International Committee on Global Navigation Satellite Systems: Activities for Capacity Building

Training Course on Global Navigation Satellite Systems

6 – 10 January 2020, Asian Institute of Technology, Bangkok, Thailand

Sharafat Gadimova
Office for Outer Space Affairs

UNITED NATIONS
Office for Outer Space Affairs

UNITED NATIONS
Office for Outer Space Affairs

United Nations Office for Outer Space Affairs

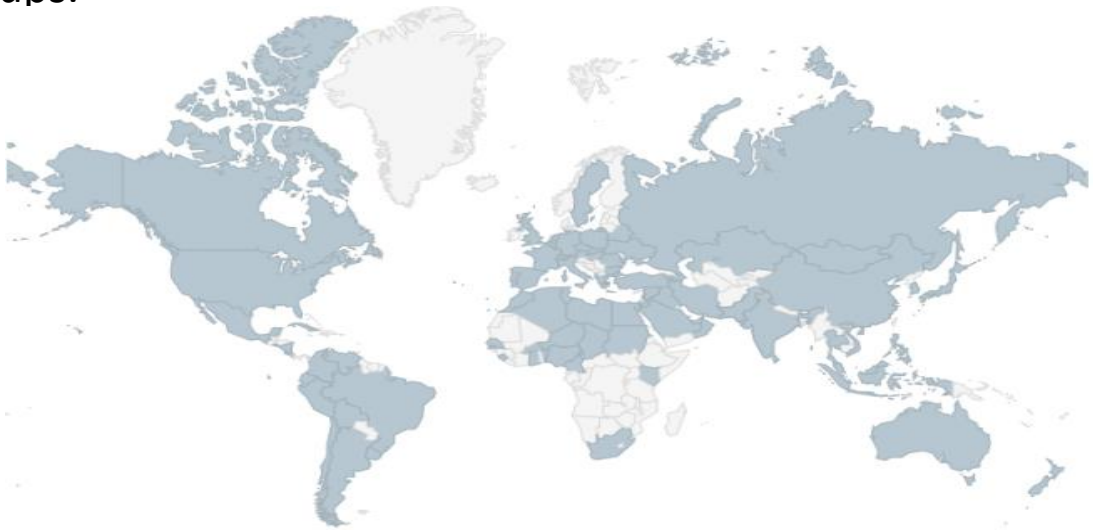
CAPACITY-BUILDER: UNOOSA brings the benefits of space to humankind by building space capacity of non-space-faring countries

GLOBAL FACILITATOR: UNOOSA plays a leading and facilitating role in the promotion of the peaceful uses of outer space

GATEWAY TO SPACE: UNOOSA is the main UN office on space matters and facilitates the coordination of UN activities using space-related technology to improve the human condition globally.

Committee on the Peaceful Uses of Outer Space

UNOOSA supports **the Committee on the Peaceful Uses of Outer Space (COPUOS**), its Scientific and Technical Subcommittee, Legal Subcommittee, and related working groups.



COPUOS was established by the General Assembly in 1959 with 24 members. Since then, the Committee's membership has continued to expand (currently 92 members), though the Office serves all 193 Member States of the UN).

STSC and LSC

The **Legal Subcommittee (LSC)** discuss **legal matters** related to the exploration and use of outer space. Topics include the status and application of the **five United Nations treaties on outer space**, the definition and delimitation of outer space, national space legislation, legal mechanisms relating to **space debris mitigation**, and **international mechanisms for cooperation** in the peaceful exploration and use of outer space

The **Scientific and Technical Subcommittee (STSC)** discuss matters related to the scientific and technical aspects of space activities. Topics for discussion include **space weather**, **near-Earth objects**, the use of **space technology for socioeconomic development**, or for **disaster management support**, **global navigation satellite systems**, and the **long-term sustainability** of outer space activities.

Space in the UN System

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

UN-Space

The annual interagency meeting (est. 1975) - since 2014 = *UN-Space.*

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

International Committee on GNSS (ICG)

- UNOOSA serves as the executive secretariat of ICG
- Established in 2005, ICG provides a mechanism for multilateral discussion and coordination on GNSS issues of concern
- 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 compatibility** among providers and users globally for enhanced services and applications

ICG: Membership and Annual Meetings

- ***Members:*** Current and future core, regional or augmentation systems providers:
  - China (BeiDou), EU (Galileo/EGNOS), Russia (GLONASS/SDCM), United States (GPS/WAAS), India (IRNSS/GAGAN), Japan (QZSS/MSAS), Nigeria (NIGCOMSAT)
  - **State Members of the United Nations** with an active programme in implementing or promoting a wide range of GNSS services and applications: Italy, Malaysia, United Arab Emirates, Australia, ***New Zealand***
- ***Associate Members and Observers***: 21 organizations
- ***Annual Meetings***: UNOOSA (2006), India (2007), … India (2019), **Vienna (2020),** UAE (2021)
- **Providers' Forum: 23rd Meeting, 8 - 12 December 2019, Bengaluru, India:** *Open Service Information Dissemination, Open Service Performance, Spectrum Protection*
  - ***ICG-15 meeting, Vienna, AUSTRIA, 14 – 18 September 2020***

Working Group Systems, Signals and Services (S)

The subgroup on compatibility and spectrum protection:

- continued its campaign to promote adequate protection of GNSS spectrum through education and outreach;

  http://www.unoosa.org/oosa/en/ourwork/icg/working-groups/s/IDMIndex.html

- continued to investigate methods of implementing interference detection and mitigation capabilities through permanent network-based solutions and through crowdsourcing techniques
- ***Recommendation (ICG-14): GNSS Spectrum Protection Booklet***
- *Fundamentals of GNSS; Interference and Spectrum Management; Interference Threats; Methods of Interference Detection and Mitigation; Current Interference Challenges*

Working Group Systems, Signals and Services (S)

Recommendation (ICG-14): Precise Point Positioning (PPP) Interoperability Task Force (to be led by Australia, japan and the European Union

- The ICG will establish a Task Force within the WG-S Interoperability and Service Standards Subgroup, with participation from WG's B and D
- The Task Force will draft a work plan focused on the objective of improving the interoperability of Precise Point Positioning (PPP) services

Specifically, the Task Force will:

- Coordinate with the ICAO Navigation Systems Panel and the SBAS Interoperability Working Group in the ongoing discussions and work of the Task Force;
- Concentrate on establishing the foundational documents, baseline definitions and assumptions to develop common terminology on basic parameters for PPP service provision/broadcast;
- Encourage the publication and dissemination of PPP signal and system information;
- Continue discussions with Service Providers (governmental and commercial) about the issues raised at the 1st PPP Workshop (Fiji 2019) and follow-on issues identified by the Task Force;
- Seek answers from Service Providers (governmental and commercial) to the questions formulated at the 1st PPP Workshop and follow-on issues identified by the Task Force

Working Group Enhancement of GNSS Performance, New Services and Capabilities (B)

Recommendation (ICG-14): Release of GNSS Transmit Antenna Patterns including Side Lobes

GNSS Service Providers consider

- releasing the antenna gain patterns or equivalent representative modelling information (including both main lobe and side lobes for each frequency, for open services) for each of the transmit antennas of the GNSS satellites in the respective satellite constellations in order to enable and/or improve the use of GNSS in the SSV

For future satellite developments

- GNSS Service Providers consider conducting antenna gain measurements, testing and/or characterization, including both main lobe and side lobes for each open service signal.

Working Group Enhancement of GNSS Performance, New Services and Capabilities (B)

- All providers have agreed on the information presented in this booklet, and on several recommendations to continue development, support, and expansion of the multi-GNSS SSV concept.
- This publication, and the work of WGB, show the significant value of GNSS SSV for a much wider scope of future space exploration activities for countries all over the world.
- GNSS SSV and its potential augmentations can enable ambitious future missions and activities in the context of space exploration going beyond low-Earth orbit to the Moon, Mars and other celestial bodies.

http://www.unoosa.org/res/oosadoc/data/documents/2018/stspace/stspace75_0_html/st_space_75E.pdf

Working Group Reference Frames, Timing and Applications (D)

Specific progress **on monitoring the offsets between GNSS times:**

- Studies have been conducted by some Providers and the timing community identifying several methods to improve their time offset determination and impact on positioning;
- Additional work is necessary for the Providers to assess the accuracy goals in the determination of the GNSS time offsets and impact on positioning, so as to specify a recommended method to determine and monitor them;
- To continue to work together (WG C and D) and contribute to capacity building on GNSS and utilization of GNSS in Geodesy and Reference Frames;

ICG: Programme on GNSS applications

- **United Nations Regional Workshops/training courses on the use and applications of GNSS:** *2019:* Workshop on the applications of GNSS, 24 – 28 June, Suva, Fiji

- **GNSS spectrum protection and interference detection and mitigation (WGS):** to engage with spectrum regulators and decision makers within their respective countries in order to do the following:
  - Ensure that there is a solid understanding of the processes and organizations involved in the regulation of the GNSS spectrum in respective countries;
  - Develop actions to ensure that there is adequate protection for the GNSS spectrum.
- **Standards and interoperability of precise point positioning services (WGS&B&D):** to increase the user benefits and opportunities to support PNT applications in developing countries.

ICG: Programme on GNSS applications

- **Sustainability and modernization of GNSS continuously operating reference stations and geospatial infrastructure through capacity development (WGD):** to provide information on the importance of planning and its link to the "why, what and how" of developing long-term capability with respect to GNSS and geospatial infrastructure and related activities:
- There was a need for standards and procedures that were " fit for purpose" , including consolidated checklists that would serve to ensure consistent and sustainable use of GNSS, and related activities in the regions;
- Engagement with the private sector, especially for training, data provision and processing, was encouraged.
- ***2020: United Nations/Mongolia Workshop on the applications of GNSS, 13 -17 April, Ulaanbaatar***

ICG: Programme on GNSS applications

❖ **Space Weather and GNSS (WGB&C)**

- Promotes the use of GNSS for scientific applications and space weather in developing countries
- 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…)

- *In cooperation with the Institute for Scientific Research at Boston College, the United States, and the Abdus Salam International Centre for Theoretical Physics, Italy:* A series of outreach workshops on space weather effects on GNSS operations

ICG: Programme on GNSS applications

2020: African Workshop on GNSS and Space Weather, Rabat, Morocco, 5 – 16 October

- To provide updated knowledge of how GNSS operate and their applications; to describe the science of SW; and how to perform ionospheric and SW research with GNSS data

- Introduction to Global Navigation Satellite Systems
- GNSS Applications
- Ionospheric Total Electron Content
- Scintillation
- Ionospheric Modeling
- Space Weather
- The Sun-Earth Connection
- Hands-on laboratories

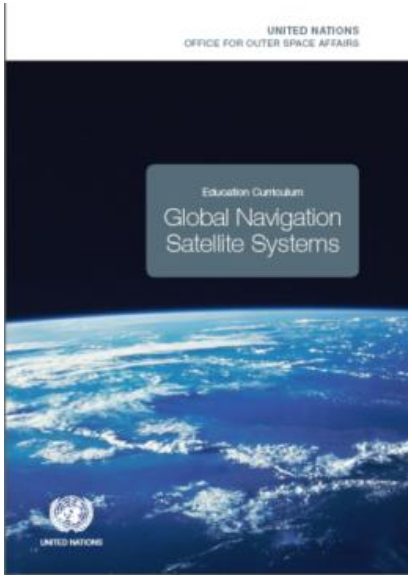
ICG: Programme on GNSS applications

- **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, IGS): *Technical Seminars on Reference Frames in Practice, FIG Working Week*
- **Training Course on GNSS (WGC)**
  - To create awareness on GNSS and its applications in Asia and the Pacific region (*the Centre for Spatial Information Science of the University of Tokyo, Japan and Asian Institute of Technology, Bangkok*)
  - General overview of signal processing in receiver, receiver performances, field survey using low-cost receiver for high-accuracy positioning,

Training on GNSS, 6 – 10 January 2020, Bangkok, Thailand

Information Centres for ICG

The Programme of Space Applications 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, Latin America and the Caribbean, and Western Asia

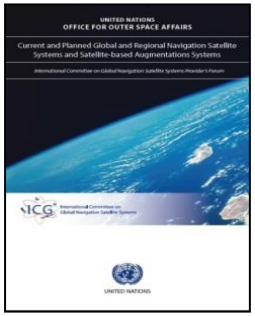


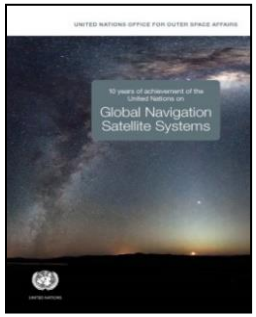
ICG Information Portal

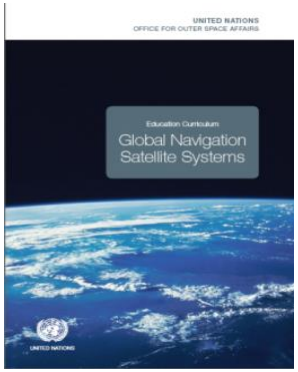
WWW.UNOOSA.ORG

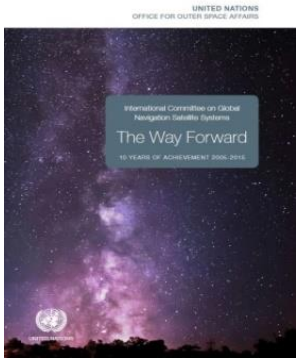
WWW.UNOOSA.ORG/OOSA/EN/OURWORK/ICG/ICG.HTML

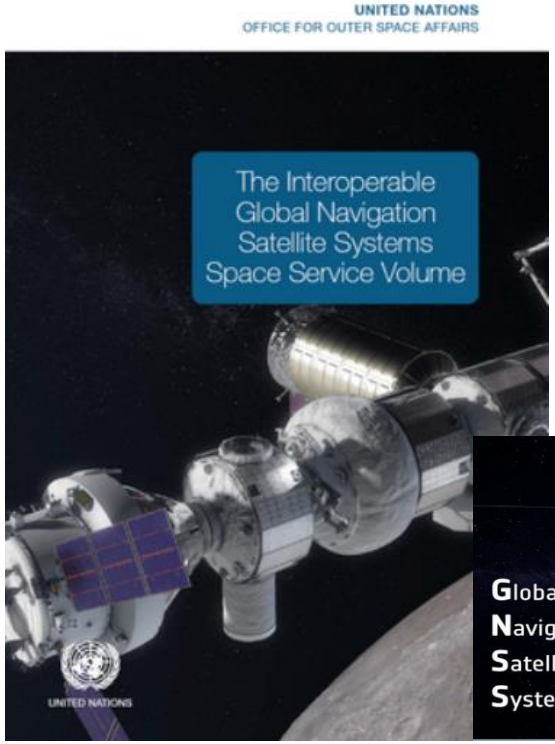
UNOOSA Publications

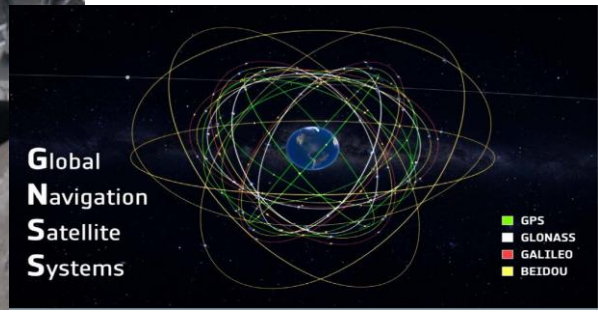












http://www.unoosa.org/oosa/en/ourwork/icg/documents/publications.html

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
- The ICG is an important vehicle in the multi-lateral arena, as satellite-based positioning, navigation and timing becomes more and more a genuine multinational cooperative venture

THANK YOU

UNITED NATIONS
Office for Outer Space Affairs
www.unoosa.org • @UNOOSA