



UNITED NATIONS
Office for Outer Space Affairs

INFORMATION NOTE

United Nations/Argentina Workshop on the Applications of Global Navigation Satellite Systems

Organized jointly by
**The United Nations Office for Outer Space Affairs and
the National Commission for Space Activities**

Co-organized and co-sponsored by
**The European Space Agency and
The International Committee on Global Navigation Satellite Systems**

Falda Del Carmen, Cordoba, Argentina

19 - 23 March 2018

1. Introduction

Since the Global Positioning System (GPS) of the United States of America and the Global Navigation Satellite System (GLONASS) of the Russian Federation became fully operational, the number of satellite systems offering position, velocity and time (PVT) at global scales is increasing. Next-generation systems that are being developed include the European Satellite Navigation System (Galileo) and China's BeiDou Navigation Satellite System (BDS), creating unprecedented opportunities due to better accuracy, reliability and availability of the PVT data. At regional scale, a variety of systems are also available: the Indian Regional Navigation Satellite System (NAVIC) and Japan's Quasi-Zenith Satellite System (QZSS), together with a number of regional augmentation systems. This landscape provides the adequate setting for the development of applications, which were not possible before and where GNSS technology and data is used on a daily basis. However, as new systems emerge, key factors like signal compatibility and interoperability among global navigation satellite systems (GNSS), shall be carefully studied to ensure that the benefits and applications of GNSS are widespread. GNSS applications have a predominant role in modern societies, manifesting in areas such as mapping and surveying, monitoring of the environment, precision agriculture and natural resources management, disaster warning and emergency response, aviation, maritime and land transportation among others.

To focus on GNSS technology and its applications, **a five-day Workshop will be held in Cordoba, Argentina, from 19 to 23 March 2018**. This Workshop is being organized by the United Nations Office for Outer Space Affairs in cooperation with the National Commission for Space Activities (CONAE) as part of the activities of the United Nations Programme on Space Applications. The Workshop will be hosted by CONAE. The Workshop is co-sponsored by the European Space Agency (ESA). The Government of the United States of America and the European Commission through the International Committee on Global Navigation Satellite Systems (ICG) are also co-sponsors of this Workshop.

2. Background

The United Nations Office for Outer Space Affairs (UNOOSA)¹ is the United Nations Office responsible for promoting international cooperation in the peaceful uses of outer space and, among other responsibilities, is the Executive Secretariat of ICG and its Providers Forum.

ICG was established in 2005 under the umbrella of the United Nations to encourage and facilitate compatibility, interoperability and transparency between all satellite navigation systems, to promote and protect the use of their open service applications and thus, benefit the global community while increasing their use to support sustainable development, particularly in the developing countries². 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.

The Office for Outer Space Affairs, in its capacity as the Executive Secretariat of ICG and its Providers' Forum, is promoting the use of GNSS throughout its programme on GNSS applications and related capacity building activities, in particular, support is provided to the regional centres for space science and technology education affiliated to the United Nations which also act as information centres for ICG³.

In the last few years different institutions had begun to deploy several instruments of different kind⁴ (for example, GNSS receivers, ionosondes, magnetometers) in many low latitude countries in Africa, South America and Southeast Asia, over which the ionosphere had remained less known because of the scarce distribution of ionospheric sensors. Due to this efforts, new sets of data are now available and expected to make possible improvements in ionospheric modelling efforts. Additionally, some specific phenomena that take place in many low latitude countries in Africa, South America and Southeast Asia can be better monitored. Since the ionosphere the major error source in GNSS receivers, an improved knowledge of the low latitude ionosphere would mitigate the ionospheric effects on GNSS positioning applications (e.g. precision agriculture, environmental monitoring, civil aviation) in the same geographic region.

Development projects, applications, services or products requiring georeferencing, require a uniform coordinate reference system. Most countries have some form of national reference frame or system. These reference frames/systems are usually based on local origin or datum point, which restrict their use to a particular country. This makes cross-border mapping, development and planning projects difficult. This therefore calls for the establishment of a common and uniform continental reference coordinates frames/systems⁵. In this respect, the Geocentric Reference System for America (SIRGAS) is responsible for the reference frame for South and Central America.

The availability of GNSS and other space-based systems is creating an unprecedented opportunity, bringing benefits in the areas of emergency management, marine and land monitoring or fleet control to name a few. Due to this availability, the development of integrated applications is an area in rapid expansion. This Workshop will be an opportunity to discuss on the potential synergies and the development of integrated applications.

The Workshop will also be informed about the preparations towards the **fiftieth anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE+50)**, to be held in June 2018. Information about a series of high level fora: Space as a Driver for Socioeconomic Sustainable Development, to be organized by the Office for Outer Space Affairs in 2016 through 2018, will also be presented. These series of fora will address the cross-

1 <http://www.unoosa.org/>

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

3 <http://www.unoosa.org/oosa/en/SAP/centres/index.html>

4 <http://www.iswi-secretariat.org/>

5 <http://www.unoosa.org/oosa/en/SAP/gnss/icg/regrefsys.html>

sectoral impact of integrating economic, environmental, social, policy and regulatory dimensions of space in pursuance of global sustainable development.

The Workshop is aligned with the objective of UNISPACE+50 to strengthen international coordination and cooperation in the use and applications of space science and technology. In particular, the Workshop expects to contribute mainly to the following thematic priorities:

Thematic Priority 1: Global partnership in space exploration and innovation

Thematic Priority 4: International framework for space weather

Thematic Priority 7: Capacity building for the 21st Century.

The regional centres for space science and technology education affiliated to the United Nations, as information centres for ICG, are working towards the establishment of a network of institutions involved or interested in GNSS. They are also identifying new applications that could be developed in the regions on the basis of GNSS services.

Regarding the Sustainable Development Goals (SDG), the Workshop contribute to the following:

- SDG3: *Good Health and wellbeing* - GNSS positioning enables individual patients, staff or equipment to be monitored, and response teams directed more efficiently;
- SDG7: *Affordable and clean energy* - GNSS reflectometry techniques can produce scatterometry models to assist in the optimum positioning of off-shore wind farms; and
- SDG15: *Biodiversity and Ecosystems* - GNSS reflectometry offers the potential for monitoring vegetation and biomass. It also has an important role in providing information for global monitors such as: carbon modelling, greenhouse gas emission inventories and deforestation control).

2018: UNISPACE+50 years of space cooperation and development

UNISPACE+50 will take stock of the contributions of the three UNISPACE conferences (UNISPACE I, held in 1968, UNISPACE II, held in 1982 and UNISPACE III, held in 1999) to global space governance. In line with the 2030 Agenda for Sustainable Development and sustainable development goals, UNISPACE+50 aims to chart the future role of the Committee on the Peaceful Uses of Outer Space (COPUOS), its subsidiary bodies and the United Nations Office of Outer Space Affairs at a time of an evolving and more complex space agenda when more actors, both governmental and non-governmental, are increasingly involved in space activities. The activities of the United Nations Programme on Space Applications are an integral part of the UNISPACE+50 thematic cycle, contributing to space economy, space society, space accessibility and space diplomacy. More detailed information is available at the website of the Office for Outer Space Affairs:

<http://www.unoosa.org/oosa/en/aboutus/history/unispace.html>

3. Objectives and Expected Outcomes

The main objective of the Workshop is to reinforce the exchange of information between countries and scale up the capacities in the region pursuing the application of GNSS solutions.

In order to strengthen the ongoing processes in the lead up to UNISPACE+50, the specific objectives of the Workshop are:

- a) to introduce GNSS and its applications to transport and communications, aviation, surveying, mapping and Earth science, management of natural resources, the environment and disasters, precision agriculture; high precision mobile application, as well as space weather effects on GNSS and dual-frequency receivers;
- b) to promote greater exchange of actual experiences with specific applications;

- c) to encourage greater cooperation in developing partnerships and GNSS networks, in the framework of the regional reference frames;
- d) to define recommendations and findings to be forwarded as a contribution to ICG and UNISPACE+50, in particular in forging partnerships to strengthen and deliver capacity-building in the use and applications of space science and technology.

The expected outcomes of the Workshop are:

- a) recommendations and findings on discussed topics to be adopted by the Workshop participants;
- b) preliminary agreement of cooperation between countries in the region and the GNSS continuously operating reference station (CORS) networks;
- c) action plan addressing identified issues/concerns.

Additionally, building on past coordination and capacity-building activities, the current Workshop could consider, *inter alia*, the following issues for recommendations to UNISPACE+50:

- Better define pilot projects to strengthen collaboration at regional level;
- The creation of regional networks of GNSS-related institutions, including the regional centres for space science and technology education affiliated to the United Nations;
- Propose actions to progress in the establishment of common and uniform continental reference coordinates frames and systems;
- Promote actions for the development of modernized national horizontal reference systems, including deformation models and vertical datums based on accurate local geoid models;
- Propose means to build capacity in regional geodetic with a focus on GNSS data processing and the use of open geodetic software in cooperation with entities such as the International Federation of Surveyors (FIG) and the International Association of Geodesy (IAG).

4. Preliminary programme of the Workshop

The Workshop programme will include plenary sessions and sufficient time for discussions among participants to identify the priority areas where pilot projects should be launched and examine possible partnerships that could be established. A half-day technical tour will be arranged by the Local Organizing Committee during the Workshop. As a preliminary suggestion the following sessions will be organised:

Thematic Sessions

Session 1: Current and planned GNSS and satellite-based augmentation systems

- Programme updates on GNSS and satellite-based augmentation systems: GLOBal NAVigation Satellite System (GLONASS) and System of Differential Correction and Monitoring (SDCM), Global Positioning System (GPS) and Wide-Area Augmentation System (WAAS), European Satellite Navigation System (GALILEO) and the European Geostationary Navigation Overlay Service (EGNOS), BeiDou Navigation Satellite System (BDS), Indian Regional Navigation System (NAVIC) and GPS Aided Geo-Augmented Navigation (GAGAN), Quasi-Zenith Satellite System (QZSS).

Session 2: GNSS-based applications focusing on, but not limited to

- Advances and performance benefits due to multi-sensor integration of GNSS applications in surveying and geodesy;
- The use of GNSS for aviation, including integration of satellite navigation technology into air traffic management and airport surface navigation and guidance;
- The use of navigation and timing systems for road, rail, and engineering applications,

including vehicle guidance, geographic information system (GIS) mapping, and precision farming;

- Navigation systems operation in marine environment, including waterway navigation, harbour entrance/approach, marine archaeology, fishing, and recreation;
- Commercial applications of GNSS;
- The use of GNSS signals for navigation and positioning of in-orbit space operations, particularly from low-Earth orbit to cis-Lunar.

Session 3: GNSS spectrum protection and interference detection and mitigation

- ICG activities and its role in spectrum protection and interference detection and mitigation

Session 4: GNSS and space/atmospheric weather monitoring

- Atmospheric monitoring (troposphere) to improve numerical weather predictions
- Space weather monitoring (ionosphere) for space situation awareness

Session 5: GNSS reference frames/systems and reference station networks

- Programme updates on regional and national reference frames/systems and perspectives for a regional cooperative mechanism
- International GNSS Service (IGS) and other initiatives, CORS network and multi-GNSS environment
- Geocentric Reference System for America (SIRGAS)

Session 6: Capacity building, training and education in the field of GNSS

- GNSS education opportunities at different levels/needs
- The strengthening of a specialized master's programmes for long-term professional education and support to PhD training and networking in GNSS
- GNSS education tools/open source software related to GNSS

Discussion Sessions

- Issues, concerns and approaches for pilot projects/initiatives, requirements of implementing, mechanisms and resources of implementing
- Possible follow-up projects and initiatives and proposals for future workshops/training courses/technical seminars

Technical Tour

5. Working Methods

Participants of the Workshop are requested to deliver a presentation paper and materials covering information on the use of GNSS technology, case studies/projects in GNSS applications in their respective countries. Each speaker is allocated 20 minutes for the presentation. It is also necessary to submit an abstract of presentation with a maximum of 600 words including the following details: Paper Title, Author (s) Name(s), Affiliation(s), and e-mail address for the presenting author. Applicants are requested to *use the template* to present an *abstract* in the required format.

Presentations made at the Workshop will be published on the website of the Office for Outer Space Affairs (www.unoosa.org) approximately two weeks after the Workshop.

6. Sponsorship of the Workshop

The Office for Outer Space Affairs of the United Nations, CONAE and ESA are responsible for organizing the workshop. The United States of America and the European Commission through the ICG are co-sponsors of the workshop. **Sponsorship of the workshop is still open to the ICG membership and other interested entities.**

7. Expected participants

The Workshop is being planned for a total of 75 participants including scientists, engineers, university educators, and policy-and-decision makers and senior experts from the following groups: international, regional, national and local institutions, United Nations agencies, intergovernmental and non-governmental organizations, research and development institutions, and also from industry.

8. Participation requirements

Participants should be in senior managerial or decision-making responsibility at governmental agencies, national and regional institutions, intergovernmental and non-governmental organizations or industry. **Equally qualified female applicants are particularly encouraged.**

9. Language of the Workshop

The working language of the Workshop will be English.

10. Financial support

Within the limited financial resources available, a limited number of selected participants will be offered financial support to attend the workshop. This financial support will defray the cost of travel (a round trip airticket – most economic fare – between the airport of international departure in their home country and Cordoba, Argentina) and/or the room and board expenses for the duration of the workshop. The co-sponsors of the workshop will jointly select participants on a competitive basis. Successful applicants will be notified of the outcome within two weeks after the deadline.

11. Deadline for Submission of Applications and Abstracts

The completed application form together with the presentation abstract should be submitted on-line, to the Office for Outer Space Affairs, **no later than Thursday, 15 February 2018**. Only complete applications with all the requested information and signatures will be considered by the Workshop organizing committee. Please note that on-line application form is available on the web site of the Office for Outer Space Affairs at the following address:

<https://register.unoosa.org/civicrm/event/info?id=72&reset=1>

12. Life and Health Insurance

Life/major health insurance for each of the selected participants is necessary and **is the responsibility of the candidate or his/her institution or Government**. The co-sponsors will not assume any responsibility for life and major health insurance, nor for expenses related to medical treatment or accidents.

13. Further Information and Contact Details

For information regarding the submission of nominations for attendance and funding, please contact Mr. Jorge DEL RIO VERA, United Nations Office for Outer Space Affairs, at the following e-mail address: (jorge.delriovera@un.org).

For information regarding the Workshop programme, please contact Mr. Jorge DEL RIO VERA at: (jorge.delriovera@unoosa.org) or Ms. Sharafat GADIMOVA, United Nations Office for Outer Space Affairs, at: (sharafat.gadimova@un.org).

The focal point for Argentina can be contacted at the following e-mail addresses: Mr. Stanislav MAKARCHUK, Responsible for Cooperation in International Projects on Universe Exploration and Satellite Navigation, National Commission on Space Activities - CONAE (stas@conae.gov.ar).