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Updated heliospheric modulation potential of cosmic rays and station-specific scaling factors for 1964-2021

Pauli Väisänen¹, Ilya Usoskin^{1,2}, Riikka Kähkönen¹, Sergey Koldobskiy^{1,2}, and Kalevi Mursula¹

¹University of Oulu, Space Physics and Astronomy Research Unit, Oulu, Finland (pauli.vaisanen@oulu.fi)

²University of Oulu, Sodankylä Geophysical Observatory, Finland

Galactic cosmic rays (GCR) are energetic particles originating from galactic or extra-galactic sources. When they arrive inside our heliosphere, they are modulated by the magnetic irregularities in the solar wind flow from the Sun, deflecting and slowing down the GCR particles. The level of this modulation varies according to solar activity, especially the 11-year solar cycle. The heliospheric modulation potential, denoted by Φ , describes the average energy loss of particle in MV and quantifies the level of modulation. It can be determined using ground-based neutron monitor (NM) measurements of GCRs by multiple stations. Here we use the most recent version of the NM yield function and a RMSE-minimization method to compute a new and more accurate version of the modulation potential Φ and station-specific scaling factors κ , which can be used to scale the level of count rates to the theoretical NM count rate given by the model. The new version offers daily resolution of Φ and can be conveniently updated with new measurements, stations, or updates to datasets whenever they might occur. The scaling factors and their variation can be used to scale the data for physical analyses or to identify outliers, errors or physical phenomena which do not match with the model.