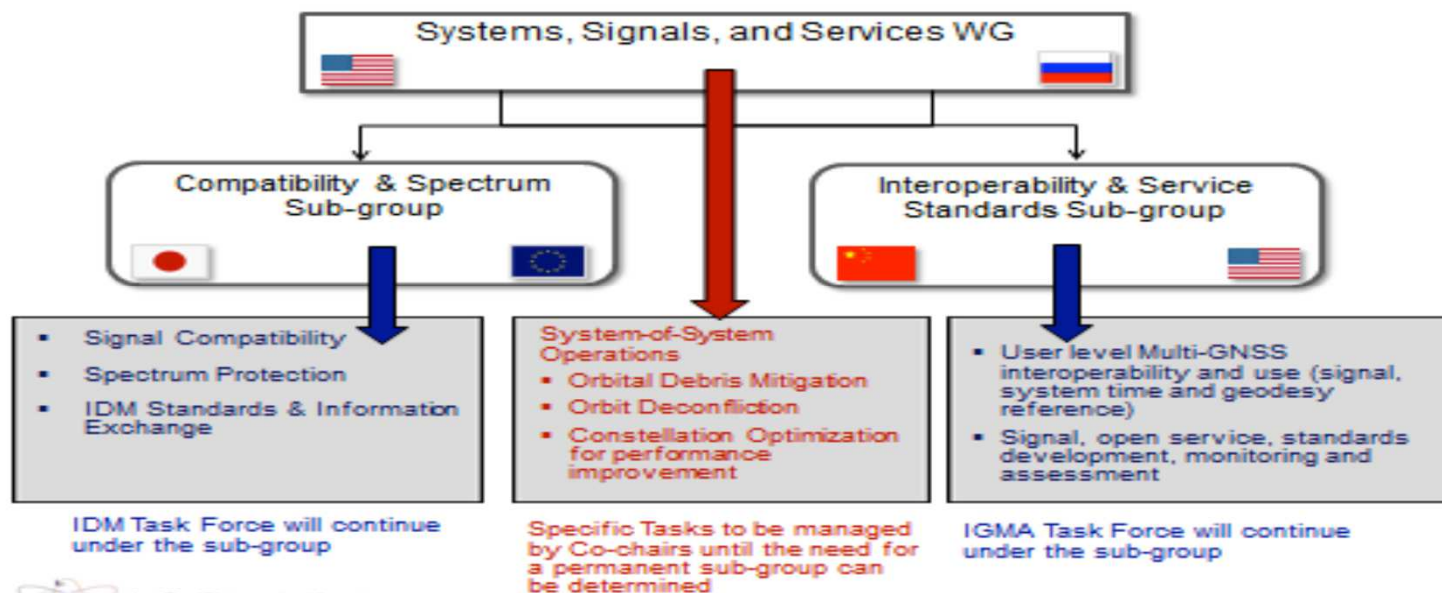
- The alignments of GNSS associated reference frames to the realization of the International Terrestrial Reference Frame (ITRF2008)
- Timing References in relation to Rapid Coordinated Universal Time (UTC<sub>r</sub>)

**ICG Information Portal:** <http://www.unoosa.org/oosa/en/ourwork/icg/working-groups.html>

*ICG-10 Meeting, 2015, Boulder, Colorado, United States: Joint Statement*



## WG Architecture







## Programme on GNSS applications

### ▪ United Nations Regional Workshops on the use and applications of GNSS

- These activities increase awareness among decision and policy makers of the benefits of GNSS, and develop regional and national pilot projects on GNSS applications
- These activities bring together a large number of experts, including those from developing countries, to discuss and act on issues that are also of high relevance to the ICG

### ▪ United Nations/Nepal Workshop, 5 – 9 December 2016, Kathmandu

#### ▪ ICG Seminar: Space Weather and its effects on GNSS

- Part I: General space weather phenomena;
- Part II: Ionospheric physics and how the ionosphere affects GNSS signals under quiet and disturbed conditions;
- Part III: Illustrate the effects that space weather has shown on GNSS systems and applications

#### ▪ Seminar on GNSS Spectrum Protection and IDM

Information Portal: <http://www.unoosa.org/oosa/en/ourwork/icg/activities.html>



## Programme on GNSS applications

- **Promoting the use of GNSS technologies as tools for scientific applications**
  - These activities are to provide technical knowledge on the operational and practical aspects and issues relating to reference frames, in particular to facilitate a regional forum for geodetic agencies, improve data sharing (GNSS leveling, tide gauge, gravity)
  - **Technical Seminars on Reference Frames in Practice, FIG Working Week 2016, Christchurch, New Zealand, 1- 2 May 2016**
- **Space Weather and its effects on GNSS**
  - **ICTP and Boston College: Use of Ionospheric GNSS Satellite Derived Total Electron Content Data for Navigation, Ionospheric and Space Weather Research, 20 – 24 June 2016, Trieste, Italy**
- **United Nations/Italy Long-term Fellowship Programme: Master in Navigation and Related Applications (MNA), Politecnico di Torino, Turin, Italy**
  - The curriculum is structured to meet effectively work market demands for high-level technicians endowed with a broad vision of the navigation/localization state-of-the-art



# Eleventh Meeting of the ICG, Sochi, Russian Federation

6 – 11 November 2016

## ICG-11 PROGRAMME AT-A-GLANCE

	SUNDAY 6 NOVEMBER	MONDAY 7 NOVEMBER	TUESDAY 8 NOVEMBER	WEDNESDAY 9 NOVEMBER	THURSDAY 10 NOVEMBER	FRIDAY 11 NOVEMBER
AM sessions (9:00-12:30)	Registration	Registration	Registration	Registration	Registration	Registration
		1st Plenary Session of ICG	WG A   WG C	Joint WG A, WG B, WG C, WG D Meeting WG B   WG D	WG A   WG B   WG C   WG D 2nd Plenary Session of ICG	3rd Plenary Session of ICG
PM sessions (14:00-18:00)	1st Providers' Forum Meeting Meeting with the Working Groups Co-Chairs	Lunch 1st Plenary Session of ICG (continued) Applications & Experts Session Welcome Dinner	Lunch WG A   WG C	Lunch WG B   WG D City Tour Banquet	Lunch 2nd Plenary Session (continued) 2nd Providers' Forum Meeting	





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# ICG Information Portal

The screenshot displays the ICG Information Portal website. At the top, there are two navigation bars for the United Nations Office for Outer Space Affairs, each featuring a search bar and social media icons. The main content area is titled "International Committee on Global Navigation Satellite Systems (ICG)" and includes a "MISSION STATEMENT" and a "VISION STATEMENT". A central image shows the Earth with several navigation satellites in orbit. Below this, there are three columns: "Members", "Associate Members", and "Observers", each with a list of participating organizations. On the right side, there is a "Our Work" sidebar with links to various activities and documents.

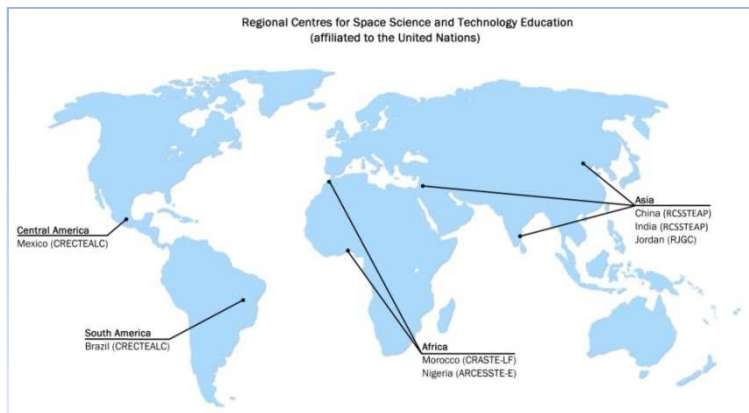
■ [WWW.UNOOSA.ORG](http://WWW.UNOOSA.ORG)

■ [WWW.UNOOSA.ORG/OOSA/EN/OURWORK/ICG/ICG.HTML](http://WWW.UNOOSA.ORG/OOSA/EN/OURWORK/ICG/ICG.HTML)





## Information Centres for ICG



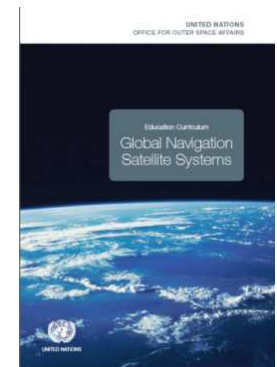
United Nations-affiliated Regional Centres for Space Science and Technology Education

***Africa: Morocco and Nigeria***

***Latin America and the Caribbean: Brazil/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



## Conclusion

- Significant progress continues to be made through ICG, and the results of this work not only promote the capabilities of GNSS to support sustainable development, but also promote new partnerships among members of ICG and institutions of the broader user community, particularly in developing nations
- The activities and opportunities provided through the ICG result in the development and growth of capacities that will enable each country to enhance its knowledge, understanding and practical experience in those aspects of GNSS technology that have the potential for a greater impact on its economic and social development, including the preservation of its environment



## Towards UNISPACE+50 in 2018

- **2018** marks the 50<sup>th</sup> anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE), held in Vienna in 1968
- **UNISPACE+50 will articulate a long-term vision for Space:** from a domain of States towards a domain of a commonly shared human experience
  - UNISPACE III (1999), the Vienna Declaration put forth 33 recommendations
    - Recommendation on GNSS: *"...to improve the efficiency and security of transport, search and rescue, geodesy and other activity by promoting the enhancement of, universal access to and compatibility of space-based navigation and positioning systems"*
  - **The work of ICG** is growing rapidly in line with anticipation that GNSS applications will continue to grow in the coming years

## High Level Forum on Space as a driver for socio-economic sustainable development, 20 – 24 November 2016, Dubai, United Arab Emirates

- The Forum aims to become a platform for providing updates and recommendations on the potential of space innovations to address new and emerging sustainable development challenges
- The Forum seeks to address the cross-sectoral benefits of integrating economic, environmental, social, policy and regulatory dimensions of space in pursuance of global sustainable development

Thank you

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