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Space Weather

Progress report on the work of the Expert Group on Space Weather at the 57th session of the Subcommittee

Submitted by the Rapporteur of the Expert Group on Space Weather

I. Introduction

The present document contains information for delegations on the progress of work of the Expert Group on Space Weather, as will be presented to the Subcommittee by the Rapporteur of the Expert Group, Ian Mann of Canada.

The Expert Group notes the growing interest in addressing the challenges associated with mitigation of the adverse impacts of space weather in Member States of the Committee on the Peaceful Uses of Outer Space. The Expert Group reiterates the need for Member States to take action to increase their and global preparedness to extreme space weather events.

The Expert Group highlights the importance of improved communication between Member States and their national and international organisations in the context of further space weather research, in developing improved understanding of space weather phenomena, and in the development of improved space weather services and approaches to mitigate the adverse impacts of space weather.

* A/AC.105/C.1/L.383.

The Expert Group notes the draft report from the *Working Group on the "Space2030" Agenda of the Committee on the Peaceful uses of Outer Space* (A/AC.105/C.1/L.382), and in particular that space weather forms a core part of *Overarching Objective 3: Improve access to space for all and ensure that all countries can benefit socioeconomically from space science and technology applications and space-based data, information and products, thereby supporting the achievement of the Sustainable Development Goals.* The Expert Group further notes that Space Weather is an important element of all of the four pillars, namely space economy, space society, space accessibility, space diplomacy, which have already been identified by the Committee and the General Assembly resolution 73/6. The Expert Group further notes the importance of aligning its work with the expected tracking of implementation of the approved Long-term Sustainability of Outer Space Activities (LTS) Guidelines, including B.6 (Share operational space weather data and forecasts) and B.7 (Develop space weather models and tools and collect established practices on the mitigation of space weather effects), under the new Working Group on the Long-Term Sustainability of Outer Space Activities ("LTS 2.0").

In this context, the Expert Group on Space Weather reiterates the strategic importance of the Committee to elevate awareness of the threat posed by space weather, and recommends that the Scientific and Technical Subcommittee encourage Member States to take concrete steps to protect their infrastructure and broader efforts to increase global resilience. The Committee can play a key role in facilitating communication and promoting increased collaboration to address the challenges of understanding and mitigating the impacts of severe space weather, for the benefit of all mankind. The Expert Group on Space Weather may also be valuable in recommending best practices for implementation of the space weather guidelines B.6 and B.7 in Member States.

The Expert Group held four meetings on the margins of the 57th session of the Scientific and Technical Subcommittee on 4-6, February, 2020. The Expert Group also held an intersessional Space Weather Expert Group Workshop hosted at the Headquarters of the Canadian Space Agency on 10-11th July 2019, on the margins of the 27th Assembly of the International Union of Geodesy and Geophysics (IUGG) in Montreal, Canada from 8-18th July 2019.

II. Facilitating International Coordination

As expressed in previous Expert Group reports to the Subcommittee, and consistent with its mandate, the Expert Group continues to emphasise that international coordination is essential to deliver accurate and timely responses to the questions of the "*Why, When, What and How*" of space weather. Recognizing the potential for severe global impacts of adverse space weather is "why" we need a global response. Member States need clear and actionable information to be able to know "when" to act, "what" to do, and "how" to respond to impending severe space weather. This drives an urgent need for improved communication and collaboration to develop improved knowledge through research in parallel with developing improved monitoring, forecasting, warning procedures and communication protocols, particularly for extreme space weather events.

The Expert Group emphasises that the Committee should focus on on improved coordination by Member States and relevant international organizations and identification of potential gaps in space weather services and products, and on promoting and encouraging national implementation of the LTS Guidelines.

In the report on Thematic Priority 4: International Framework for Space Weather Services for UNISPACE+50 (A/AC.105/1171), the Expert Group identified six priority areas in the "Roadmap for international coordination and information exchange on space weather events" in section III of the report:

a. Product and service selection
b. Information communication protocol
c. Response procedures
d. Product sustainment and improvement and risk assessments
e. Improved understanding of fundamental physical processes which cause extreme space weather
f. Promote capacity building for space weather in the Committee member States

As demonstrated in the Thematic Priority 4 report, all of these six priorities are directly traceable to subsections B.6 and B.7 of the adopted voluntary Guidelines for the Long-Term Sustainability of Outer Space Activities (A/71/20) which relate to space weather, and related Guidelines C.1-C.4 on international cooperation, capacity building, and awareness. The Expert Group continues to encourage the Committee to recommend that Member States and international organisations implement these space weather Guidelines. As part of this approach, progress against implementation within Member States could be assessed in the context of the LTS 2.0 Working Group and reported to the Scientific and Technical Subcommittee.

III. Recent Progress

The Expert Group continues to work in accordance with its mandate, not least in relation to the promotion of increased and expanded member State involvement in providing space weather monitoring, from the ground and in space, and in developing, advancing, and sharing, and delivering space weather services.

The Expert Group on Space Weather noted with pleasure the progress achieved through international cooperation towards operational space weather services with the designation by International Civil Aviation Organization (ICAO) of global space weather information providers for international air navigation, which became operational on 7 November 2019, and which will be augmented by regional space weather information providers no later than November 2022.

The Expert Group recognised the importance of science and innovation as drivers of improved space weather services, and commended the COSPAR Panel on Space Weather (PSW) in its efforts to develop International Space Weather Actions Teams (ISWAT), with expectation that ISWAT will advance scientific knowledge and improve the scientific models that support transitional efforts for research to operations to enable future improved space weather operational services. The Expert Group approved the nomination of the Rapporteur of the Expert Group on Space Weather as its formal representative on the COSPAR PSW.

The Expert Group recognized a continuing need for better coordination and collaboration among national and international space weather actors.

The Expert Group highlighted the importance of Member States and international organisations to implement the LTS Guidelines B.6 and B.7 on space weather, and related Guidelines C.1-C.4 on international cooperation, capacity building, and awareness.

The Expert Group noted all the Committee Member are also Members of the World Meteorological Organization (WMO), and further noted the shared history of cooperation between WMO and the Committee. During the Eighteenth World Meteorological Congress in June 2019, WMO adopted the Four-year Plan for WMO Coordination of Space Weather Activities and called on Member States to support implementation in partnership with relevant international organizations and national agencies. Effective 1 January 2020 the WMO Integrated Global Observing System (WIGOS) became operational and together with the WMO Information System (WIS) and the Seamless Global Data Processing and Forecasting System (SGDPFS) will serve a broad range of application areas, including space weather.

The Expert Group welcomed efforts by the WMO to implement relevant LTS guidelines by continuing development of the WMO technical and regulatory framework for space weather, the registration of space weather observing stations with the WMO Integrated Global Observing System (WIGOS), and the use of the WMO Information System (WIS) and Seamless Global Data Processing and Forecasting System (SGDPFS) for space weather applications and services.

The Expert Group further welcomed efforts by the International Space Weather Initiative (ISWI), and the new Variability and Predictability of the Solar-Terrestrial Coupling (PRESTO) program, within the Scientific Committee on Solar-Terrestrial Physics (SCOSTEP), to implement relevant LTS guidelines, particularly with regard to capacity building.

The Expert Group emphasized the importance of space weather risk assessments and socio-economic impact studies to improve national and global preparedness.

The Expert Group will prepare a report with recommendations highlighting opportunities for the efficient coordination of space weather activities at the international level towards implementation of the relevant LTS guidelines. The report will map the international space weather actors, their mandates and linkages, identify gaps, and recommend actions by Member States and other relevant space weather actors for improving coordination. The Expert Group will submit this paper to the 58th Session of the Subcommittee, aiding the Member States of the Committee in assessing future actions to mitigate the impacts of space weather and consistent with the Expert Group’s work plan up to the end of the current mandate for the Expert Group in 2021.

IV. Recommendations

In the view of the Expert Group, implementation of the approved voluntary Guidelines for the Long-Term Sustainability of Outer Space Activities (A/71/20)

provide foundation for the mitigation of the adverse impacts of space weather. The Expert Group therefore reiterates its view that implementation of the voluntary guidelines is of the utmost importance and should be prioritised for appropriate action within Member States and their national and international organisations.

Consistent with the Guidelines for the Long-Term Sustainability of Outer Space Activities (A/71/20), and with the Expert Group report Thematic Priority 4: International Framework for Space Weather Services for UNISPACE+50 (A/AC.105/1171), the Expert Group identified a number of strongly synergised and common themes across the goals of multiple entities engaged in space weather including COSPAR, ICAO, WMO and the International Space Environment Service, and which could be elaborated in the course of the implementation of specific joint projects by the participating entities. To this end, at this 57th meeting of the Subcommittee, the Expert Group recommends that the Committee encourage Member States to:

a. Provide regular updates to the Committee on their progress toward implementing LTS Guidelines B.6 and B.7. and related Guidelines C.1-C.4 on international cooperation, capacity building, and awareness.

b. Take action to ensure coordination of their national space weather activities with respect to relevant international organizations, in particular coordination of these activities with their respective Permanent Representatives to the World Meteorological Organization and the International Civil Aviation Organization;

c. Engage actively with the COSPAR PSW International Space Weather Action Teams initiative to improve our scientific knowledge base and to promote the development of improved space weather services.

d. Continue to support and participate in capacity building activities for space weather services and research, including those of the International Space Weather Initiative.

V. Mandate and Work Plan for the Expert Group

The Expert group work plan for the period of its mandate up to 2021 was approved at the 55th session of the Subcommittee in 2018 as is as follows (see also the report from the Expert Group provided to the Subcommittee in A/AC.105/C.1/2018/CRP.14):

1. *Recognizing the impacts of space weather, the group will promote increased and expanded member State involvement in providing space weather monitoring, from the ground and in space, and in developing, advancing, and sharing and delivering space weather services.*

2. *Consistent with the Thematic Priority 4 report, the Expert Group will continue to examine mechanisms to facilitate improved coordination between the relevant space weather organisations, with a view to developing future recommendations for their possible implementation within Committee on the Peaceful Uses of Outer Space. The Expert Group re-iterates that facilitating such improved coordination is key for the cost effective development of new international space weather*

services. However, this must be done with due regard to existing work plans and road maps of the space weather organisations, avoiding duplication of effort.

3. *The expert group will report yearly to the Scientific and Technical Subcommittee on its progress, on important issues which have been identified, and where specific actions are recommended, including those related to a possible future international coordination group for space weather. The expert group will also make a recommendation for its continuing and future work plan.*

The Expert Group also provided the Subcommittee with an update of its work at its 56th session in 2019 in the form of a Conference Room Paper (A/AC.105/C.1/2019/CRP.12). The Expert Group notes the concerns raised by some Member States during the 56th Session of the Scientific and Technical Subcommittee regarding the potential consideration of an International Coordination Group for Space Weather. There also currently remains a continued lack of consensus within the Expert Group on this proposal. Therefore the Expert Group does not intend to focus on this topic as a priority for further development at this time.

Consistent with its existing mandate, and consistent with the recommendations contained in the UNISPACE+50 Thematic Priority 4 Report, and with the draft report from the Working Group for the “Space2030”Agenda, the Expert Group proposes to continue with its work.

Specifically, the Expert Group will complete intersessional work to compile a report to be submitted to the Subcommittee at its 58th session. The report will assess the activities of the multiple international space weather entities in the context of the LTS Guidelines, in particular B.6 and B.7, and the LTS 2.0 Working Group, and provide recommended best practices for their implementation, and assess potential future approaches for the consideration of the Committee in relation to the mitigation of the effects of adverse space weather beyond the end of the current mandate of the Expert Group on Space Weather in 2021.