

Space Weather Societal Impacts Workshop and Seminar at the 55th Meeting of the United Nations Committee on the Peaceful Uses of Outer Space

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Published: 28 November 2012

Citation: Head, J., and H. Haubold (2012), Space Weather Societal Impacts Workshop and Seminar at the 55th Meeting of the United Nations Committee on the Peaceful Uses of Outer Space, *Space Weather*, 10, S11007, doi:10.1029/2012SW000868.

The United States organized and convened a workshop on Space Weather Societal Impacts, held on the margins of the 55th Meeting of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), in Vienna on 8 June 2012. The purpose of this workshop was to focus the attention of space weather experts and member state representatives in the United Nations on the societal impacts of space weather events, with particular attention to the needs of developing nations. Approximately 20 science and policy experts representing more than 10 nations participated in the workshop. In focusing on societal impacts, the workshop helped the U.N. Office for Outer Space Affairs meet the mandate set forth by the member states in the COPUOS agenda item on the International Space Weather Initiative (ISWI). ISWI has enjoyed a great deal of success in implementing research observatories globally but has had less success in articulating the potential societal implications of space weather events. This first workshop on Space Weather Societal Impacts addresses the gap in international appreciation for the hazards attendant in solar activity at the governmental level of member States of the United Nations. The workshop was organized around several themes.

Space Weather Phenomena

A tutorial on the broad range of phenomena and the relevant physics of space weather was presented. Space weather was broken into three types of phenomena: solar flares, coronal mass ejections, and the solar wind, covering electromagnetic radiation, energetic charged particles, and magnetized plasma. The discussion continued with the physical mechanisms by which these phenomena interact with the Earth as a geophysical system and how these interactions might interfere with communications, satellites, and the electric grid. The Sun-Earth transport times, and hence possible warning times, were also conveyed. It was noted that civilization has

inadvertently but markedly increased its vulnerability to solar events over the past several decades through greater reliance upon vulnerable systems; previously unnoticed events can now have a devastating impact. Today, it is clear that developing as well as developed countries are vulnerable.

Impacts

The workshop focused on several specific impacts on technological systems. Solar events can disrupt high-frequency communications both through UV radiation and charged particles interacting with the ionosphere. Affected human activities include aviation, humanitarian aid, and emergency response. It was noted that the 8 March 2011 solar storm disrupted communications over most of the continent of Africa (Figure 1).

Loss of satellite links can have ramifications for developing as well as developed countries. For example, Burkina Faso relies upon donated transponder time from a commercial communications satellite for telemedicine. Loss of that or even another satellite would make these medical services unavailable since in times of crisis the global satellite telecommunications industry places priority on restoring services to paying customers.

Regarding the electric grid, high-voltage transformers are particularly vulnerable to geomagnetic storms and can take years to replace. The workshop discussed transformer failures in Canada, the United States, and South Africa as well as recent research results indicating a greater vulnerability to electric grid failure than had been previously believed for countries near the geomagnetic equator.

International Efforts

The workshop discussed international efforts already underway to address space weather hazards. The U.N. COPUOS

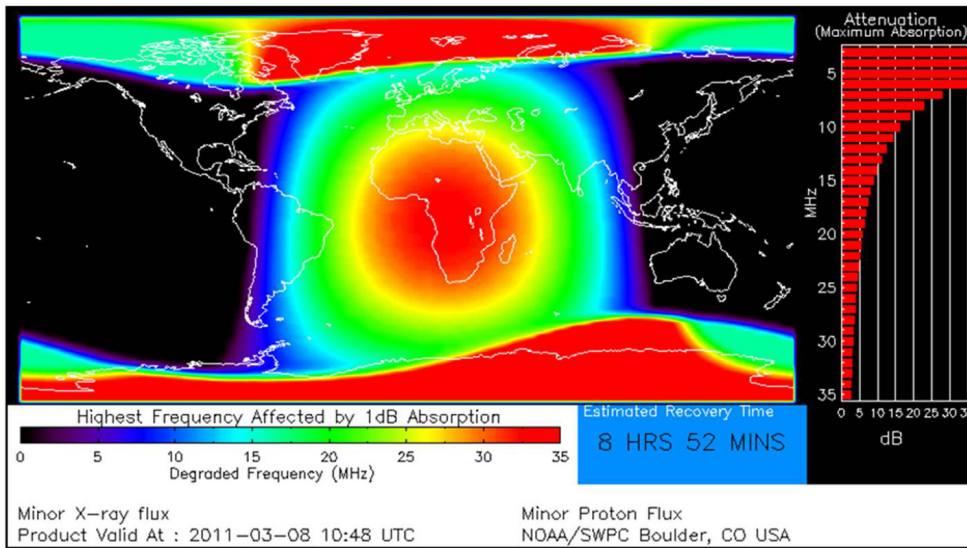


Figure 1. Map of ionospheric disturbance resulting from a solar storm on 8 March 2011 at 10:48 UT. Energetic photons have disrupted the ionosphere over the continent of Africa, interfering with HF communications. Charged particles from the same event have arrived in the polar regions, disrupting communications there as well. Map is provided courtesy of the Space Weather Prediction Center, NOAA, in Boulder, Colo.

has launched a Working Group on Long-term Sustainability of Space Activities, which includes an expert group focused on space weather. This expert group will deliver a report and a set of recommended guidelines to the working group by 2014. The guidelines could be adopted on a voluntary basis to allow states to take actions to protect their populations. The World Meteorological Organization (WMO) has launched an Inter-programme Coordination Team for Space Weather. The team has helped the WMO launch a Web-based space weather product portal (http://www.wmo.int/pages/prog/sat/spaceweather-productportal_en.php). This Web site provides a single point of entry for users to access space weather operational products from around the world. The WMO welcomes all users to explore the portal and provide feedback. Space weather organizations are encouraged to participate.

ISWI, a 3 year agenda item of the Science and Technical Subcommittee (STSC) of the COPUOS, will conclude its activities in 2012. ISWI brokers mutually beneficial relationships between instrument providers and instrument hosts. Many crucial areas of the globe are not well instrumented, and many developing nations are ideally located to fill these critical gaps. ISWI is largely a research program: most of the instruments and host institutions do not provide data in an operational manner. This is an area of consideration as ISWI continues to grow and evolve, possibly under the new agenda item on space weather in the STSC. The workshop also learned about the recently formed Asia-Oceania Space Weather Alliance, which held its first conference in 2012.

Summary and Actions

The workshop participants agreed that the societal impacts of space weather are potentially severe and could be more broadly felt than is commonly recognized. In addition,

the participants agreed that the burden of providing assets and services requires more global coverage and funding than can be borne by any one nation; international cooperation is required to provide adequate mitigation of this hazard.

The participants assigned two actions: First, the workshop will convene via e-mail to craft and discuss a document that provides a framing vision for the global space weather enterprise. Second, the participants will provide a description of space weather impacts, clearly articulating the consequences of space weather activity for infrastructure in developed and developing countries. These descriptions are meant to help communicate to all nations the risks presented by solar activity and to encourage a global response to meet this challenge.

On the following business day, a seminar on space weather followed the morning plenary session of the COPUOS, with simultaneous translation into the six official languages of the U.N. The seminar highlighted the key aspects of the workshop and was well received. Many delegations requested the presentation materials, which have been placed on the ISWI Web site (<http://www.iswi-secretariat.org/>).

Assuming that the workshop participants make good progress with their action items, we anticipate a follow-on workshop in 2013. In the meantime, the results of the workshop were conveyed to two U.N. activities on space weather that were held in Graz, Austria (<http://www.unoosa.org/oosa/en/SAP/act2012/graz/index.html>), and in Quito, Ecuador (<http://iswieuador.epn.edu.ec/>), for further consideration.

Acknowledgments.

The conveners recognize the thoughtful and energetic logistical support for this workshop from the U.N. Office for Outer Space Affairs. We also thank the participants, in particular the speakers, for their efforts in support of this work-

shop. Finally, we thank Madhulika Guhathakurta, NASA Headquarters, for suggesting this workshop.

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