



United Nations Committee on Peaceful Uses of Outer Space (COPOUS):

Space Weather Expert Group

Thematic Priority 4: Developing an International Framework
for Space Weather Services (2018-30).

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Thanks to Karel Schrijver, Chair of COSPAR-ILWS Space Weather Roadmap Team.

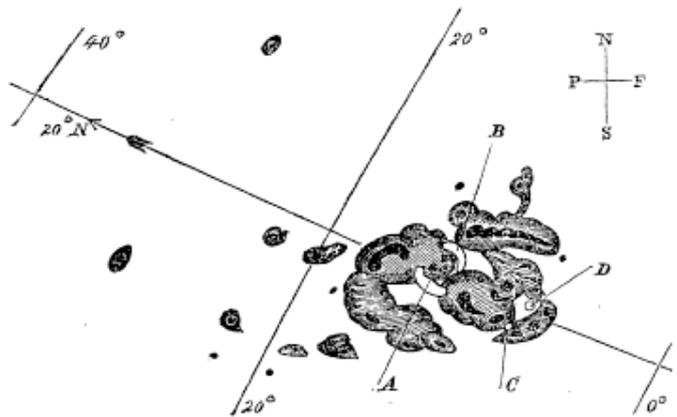
Solar flaring and the connection to geospace: discovered in 1859

On a curious Appearance seen in the Sun.
By R. Hodgson, Esq.

“While observing a group of solar spots on the 1st September, I was suddenly surprised at the appearance of a very brilliant star of light, much brighter than the sun’s surface, most dazzling to the protected eye, illuminating the upper edges of the adjacent spots and streaks, not unlike in effect the edging of the clouds at sunset; the rays extended in all directions; and

Description of a Singular Appearance seen in the Sun on September 1, 1859. By R. C. Carrington, Esq.

While engaged in the forenoon of Thursday, Sept. 1, in taking my customary observation of the forms and positions of the solar spots, an appearance was witnessed which I believe to be exceedingly rare. The image of the sun’s disk was, as usual with me, projected on to a plate of glass coated with distemper of a pale straw colour, and at a distance and under a power which presented a picture of about 11 inches diameter. I had secured diagrams of all the groups and detached spots, and was engaged at the time in counting from a chronometer and recording the contacts of the spots with the cross-wires used in the observation, when within the area of the great north group (the size of which had previously excited general remark), two patches of intensely bright and white light broke out, in the positions indicated in the appended diagram by the letters A and B, and of the forms of the spaces left white. My

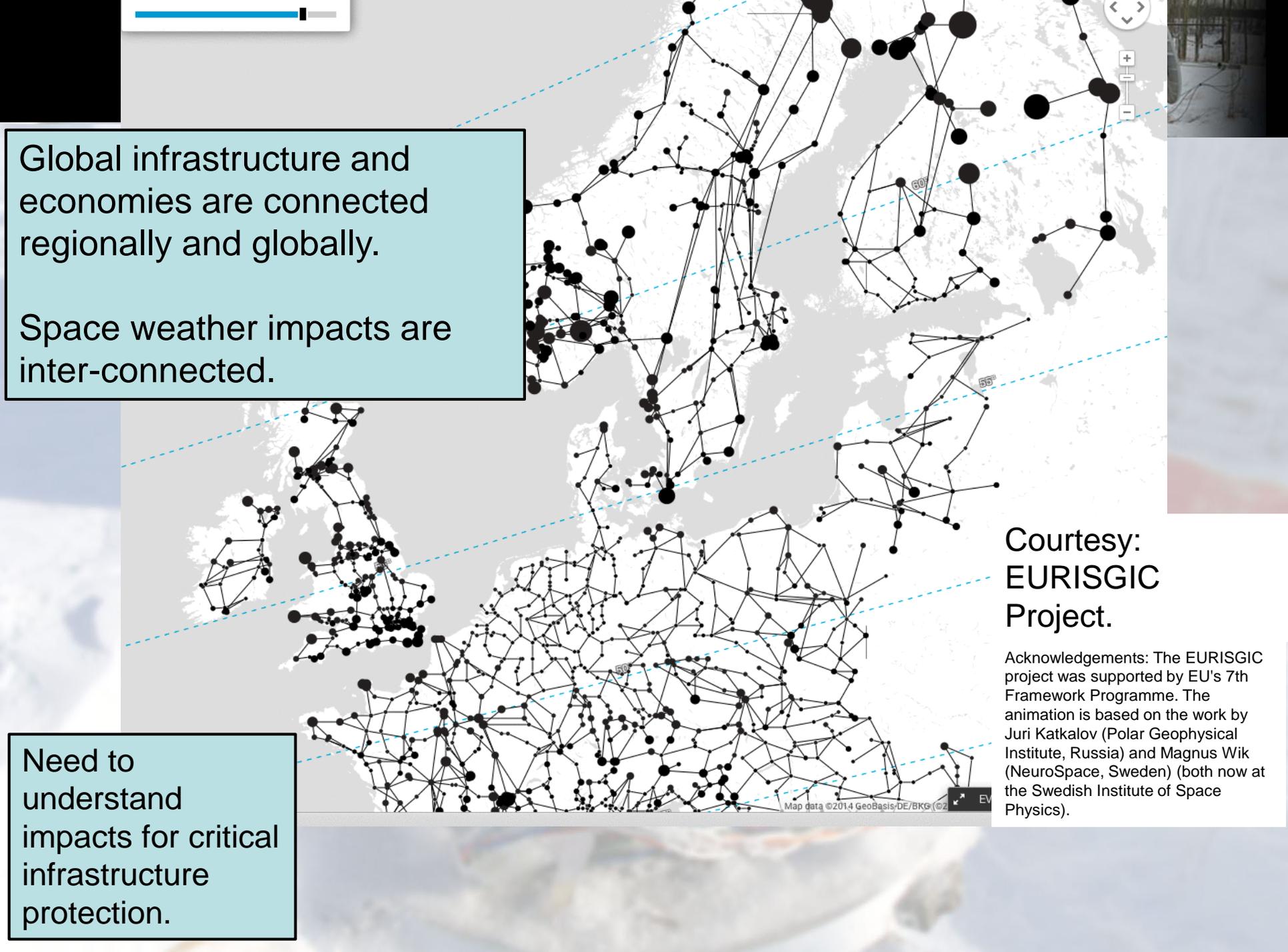


first impression was that by some chance a ray of light had penetrated a hole in the screen attached to the object-glass, by

ing brilliancy of the
ge telescope with
es, and disappeared
pe used, an equa-



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Global infrastructure and economies are connected regionally and globally.

Space weather impacts are inter-connected.

Need to understand impacts for critical infrastructure protection.

Courtesy:
EURISGIC
Project.

Acknowledgements: The EURISGIC project was supported by EU's 7th Framework Programme. The animation is based on the work by Juri Katkalov (Polar Geophysical Institute, Russia) and Magnus Wik (NeuroSpace, Sweden) (both now at the Swedish Institute of Space Physics).



United Nations COPUOS

- UN Committee on Peaceful Uses of Outer Space (COPUOS) formed in 1959, and was responsible for 5 space treaties, and was set up by and reports to UN General Assembly.
- COPUOS now has 84 member states with interests in space, and around 30 permanent observers (intergovernmental and non-governmental organizations including WMO, SCOSTEP, etc).
- Works on basis of consensus to:
 - Promote information sharing and international cooperation in peaceful uses and exploration of outer space under UN auspices
 - Study legal matters related to the use and exploration of outer space.
- COPOUS has two Subcommittees: Scientific and Technical Subcommittee (STSC) and the Legal Subcommittee.
- STSC approved regular Space Weather agenda item in 2013.



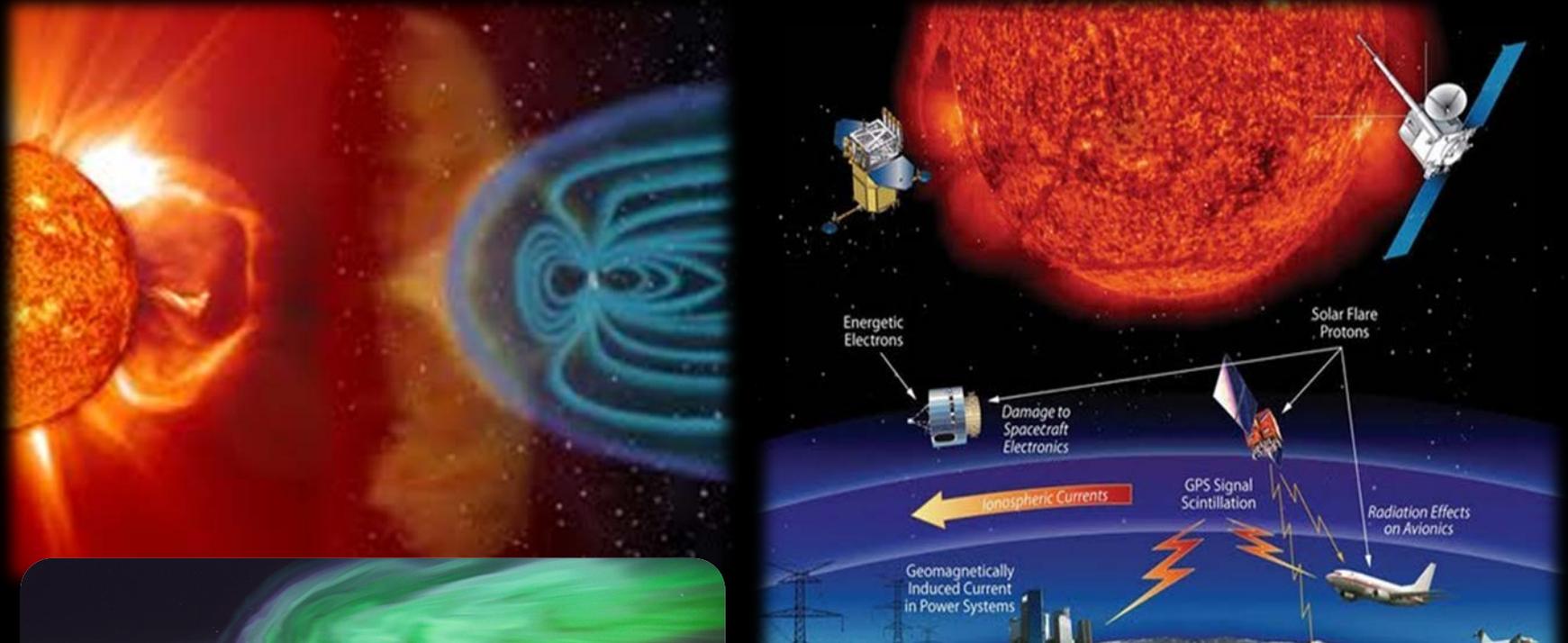
Heritage: Expert Group C LTS & New Space Weather Expert Group

- Through Expert Group C, identified space weather best practices relating to Long-Term Sustainability of Outer Space Activities (LTS) in UN Committee on Peaceful Uses of Outer Space (COPUOS). 2011- 2015.
- New Space Weather Expert Group with Rapporteur, reporting to UN COPUOS under permanent agenda item approved Feb. 2015 in Vienna.

UN COPUOS actions provide opportunity to define activities of an new UN Space Weather coordination group meeting strategic needs of international community.

Space Weather has a wide range of impacts on terrestrial and space-based infrastructure.

International co-ordination and collaboration is critical to understand and quantify impacts and for *future critical infrastructure protection*.



Future opportunity within on-going UN Space Weather Expert Group to define actions for 2018-2030.



Recognised Space Weather Risks

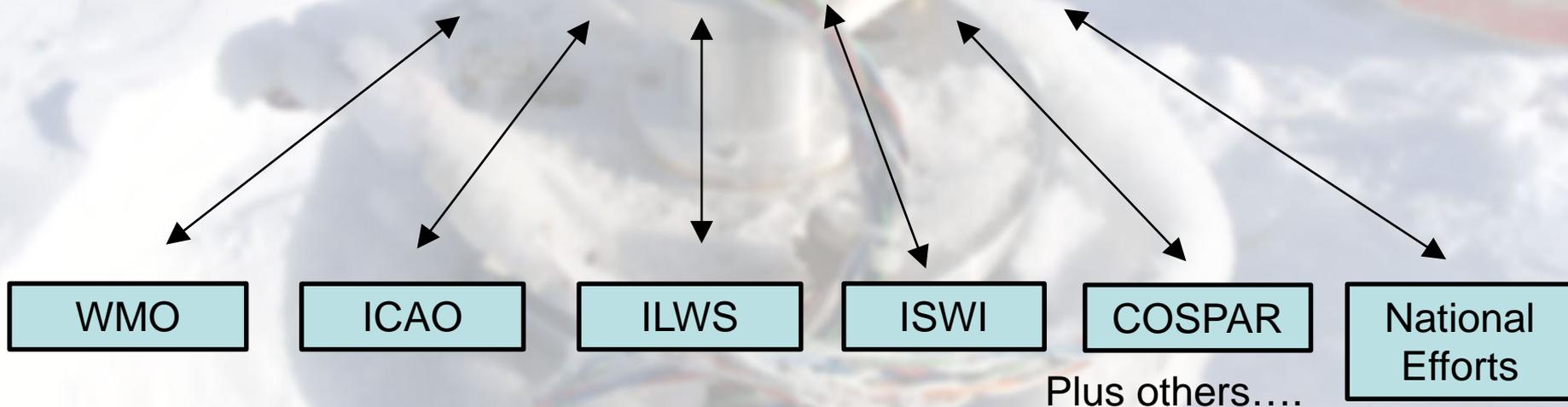
- High Impact: Can have very high socio-economic impact on wide range of ground and space-based technological infrastructure (~\$10s B to perhaps upto ~\$1-2 Trillion; Baker et al., 2008).
- High Likelihood of Extreme Event: Comparatively high likelihood of extreme event (e.g., 23 July 2012 event – Baker et al., 2013). According to Riley (2012) probability of extreme event happening in the next decade might be as high as ~12%.
- Impacts span all Space Weather Activity Levels: Even modest space weather can have significant impacts (e.g., Schrijver et al., 2014; Schrijver and Mitchell, 2013).
- Impacts are Regional: Different geographical regions are vulnerable to different space weather; these need to be understood.
- New Science and Applications Research: Advances require both increased scientific understanding of the space weather processes as well as better applied research of impacts and mitigation.



Active International Space Weather Efforts

UN has political role to promote and coordinate
Perhaps coordinate future COPUOS approach around
approved LTS guidelines

UN COPUOS International Space Weather Coordination Group



With new understanding of both increased likelihood and impact of space weather,
international coordination at strategic level is essential.



Future COPUOS Foci (2018-30)

- WHEN: *Important to know when to act.*
 - **International Space Weather Warning Network?** Cf. UN International Asteroid Warning Network (IAWN)?
- WHAT: *Important to know what to do.*
 - Promote study of **socio-economic and risk impact studies** in member states.
 - Promote engagement of **Critical Infrastructure Protection** administrations in Member States.
 - Promote definition of **actionable operational responses**.
 - Improve modeling and R2O – action teams under COSPAR via ISWAT.
- HOW: *Define appropriate mechanism/administration to meet space weather needs in UN context.*
 - Suggest creating a new **International Coordination Group on Space Weather** to replace the Expert Group, with expanded role promoting international coordination.
 - Currently examining potential model for ICGSW mandate, terms of reference etc with a view to potential approval by COPUOS in 2020.
- SCIENCE: *New science research needs to be prioritized at UN Member State and international agency level. How best to promote and achieve this?*

UN COPUOS has political influence for communication and coordination with and between Member States; implementation expected to be delivered by other entities (WMO, ISES, national space weather plans etc).