



# General Assembly

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## Committee on the Peaceful Uses of Outer Space

### Activities carried out in 2009 in the framework of the workplan of the International Committee on Global Navigation Satellite Systems

#### Report of the Secretariat

#### I. Introduction

1. The Committee on the Peaceful Uses of Outer Space, at its fifty-second session, in 2009, noted with appreciation that the International Committee on Global Navigation Satellite Systems (ICG) continued to make significant progress towards achieving compatibility and interoperability among global and regional space-based positioning, navigation and timing systems and in promoting the use of global navigation satellite systems (GNSS) and their integration into national infrastructures, particularly in developing countries.<sup>1</sup>

2. At the Fourth Meeting of the International Committee on Global Navigation Satellite Systems, held in Saint Petersburg, Russian Federation, from 14 to 18 September 2009, participants discussed how GNSS could benefit people around the world. The Meeting, attended by current and future GNSS operators and augmentation system providers from China, India, Japan, the Russian Federation, the United States of America and the European Union, sought to promote the enhancement of and universal access to space-based navigation and positioning systems and their compatibility and interoperability (see A/AC.105/948). The goal of the work of ICG is to have GNSS signals from all operating GNSS available at any location and at any time for civil applications.

3. The present report contains an update on the implementation of a wide range of activities included in the ICG workplan for 2009. Those activities focused on building capacity, specifically in deploying instruments for the International Space Weather Initiative, developing a GNSS education curriculum and utilizing regional

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<sup>1</sup> *Official Records of the General Assembly, Sixty-fourth Session, Supplement No. 20 (A/64/20)*, para. 128.



reference frames in support of sustainable development, particularly in developing countries.

## **II. Activities of the International Committee on Global Navigation Satellite Systems carried out in 2009**

4. Pursuant to the ICG workplan, the Office for Outer Space Affairs of the Secretariat, through its programme on GNSS applications, concentrated its work in 2009 on (a) training for capacity-building in developing countries; (b) promoting the use of GNSS technologies as tools for scientific applications; (c) the International Space Weather Initiative; and (d) regional workshops on GNSS applications. Close attention was paid to the role of ICG information centres as hubs to promote GNSS applications and education.

### **A. Training for capacity-building in developing countries**

5. At its fifty-second session, the Committee noted with appreciation that the regional centres for space science and technology education, affiliated to the United Nations, would serve as ICG information centres.<sup>2</sup> The regional centres for Africa are located in Morocco and Nigeria; for Latin America and the Caribbean, in Brazil and Mexico; and for Asia and the Pacific, in India. Information on the regional centres is available on the website of the Office for Outer Space Affairs ([www.unoosa.org](http://www.unoosa.org)).

6. The Office for Outer Space Affairs supported training courses on GNSS held at the African Regional Centre for Space Science and Technology — in French language, in Rabat, from 28 September to 24 October 2009, and at the Regional Centre for Space Science and Technology Education for Latin America and the Caribbean in Tonantzintla, Mexico, from 16 to 20 November 2009. Through ICG, the training courses also received support from the Government of the United States and the European Space Agency (ESA). These courses were part of the work of the Office to develop an in-depth GNSS curriculum for introduction at all the regional centres and other institutions of higher-level education. The courses also aimed at establishing and strengthening networks in the regions for the exchange of information. The training course reports are available at the ICG information portal ([www.icgsecretariat.org](http://www.icgsecretariat.org)).

7. As a further step in this process, the GNSS curriculum will supplement the proven standard model education curricula of the regional centres, developed through the United Nations Programme on Space Applications and comprising the following core disciplines: remote sensing and geographic information systems, satellite communications, satellite meteorology and global climate, and space and atmospheric sciences.

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<sup>2</sup> Ibid., para. 132.

## **B. Promoting the use of global navigation satellite system technologies as tools for scientific applications**

8. In view of the increased use of GNSS technologies, particularly the global positioning system (GPS), in the various geo-information applications, services and products and of the requirements of relating GPS solutions to existing mapping products based on local and national coordinate reference systems, there is a need to determine the transformation parameters between such systems and GNSS reference frames. This could be achieved upon full implementation of the regional reference frames, namely the African Geodetic Reference Frame (AFREF), the Geocentric Reference System for the Americas (SIRGAS), the Reference Frame Sub-Commission for Europe (EUREF) and the European Position Determination System (EUPOS), and the Asia Pacific Reference Frame (APREF).

9. Cooperation between ICG and regional reference systems holds vast potential for geodesy, mapping, surveying, geo-information, mitigation of natural hazards and the earth sciences, among other areas. As one element of the programme on GNSS applications, this cooperation, which is also facilitated through the United Nations-affiliated regional centres, could provide a major springboard for the transfer and enhancement of skills and knowledge in surveying, geodesy and, especially, GNSS and related applications.

10. Within the scope of its activities, ICG provided funding that enabled 10 professionals from Africa to participate in a workshop on satellite navigation science and technology for Africa held at the Abdus Salam International Centre for Theoretical Physics, in Trieste, Italy, from 23 March to 9 April 2009, and a workshop on establishment of GNSS permanent stations and data processing held at the Regional Centre for Mapping of Resources for Development, in Nairobi from 24 August to 4 September 2009.

11. These workshops integrated formal lectures with hands-on practice in GNSS architecture, signal structure, hardware design, state-of-the-art applications and scientific exploration using GNSS. An on site computer laboratory allowed participants ample opportunity to perform positioning calculations, to use mapping and surveying software, to plan a precision farming procedure and to analyse atmospheric and ionospheric data — all on the basis of GPS measurements.

12. In addition, the Office for Outer Space Affairs co-organized the Second International Symposium on Global Navigation Satellite Systems, Space-Based and Ground-Based Augmentation Systems and Applications, which was hosted by the Government of Germany and held in Berlin from 30 November to 2 December 2009. The Symposium addressed the objectives, activities, organization and achievements of the cooperation with EUPOS and EUREF. The potential of space-based geodetic techniques, in particular GNSS and differential GNSS reference station networks, was recognized for use in modern and precise continental reference frames in the Eurasian tectonic plate.

## **C. International Space Weather Initiative**

13. At its fifty-second session, the Committee noted with satisfaction the agreement reached by the Scientific and Technical Subcommittee at its

forty-sixth session to consider, beginning at its forty-seventh session, a new agenda item entitled “International Space Weather Initiative” under a three-year workplan with specific focus on the effects of space weather on the Earth and its impact on, inter alia, communications and transport.<sup>3</sup>

14. From 2005 to 2009, the workshops held within the framework of the International Heliophysical Year 2007 were dedicated to and contributed to the deployment of 14 ground-based instrument arrays (GPS receivers, radio antennas, magnetometers, cosmic ray detectors) for research on climate change, space weather and ionospheric phenomena. Currently, more than 1,000 instruments are operational in these instrument arrays.

15. A sudden ionospheric disturbance (SID) monitor, designed to detect solar flares, is successfully operating at the United Nations Office at Vienna and will be extended to an Atmospheric Weather Electromagnetic System for Observation Modeling and Education (AWESOME) instrument that provides both solar and night-time research-quality data. To share data, the SID monitor is being integrated into the existing worldwide network of SID and AWESOME monitors. This network is advancing the understanding of the fundamental heliophysical processes that govern the Sun, Earth and heliosphere, particularly space weather phenomena. Monitoring the fundamental processes responsible for solar-terrestrial coupling is vital to understanding the influence of the Sun on the near-Earth environment.

16. With regard to the development of ionospheric observation points at a number of universities in Morocco, the Office for Outer Space Affairs co-organized a workshop to establish scientific and instrumental collaboration for observing the consequences of space weather. The workshop, held in Rabat from 18 to 24 November 2009, was hosted by the Mohammed V University at Souissi on behalf of the Government of Morocco. Tentatively, two magnetometers (Magnetic Data Acquisition System (MAGDAS)), two GPS receivers (GPS-Africa and Scintillation Network Decision Aid (SCINDA)) and one radio spectrometer (Compound Astronomical Low-cost Low-frequency Instrument for Spectroscopy and Transportable Observatory (CALLISTO)) will be transferred to Moroccan observational sites. The African Regional Centre for Space Science and Technology — in French language, located in Rabat, will participate in the operation of the two GPS receivers.

#### **D. Regional workshops on global navigation satellite system applications**

17. The United Nations/Azerbaijan/United States of America/European Space Agency Workshop on Applications of Global Navigation Satellite Systems was held in Baku from 11 to 15 May 2009. The Ministry of Communication and Information Technologies hosted the Workshop on behalf of the Government of Azerbaijan. The Workshop was co-sponsored by the Government of the United States (through ICG) and ESA. The specific objectives of the Workshop were (a) to strengthen regional information and data exchange networks in the use of GNSS technology; (b) to identify the specific needs of individual GNSS plans and projects at the regional and

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<sup>3</sup> Ibid., para. 155.

international levels for near-term, medium-term and long-term applications; and (c) to develop a regional plan of action that would contribute to the wider use of GNSS technology and its applications (see A/AC.105/946).

18. In the framework of the various ongoing projects and programmes of relevance to the region, participants agreed on follow-up activities to further strengthen the reference station networks through EUPOS and agreed that GNSS training courses and workshops should be organized for countries in the region not currently operating permanent reference stations. Participants highlighted the importance of continuing education and training for experts and users and recommended the available online educational materials to be used for distance learning or e-learning.

### **III. Technical advisory services**

19. In 2009, the Office for Outer Space Affairs, as the executive secretariat of ICG and the Providers' Forum, participated in and contributed to the major international and regional meetings on GNSS:

(a) Munich Satellite Navigation Summit 2009 — The Worldwide Race in GNSS, held in Munich from 3 to 5 March;

(b) First European Space Agency Global Navigation Satellite Systems Education Workshop, held in Madrid on 12 and 13 March;

(c) Second GNSS Vulnerabilities and Solutions Conference, held in Baška, Croatia, from 2 to 5 September;

(d) Tenth Austrian Day of Geodesy Conference, held in Schladming, Austria, from 6 to 8 October;

(e) Second International Symposium on Global Navigation Satellite Systems, Space-based and Ground-based Augmentation Systems and Applications, held in Berlin from 30 November to 2 December;

(f) Seventh International Federation of Surveyors Regional Conference, "Spatial Data Serving People: Land Governance and the Environment — Building the Capacity", held in Hanoi from 19 to 22 October;

(g) International Global Navigation Satellite Systems Society 2009 Symposium on GPS/GNSS, held in Gold Coast, Australia, from 1 to 3 December.

20. In addition, the Office for Outer Space Affairs assisted the ICG Working Group on Compatibility and Interoperability in the preparation of workshops focusing on the interoperability of global and regional navigation satellite systems and satellite-based augmentations from the user's perspective. These workshops were held in Munich on 2 and 3 March 2009, immediately preceding the Munich Satellite Navigation Summit 2009; in Vienna on 30 and 31 July 2009; and in Gold Coast, Australia, on 30 November 2009, in conjunction with the International Global Navigation Satellite Systems Society 2009 Symposium on GPS/GNSS.

#### **IV. Voluntary contributions**

21. The successful implementation of ICG activities in 2009 benefited from the support and voluntary contributions (in cash and in kind) of the following ICG members:

(a) The Government of the United States provided \$100,000 to support capacity-building and technical advisory services and also arranged for experts to make technical presentations and participate in deliberations at activities covered in the present report;

(b) The Government of China, the Government of the Russian Federation, the European Union, ESA and EUPOS provided sponsorship for experts to make technical presentations and participate in deliberations at activities of the programme of GNSS applications. The European Union provided sponsorship for one staff member of the Office for Outer Space Affairs to participate in the Tenth Austrian Day of Geodesy Conference and the First European Space Agency Global Navigation Satellite Systems Education Workshop.