Topical Discussion Meeting report TDM#4

A Topical Discussion Meeting aims at active participation or interaction between the participants. The participants work and discuss on a predefined theme or problem heading towards an outcome or target. A working meeting is a 1h informal afternoon meeting with NO abstract submission form and therefore NO poster contributions.

Name of the meeting: Observations of transient events with the global neutron monitor network
Convener/s: Alex Mishev, University of Oulu, SGO, Finland, Agnieszka Gil, University of Siedlce, CBK PAN, Poland
Secretary: Agnieszka Gil, Alex Mishev
Data – Time – Room: 28.10.2025, 13:30-14:30, Tonsalen
# of attendees (approximate): ~40
Speakers, if any (names and institution): Eleanna Asvestari, University of Helsinki, Finland, Mateja Dumbovic, Hvar Observatory, Croatia
Form of TDM: Event impact

Objective of the TDM

The objective of this TDM was to discuss the applications of the global NM network for space-weather purposes, including alerts for GLEs, aircrew dose assessment and monitoring services. The goal of the TDM was to enable and support a broad discussion about recent achievements related to all aspects of space weather, focusing on the application of NMs for study transients and the related space weather phenomena.

Discussion highlights

Over several decades the global neutron monitor (NM) network provides continuous records of cosmic ray (CR) variations. NMs have been extensively used as the main global multi-instrument tool for the analysis of a specific class of strong solar particle events, namely ground level enhancements (GLEs) in which solar ions are accelerated to quasi and relativistic energies, leading to sudden increases of count rates of particle detectors at the surface of the Earth. GLEs are particularly strong SEP events with imminent space weather effects. In addition, NMs are used for the registration of Forbush decreases and recently observed anisotropic CR enhancements (ACREs). 2024 was a particularly interesting year with three GLEs, a notable Forbush decrease and ACRE were reported. During the open discussion special focus was on the recent advances of modeling of transients, nowcasting of aircrew dose exposure, specifically during GLEs. The applications of the global NM network measurements and outputs within satellite-born instruments, as well as, other ground based detectors, which provide complementary information to NM records and can be used to unfold open issues as e.g. spectra evolution during GLEs were discussed during this TDM
The discussion was preceded by a brief introduction by the Conveners and two short presentations:

- E. Asvestari talked about ‘Reconstructing the heliospheric conditions during complex transient events: the advantages and limitations of numerical simulations’.
- M. Dumbovic gave a presentation about ‘What we know and don't know about

Forbush decreases'

Main conclusion of the meeting

The main conclusions from our discussion are the following:
We need more neutron monitors at various locations to better describe evolution of the spectra during GLEs and for better nowcasting of aircrew dose exposure;
We need more space-borne instruments such as the Alpha Magnetic Spectrometer (AMS-02) on board of the International Space Station, Integrated Science Investigation of the Sun on Parker Solar Probe or The Energetic particle detector on Solar Orbiter, etc.;
We need more multipoint observations of Forbush decreases and advanced tools for analysis. Anisotropy poses real challenge on the analysis, therefore more efforts are needed on development of methods and tools for analysis;
To be able to reproduce more realistically and, consequently, better understand the nature of the transient phenomena discussed, which will bring us closer to more effective forecasting.

Annexes

-