



International Committee on Global Navigation Satellite Systems: Space Weather

Sharafat Gadimova

The United Nations Office for Outer Space Affairs, Vienna, Austria, e-mail: Sharafat.gadimova@un.org

The International Committee on Global Navigation Satellite Systems (ICG), established in 2005 under the umbrella of the United Nations, promotes cooperation on matters related to civil satellite-based positioning, navigation, timing, and value-added services. The ICG works to enhance 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 greater use of GNSS capabilities to support sustainable development, particularly taking into account interests of developing nations.

The International Heliophysical Year 2007 (IHY) drew scientists and engineers from around the globe in a coordinated observation campaign of the heliosphere and its effects on planet Earth. Building on these activities, the United Nations Committee on the Peaceful Uses of Outer Space launched the International Space Weather Initiative (ISWI) in 2009. ISWI is a program of international cooperation to advance space weather science by a combination of instrument deployment, analysis and interpretation of space weather data from these instruments in conjunction with space data, and the communication of the results to the public [1]. While the ISWI was formally concluded as an agenda item of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space in 2012, its activities continue under the framework of a new agenda item on Space Weather and under the Expert Group on Space Weather, established by the Scientific and Technical Subcommittee. A periodic ISWI newsletter is published by the International Centre for Space Weather Science and Education (ICSWSE) of Kyushu University and the ISWI website is maintained by the Bulgarian Academy of Sciences (see www.iswi-secretariat.org). IHY and ISWI have contributed to the development of space science schools that encourage students to consider a career in space science. This project is supported by the ICG's working group on information dissemination and capacity building. In that context, the Office for Outer Space Affairs in cooperation with the Institute for Scientific Research of Boston College of the United States and the Abdus Salam International Centre for Theoretical Physics (ICTP), Italy is organizing space weather discussion forums to educate the public and policy-makers about space weather phenomena, as well as training courses and seminars for students and professionals in space weather data analysis and prediction. Those activities bring together a large number of experts every year, including experts from developing nations, to discuss and act on issues that are also of great relevance to ICG.

The relationship between GNSS and space weather is twofold. On one hand, ionospheric delay is the main source of error in using GNSS, especially over the equatorial region, such error being referred to as "equatorial ionospheric anomaly". In this connection, ionospheric research is an essential component of the development and implementation of global navigation satellite augmentation systems, as understanding of the challenges posed by the ionosphere could provide important insights into the development of GNSS. On the other hand, existing data from GPS and GNSS stations serve as a valuable source of data for evaluating aspects of the response of the mid- and low-latitude ionosphere to magnetic storms and space weather effects.

Beyond the Earth, swelling of the atmosphere as a result of space weather can change satellite orbits, thereby degrading space situational awareness information. This also occurs in two ways. Firstly, the space debris population and its evolution are tied to the altitude-dependent density of the atmosphere, which is dependent upon solar effects. Secondly, the ability to predict conjunctions and hence enable collision avoidance also depends on accurate knowledge of atmospheric density.

1. Space Weather: Special Report of the Inter-Agency Meeting on Outer Space Activities on Developments within the United Nations System related to Space Weather, United Nations General Assembly Document, A/AC.105/1146, 28 April 2017, pp. 5, 14.