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# Space weather during extreme SEPs: new assessment of worst case scenario

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An important topic in the field of space physics is the quantification of the cosmic-ray-induced effects in the atmosphere and the corresponding space weather effects. Space weather effects, specifically the exposure to radiation at aviation altitudes, represent an important threat. Here, we focus on a specific class of events due to solar energetic particles (SEPs), viz. events that can be registered at ground level: ground-level enhancements and more particularly extreme events with cosmogenic imprints,i.e. that have been registered by 14C records.

Naturally, for assessment of space weather effects during extreme SEP events, it is necessary to possess precise information on their spectra. Here we present results and application of an analysis of SEPs using neutron monitor (NM) records, that is derivation of their spectra, and application of numerical models. Using reconstructed spectra during the strongest directly recorded event, that is GLE # 5, occurred on 23 February 1956, and employing a convenient rescaling, we assessed the space weather effect during the strongest indirectly reconstructed historical extreme SEP event, that is, 774 AD. Subseqeuntly, employing a state-of-the-art reconstruction of the magnetic field we study the worst-case scenario representing a combination of a geomagnetic excursion, that is the Laschamp excursion ca. 42 kyr ago and a 774 AD-like event. The possible implications are discussed.