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Committee on the Peaceful Uses of Outer Space

Activities carried out in 2010 in the framework of the workplan of the International Committee on Global Navigation Satellite Systems

Report of the Secretariat

I. Introduction

1. Global navigation satellite systems (GNSS) have grown from a limited number of programmes to a point where a considerable number of systems and their augmentations are operating or planned. In the future, a number of international and national programmes will operate simultaneously and support a broad range of interdisciplinary and international activities. Discussions taking place at the national, regional and international levels have underscored the value of GNSS for a variety of applications. The emergence of new GNSS and regional augmentations has focused attention on the need for the coordination of programme plans among current and future operators in order to enhance the utility of GNSS services.

2. The International Committee on Global Navigation Satellite Systems (ICG), established in 2005 on a voluntary basis as an informal body, represents a unique combination of GNSS service providers and major user groups that seek to encourage compatibility and interoperability among the various satellite systems, while increasing their use in developing countries in support of sustainable development and to protect the environment.

3. ICG held its fifth meeting in Turin, Italy, from 18 to 22 October 2010 to continue reviewing and discussing developments in GNSS. ICG also addressed GNSS technology in the era of multi-system receivers and the impact of GNSS interoperability on timing and other user applications.[1] The goal of the ICG work at that meeting was to have GNSS signals used coherently from all operating systems at any location and at any time for civil applications.

[1] See A/AC.105/982.

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4. The present report reflects a wide range of activities carried out in 2010 by the Office for Outer Space Affairs of the Secretariat, consistent with its role as the executive secretariat for ICG. Detailed information can be found at the ICG information portal (www.icgsecretariat.org).

II. Activities of the International Committee on Global Navigation Satellite Systems in 2010

5. The Office for Outer Space Affairs, through its programme on GNSS applications, concentrated 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 applications of GNSS.

A. Training for capacity-building in developing countries

6. In 2008, the plenary of the third meeting of the ICG affirmed that in the future the regional centres for space science and technology education, affiliated to the United Nations, would act as the ICG information centres.[2] The main purpose of the information centres is to foster a more structured approach to information exchange in order to make information on services provided on a continuing basis by GNSS core systems and augmentations equally accessible to all users, and to expand the overall goal of the regional centres, which is to develop, through in-depth education, an indigenous capability for research and applications.

7. The General Assembly, in its resolution 64/86, welcomed the fact that the United Nations regional centres would serve as ICG information centres. The regional centres are located in Morocco and Nigeria for Africa, in Brazil and Mexico for Latin America and the Caribbean, and in India for Asia and the Pacific.

8. In 2008 and 2009, the Office for Outer Space Affairs supported training courses on GNSS that were held at the Centre for Space Science and Technology Education in Asia and the Pacific, at the African Regional Centre for Space Science and Technology Education — in French Language and at the Regional Centre for Space Science and Technology Education for Latin America and the Caribbean.

9. In 2010, building upon the experiences of the three previous courses on GNSS, and as a further step in developing an in-depth GNSS curriculum, the Office for Outer Space Affairs and the African Regional Centre for Space Science and Technology Education — in English Language jointly organized a training course on satellite navigation and location-based services for the benefit of countries in Africa. The training course was held at Obafemi Awolowo University, Ile-Ife, Nigeria, from 4 to 29 October 2010. The training course received support from the Government of the United States of America, through ICG, and the European Space Agency (ESA). Further information on the regional centres is available on the website of the Office for Outer Space Affairs (www.unoosa.org).

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[2] See A/AC.105/928.

10. The objectives of the course were (a) to present updates on the status of and plans for current and future global and regional navigation satellite systems, and satellite-based augmentation systems; (b) to present GNSS technology and its applications; (c) to provide hands-on experience in the use of off-the-shelf software for specific applications and GNSS signal processing; and (d) to strengthen networks in the region for exchange of information on the use of GNSS technology. The training course report is available at the ICG information portal.

11. To begin developing a curriculum for a basic course, a group of educators and experts on GNSS was established. The Office for Outer Space Affairs collected information on GNSS curricula taught in selected universities that had a long tradition of teaching GNSS technology and its applications. Such information and the programmes of the short-term training courses will be used as background material to structure the first draft curriculum. Instruction through web-based distance-learning programmes will also be given consideration, as they would be vital for a variety of users.

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

12. The use of satellite-based techniques to determine the coordinates of objects on the surface of the Earth requires the use of reference systems that make it possible to relate accurate knowledge of the position of satellites to the coordinates of points on the Earth. In the case of GNSS, the coordinates of an object on Earth are related to the same reference system as the ephemerides of the GNSS constellation. This reference system is the International Terrestrial Reference Frame, which is the standard frame adopted worldwide for all geodetic and geophysical applications. The use of permanent global positioning system (GPS) stations for a variety of applications allows densification to be carried out by the regional reference networks, namely, the African Geodetic Reference Frame, the Geocentric Reference System for the Americas, the European Position Determination System (EUPOS), the International Association of Geodesy Reference Frame Subcommission for Europe and the Asia Pacific Reference Frame.

13. To strengthen cooperation among the regional geodetic reference frames, the following events received support from ICG, in accordance with its workplan for 2010:

(a) Workshop on satellite navigation science and technology for Africa, held at the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy, from 6 to 24 April;

(b) Workshop on leveraging African arrays and the African Geodetic Reference Frame, held at Howard University, Washington, D.C., from 21 to 23 June;

(c) Workshop on coordinating GPS and geo-instrumentation in Africa, held at the University of the Witswatersrand, Johannesburg, South Africa, from 19 to 22 November.

Funds provided by the United States, through ICG, were used to defray the cost of air travel for 24 participants from Africa.

14. Over the course of their training, the participants, representing 14 countries, were taught by international experts in GNSS on topics such as GPS, navigation and terrestrial reference systems and frames. The training courses also included sessions on space weather and ionospheric research in an effort to initiate space science research programmes in Africa and to support existing groups and projects in those areas.

15. ICG provided financial support for selected participants from Australia, Chile, Mexico and Peru to attend the fourteenth meeting of the GNSS implementation team of the Asia-Pacific Economic Cooperation (APEC) and to present papers focused on the realization of geodetic reference frames in their countries. The meeting was held in Seattle, United States, from 21 to 24 June 2010.

16. In addition, the Office for Outer Space Affairs organized, jointly with the International EUPOS Steering Committee, the Third International Symposium on Global Navigation Satellite Systems, Space-Based and Ground-Based Augmentation Systems and Applications, held in Brussels on 29 and 30 November 2010. One of the main objectives of the symposium was to bring together all organizations involved in defining or using reference frames in order to develop common approaches and avoid duplication and to define the mechanism for the sharing of GNSS data from continuously operating reference stations within regions.

C. International Space Weather Initiative

17. The International Space Weather Initiative is a programme of international cooperation to advance space-weather science through instrument deployment and analysis and interpretation of space-weather data from the instruments deployed, in conjunction with other space data, and to communicate the results to the public and students. It is a follow-up activity to the International Heliophysical Year 2007, but focusing exclusively on space weather. The goal of the Initiative is to develop the insight necessary to understand the science involved and to reconstruct and forecast near-Earth space weather. This includes instrumentation, data analysis, modelling, education, training and public outreach.

18. Three International Space Weather Initiative workshops have been tentatively scheduled to take place, in Egypt (2010), Nigeria (2011) and Ecuador (2012). The first in the series of workshops, held in Egypt, focused on the fact that the variability of the Sun had adverse impacts on the Earth. As society becomes increasingly dependent on space-based systems, it is vital to understand how space weather caused by solar variability affects, among other things, space systems and human space flight, electric power transmission, high-frequency radio communications, GNSS signals and long-range radar, as well as the well-being of passengers in high-altitude aircraft. The Initiative is fully utilizing and expanding as fast as feasible the worldwide ground-based instrument arrays that were deployed in the five years of the International Heliophysical Year campaign for the purpose of monitoring the impact of solar variability on the Earth.

19. The United Nations/National Aeronautics and Space Administration/Japan Aerospace Exploration Agency workshop on the International Space Weather Initiative, hosted by Helwan University on behalf of the Government of Egypt, was

co-organized and co-sponsored by Kyushu University of Japan and ICG. Further information on the workshop is available at www.spaceweather-eg.org/iswi/index.php.

20. The workshop comprised in-depth presentations of results emanating from space-weather instrument arrays such as the Magnetic Data Acquisition System, the Coherent Ionospheric Doppler Radar, the Scintillation Network Decision Aid, GPS-Africa, the South Atlantic Very Low Frequency Network, African Meridian B-Field Education and Research, African GPS Receivers for Equatorial Electrodynamics Studies, the Atmospheric Weather Educational System for Observation and Modelling of Effects and sudden ionospheric disturbance monitors, which are already present in more than 80 countries around the globe. About 1,000 space-weather instruments are operational and recording data by utilizing GPS receivers, magnetometers, very low frequency recorders, solar particle detectors and spectrometers. With the installation of a sudden ionospheric disturbance monitor in the permanent space exhibit at the United Nations Office at Vienna in November 2009, Vienna became one of the many sites worldwide reporting occurrences of solar flares as part of the International Space Weather Initiative.

D. Regional workshop on global navigation satellite system applications

21. Pursuant to General Assembly resolution 64/86, the United Nations, in cooperation with the Government of the Republic of Moldova and ICG, organized a workshop on applications of GNSS, hosted in Chisinau by the Moldovan Agency for Land Relations and Cadastre from 17 to 21 May 2010.[3] The workshop on GNSS applications for human benefit and development, jointly organized by the United Nations and the International Astronautical Federation, was held in Prague on 24 and 25 September 2010, in conjunction with the 61st International Astronautical Congress. Both workshops were co-sponsored by the United States, through ICG, and ESA.

22. The workshops covered a wide variety of GNSS applications and emphasized that in some applications there were still significant gaps to be bridged between the needs of potential end-users and the GNSS capabilities. At the same time, capacity-building should be seen as a process that is initiated through projects and is sustained beyond the project implementation period. Detailed information about the workshops is available on the website of the Office for Outer Space Affairs.

[3] See A/AC.105/974.

III. Technical advisory services

23. To present developments in ICG and its activities, the Office for Outer Space Affairs, as the executive secretariat of ICG and its Providers' Forum, participated in and contributed to the following major international and regional meetings on GNSS held in 2010:

(a) Munich Satellite Navigation Summit 2010, GNSS – Quo vadis?, Munich, Germany, 9 to 11 March;

(b) International Satellite Navigation Forum 2010, Moscow, 1 and 2 June;

(c) Second European Space Agency Global Navigation Satellite Systems Education Workshop, Madrid, 15 and 16 July;

(d) Third GNSS Vulnerabilities and Solutions Conference, Baška, Croatia, 5 to 8 September;

(e) Second Asia Oceania Regional Workshop on Global Navigation Satellite Systems, Melbourne, Australia, 21 and 22 November;

(f) Seventh Session of the Asia-Pacific Regional Space Agency Forum, Melbourne, Australia, 23 to 26 November 2010.

24. The Office for Outer Space Affairs organized the fifth meeting of the Providers' Forum, co-chaired by the European Union and the United States, in Vienna on 8 June 2010. It was held in conjunction with the fifty-third session of the Committee on the Peaceful Uses of Outer Space. China, Japan, the Russian Federation and the United States, as well as the European Union, were represented at the meeting. The meeting discussed issues related to open service signal specifications and service standards, and spectrum protection.

25. In addition, the Office for Outer Space Affairs organized the interim meetings of the ICG working groups, held in conjunction with the Munich Satellite Navigation Summit 2010 and the fifty-third session of the Committee. The Working Group on Enhancement of the Performance of GNSS Services met in Munich, Germany, on 8 March 2010 to discuss issues related to GNSS user positioning integrity. The Working Group on Compatibility and Interoperability met in Vienna on 7 June 2010 to discuss multi-system GNSS compatibility for the benefit of system operators.

26. The Office continued managing the content and maintained the server of the ICG information portal to reflect recent developments in ICG and its Providers' Forum, as well as its activities. In 2010, the information portal was expanded to include information about ionospheric space-weather effects on GNSS signals.

27. The report entitled "Current and planned global and regional navigation satellite systems and satellite based augmentation systems",[4] consistent with the template for information-sharing between service providers, was published and made available at ICG information portal.

[4] ST/SPACE/50.

IV. Voluntary contributions

28. The success of the activities of ICG in 2010 benefited from the support and voluntary contributions, in cash and in kind, of Member States:

(a) The Government of the United States provided $200,000 to support capacity-building and technical advisory services and also arranged for experts to make technical presentations and participate in deliberations at activities described above. The funds allocated were used to defray the cost of air travel and daily subsistence allowance of 32 participants from developing countries and 2 staff members of the Office for Outer Space Affairs, and for the services of an associate expert and a consultant;

(b) The Government of Italy, the Government of the Russian Federation, the European Union and the International EUPOS Steering Committee provided sponsorship for experts to make technical presentations and participate in deliberations at activities carried out in the framework of the programme on GNSS applications. Sponsorship was also provided for staff members of the Office for Outer Space Affairs to participate in the international meetings described above.