

# **United Nations Office For Outer Space Affairs: Perspective on GNSS Progress and Contribution**

**22<sup>nd</sup> PNT Board Meeting**

**5 – 6 December 2018, Redondo Beach, CA, United States**

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Office for Outer Space Affairs**





# Space in the United Nations system

**UNOOSA** is the only United Nations office with a number of General Assembly mandates to bridge access to space technologies and space-based information for Member States and other United Nations agencies and to build capacity in the use of such technologies.

For the attainment of all 17 SDGs and 169 targets **space tools** carry significant relevance:

**Direct** — as enablers and drivers for sustainable development

**Indirect** — as an integral part of the indicators for monitoring progress

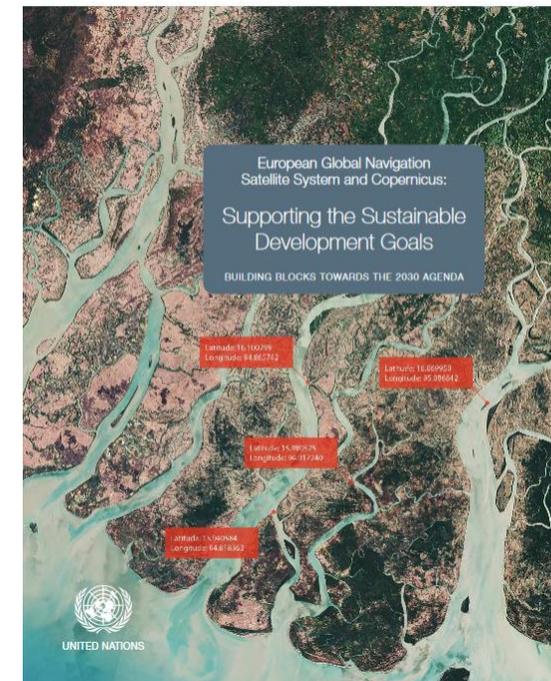
UNOOSA and the European GNSS Agency (**ST/SPACE/71**):

**European Global Navigation Satellite Systems and Copernicus: Supporting the Sustainable Development Goals**

[http://www.unoosa.org/res/oosadoc/data/documents/2018/stspace/stspace71\\_0\\_html/st\\_space\\_71E.pdf](http://www.unoosa.org/res/oosadoc/data/documents/2018/stspace/stspace71_0_html/st_space_71E.pdf)



UNITED NATIONS  
OFFICE FOR OUTER SPACE AFFAIRS





# Committee on the Peaceful Uses of Outer Space

Space and  
climate change

Disaster Management

Space debris  
mitigation

National space  
legislation

International  
mechanisms for  
cooperation

Long-term  
sustainability of  
outer space  
activities

Definition and  
delimitation  
of outer space

Space applications  
for socioeconomic  
development

Near-Earth  
objects

Global Navigation  
Satellite Systems

Space  
Weather

GGE-report and  
TCBM's



# COPUOS: Recent developments in GNSS

- **2008:** Scientific and Technical Subcommittee of UNCOPUOS (*UN GA Res. 62/217 of 1 February 2008*)
  - Consideration of an agenda item “**Recent developments in GNSS**”
- **2009:** In the GA Resolution (*A/RES/64/86 of 2009*), the recommendation was endorsed making OOSA as the **Executive Secretariat of the International Committee on GNSS (ICG):**
  - *Endorses the recommendation of the Committee on the Peaceful Uses of Outer Space (COPUOS) that the Office for Outer Space Affairs of the Secretariat should serve as the executive secretariat of the ICG and its Providers’ Forum*
- Programme on Space Applications since its establishment in 1971, has made substantial progress in **furthering knowledge and experience of space applications around the world**
  - **United Nations Regional Workshops on the use and applications of GNSS**



## International Committee on GNSS (ICG)

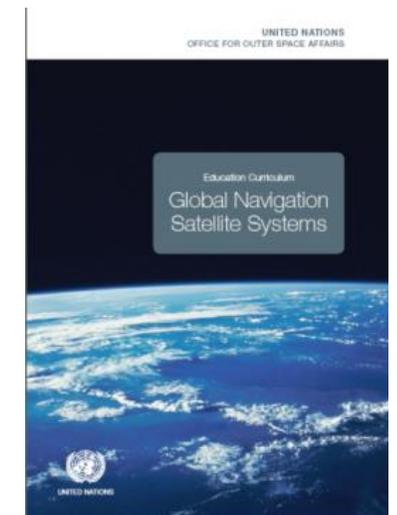
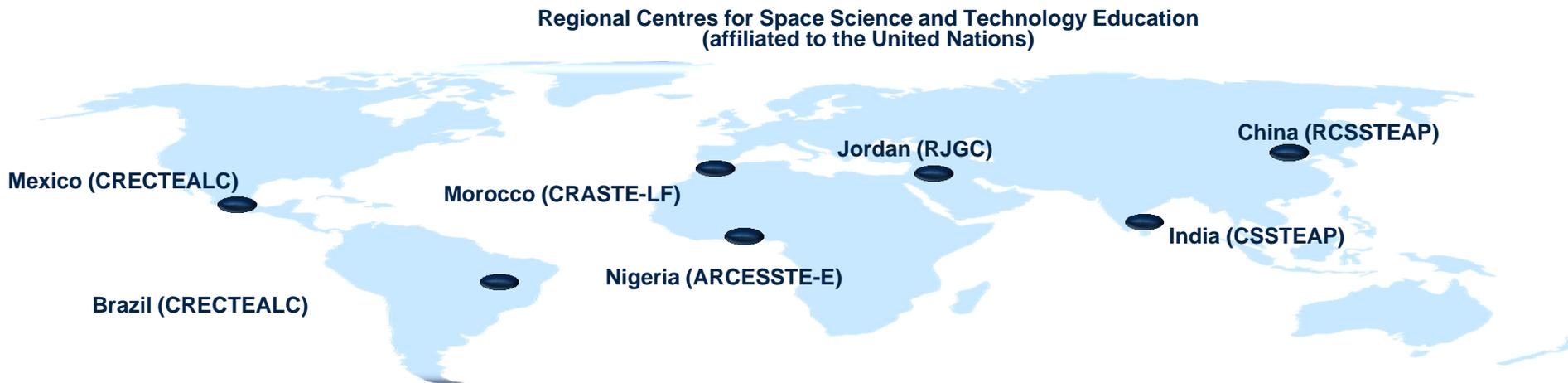
- UNOOSA serves as the executive secretariat of ICG
- The ICG promotes **voluntary cooperation** related to civil satellite-based positioning, navigation, timing, and value added services
- Encourages **coordination** among GNSS providers
- **Promotes** the introduction and utilization of GNSS services in developing countries
- **Assists** GNSS users with their development plans and applications
- Contributes to the **sustainable development** of the world
- Assure GNSS **interoperability and interconnectedness** among providers and users globally for enhanced services and applications





## Information Centres for ICG

- The Programme of Space Application established regional centres (**also acting as the ICG information centres**) in each region covered by the United Nations Economic Commissions: Africa, Asia and the Pacific, Europe, Latin America and the Caribbean, and Western Asia
  - **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





# COPUOS: Space Weather

- **2004:** Session of the Committee on the Peaceful Uses of Outer Space (COPUOS) called for addressing solar-terrestrial interaction: global climate, **space weather**, Sun-Earth-heliosphere-system
- **2005 - 2009:** Workshops and Follow-up projects: low-cost, ground-based world-wide instrument arrays, GNSS on board of instrument arrays (IHY: Instrument Array, Data, Teaching)
- **2010 - 2012:** STSC agenda item “International Space Weather Initiative” & ISWI Workshops (Egypt, Nigeria, Ecuador)
- **2013: STSC agenda item “Space Weather”**





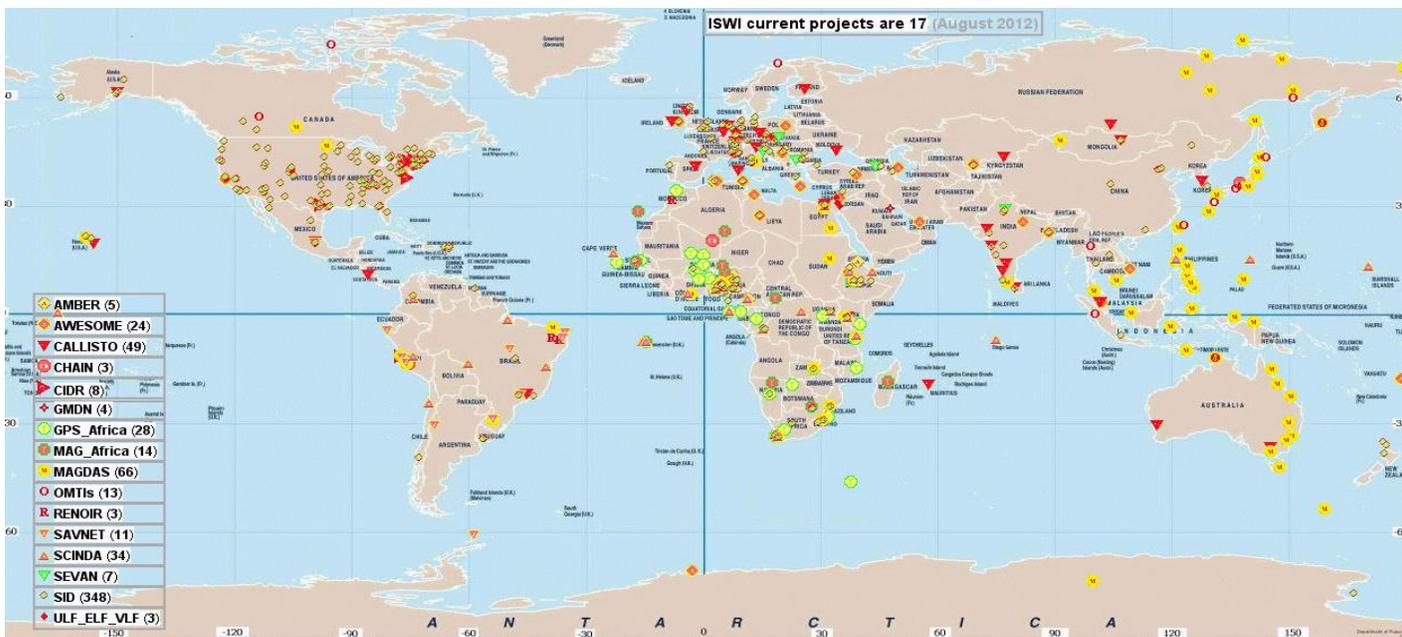
# Science, Capacity Building and Outreach

- Training in handling space-weather instruments; data handling; data analysis and interpretation
- Running advanced schools introducing topics from the solar interior to surface of Earth
  - ISWI School on Space Weather and GNSS 8 – 12 October 2018, Baku, Azerbaijan:  
<http://www.unoosa.org/oosa/en/ourwork/icg/activities.html>
- Hands-on experience to handle instruments and data sets
- Running ISWI workshops to enhance the general background in space weather, including Space Weather and its effects on GNSS
  - Workshop on ISWI, 20 – 24 May 2019, ICTP, Trieste, Italy





# ISWI Instrument Sites



[www.iswi-secretariat.org](http://www.iswi-secretariat.org)

see CSSTE see GIFDS see GMDN hide GPS Africa



AMMA: African Dual-Frequency GPS Network

- Scientists from developing/developed nations work together in deploying and operating SW instruments: > 1000 deployments in >100 sites;
- Students and faculty participate at all levels of the instrument project and science;
- 18 instrument networks from 8 countries (USA, Germany, Japan, Brazil, France, Israel, Armenia, Switzerland)



# Programme on GNSS applications

## United Nations Regional Workshops/training courses on the use and applications of GNSS

- Building the capacity of developing countries in using GNSS technology for sustainable development

### United Nations/Argentina Workshop on GNSS, 19 – 23 March 2018, Falda Del Carmen

- **WGS:** Seminar on GNSS Spectrum Protection and Interference Detection and Mitigation:  
[http://www.unoosa.org/oosa/en/ourwork/psa/schedule/2018/2018-workshop-on-gnss\\_IDM-presentations.htm](http://www.unoosa.org/oosa/en/ourwork/psa/schedule/2018/2018-workshop-on-gnss_IDM-presentations.htm)
- The purpose of the seminar is to educate participants on the importance of GNSS spectrum protection at the national level and explain how to reap the benefits of GNSS

### 2019: United Nations/Fiji Workshop on the applications of GNSS, 23 – 27 June, Suva, Fiji

### United Nations/Italy Long-term Fellowship Programme, Politecnico di Torino, Turin

- The Master in Navigation and Related Applications (MNA) Programme provides extensive background knowledge in navigation/localization systems as well as a detailed analysis on NAV/COM integration and environmental monitoring applications



# Programme on GNSS applications

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

**AfricaArray** is an educational initiative to support postgraduate studies and promote research into the structural detail of the Earth's crust and mantle. It has produced a number of master's and doctorate degrees in seismology, and one of its goals is to expand seismic networks in Africa.

- [13<sup>th</sup> AfricaArray Workshop, 24 – 27 June 2018, Johannesburg, South Africa](#)

**Reference frames and timing (WGD)** – To benefit operational geodesists or surveyors involved in positioning and measurement and potentially dealing with sea level changes. It is open to government, private sector, academic or graduate students in surveying or a related discipline (IAG, FIG)

- [Technical Seminars on Reference Frames in Practice, FIG Working Week 2019, 20 – 21 April, Hanoi, Vietnam](#)



# Programme on GNSS applications

- **Space Weather and GNSS (WGC)** – Promotes the use of GNSS for scientific applications and space weather in developing countries (International Centre for Theoretical Physics (ICTP), Boston Colleague)
  - Increased number of students and young scientists studying and using GNSS, including increasing participation by women, and many opportunities for research (improved imaging of the ionosphere over the equatorial region, ionospheric effects on augmentation systems...)

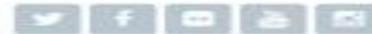
Workshop on Ionospheric Forecasting for GNSS Operations in Developing Countries: Findings and Challenges, 27 -31 May 2018, Trieste, Italy

- **Training Course on GNSS (WGC)** – To create awareness on GNSS and its applications in Asia and the Pacific region (Asian Institute of Technology and the Centre for Spatial Information Science of the University of Tokyo)
  - General overview of signal processing in receiver, receiver performances, field survey using low-cost receiver for high-accuracy positioning,

Training on GNSS, 14 – 18 January 2019, Bangkok, Thailand



# ICG Information Portal



Our Work > ICG

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

### MISSION STATEMENT

The International Committee on Global Navigation Satellite Systems (ICG), established in 2005 under the umbrella of the United Nations, promotes voluntary cooperation on matters of mutual interest related to civil satellite-based positioning, navigation, timing, and value-added services. The ICG contributes to the sustainable development of the world. Among the core missions of the ICG are to encourage coordination among providers of global navigation satellite systems (GNSS), regional systems, and augmentations in order to ensure greater compatibility, interoperability, and transparency, and to promote the introduction and utilization of these services and their future enhancements, including in developing countries, through assistance, if necessary, with the integration into their infrastructures. The ICG also serves to assist GNSS users with their development plans and applications, by encouraging coordination and serving as a focal point for information exchange.



International Committee on  
Global Navigation Satellite Systems

### VISION STATEMENT

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.

At the "United Nations International Meeting for the Establishment of the International Committee on Global Navigation Satellite Systems (ICG)" held on 1-2 December 2005 in Vienna, Austria, the ICG was established on a voluntary basis as an informal body for the purpose of promoting cooperation, as appropriate, on matters of mutual interest related to civil satellite-based positioning, navigation, timing, and value-added services, as well as compatibility and interoperability among the GNSS systems, while increasing their use to support sustainable development, particularly in the developing countries. The participants in the meeting agreed on an establishment of the ICG information portal, to be hosted by UNOOSA, as a portal for users of GNSS services.

### Our Work

Secretariat of COPUOS

Programme on Space Applications

UN-SPIDER

### ICG

- Members
- Providers' Forum
- Working Groups
- ICG Annual Meetings
- ICG Programme on GNSS Applications
- Resources
- ICG Documents
- Space Weather & GNSS
- Other Events
- ICG Timeline

UN-Space

Space Law

Topics

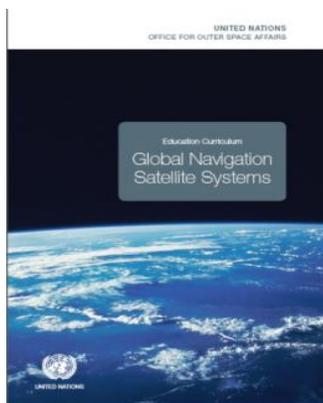
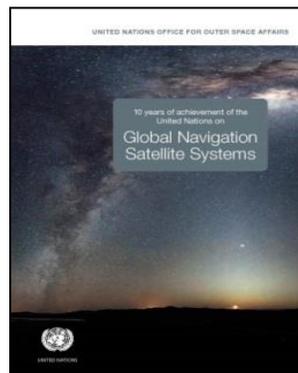
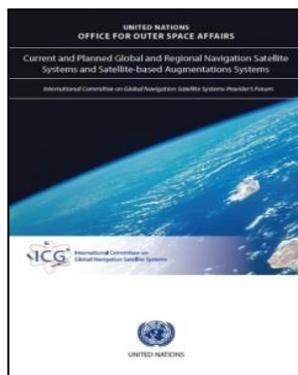
Photo Gallery

[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)



# UNOOSA Publications



UNITED NATIONS  
OFFICE FOR OUTER SPACE AFFAIRS

The Interoperable  
Global Navigation  
Satellite Systems  
Space Service Volume

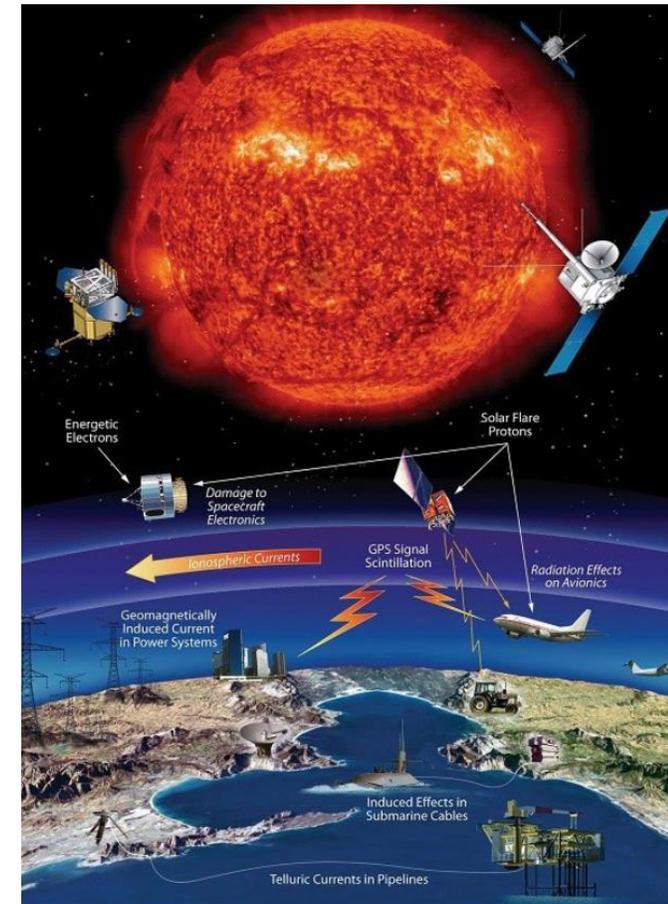
Global  
Navigation  
Satellite  
Systems

- GPS
- GLONASS
- GALILEO
- BEIDOU



## Conclusion

- ***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
- ***GNSS*** is a cost-effective and ubiquitous technology for discovering, characterizing, monitoring (and mitigating) key space weather impacts.
- ***Space weather*** is so critical because we are more dependent on space-based technology than ever before



# THANK YOU



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