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## Abstracts

### High-cadence modulation potential for study of cosmic ray variation, solar activity and data quality

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The flux of galactic cosmic rays (GCRs) arriving at Earth varies according to solar activity. This solar modulation is often quantified by the modulation potential $\phi$, which describes rigidity loss of GCR during transport in the heliosphere.

Recently, a daily version of $\phi$ was created based on neutron monitor (NM) data and was used to estimate GCR fluxes and compared to AMS-02 measurements, which showed a very good match. This can be utilized for inter/extrapolations and real-time datasets of GCR variation.

The daily $\phi$ offers utility for analyzing solar activity, but higher cadence at 1-hour and 1-minute are possible, if diurnal anisotropies can be addressed. We will present initial work on this.

It is also useful for assessing the quality of data and models. We will showcase calibrating recently discovered handwritten Oulu NM measurements from Jan-Mar 1964 and using snow-depth observations to account for the effect of snow on the Oulu NM roof during 1964-1973 when it was at Kontinkangas.

### A Deep Learning Approach for Automatic Ionogram Parameters Recognition

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Typical ionosondes operate with >5 minutes time intervals, which is enough to obtain regular parameters of the ionosphere, but insufficient to observe short-term processes in the Earth's ionosphere. The key point for this study is to increase the ionosondes data time resolution by automatization of ionogram scaling routine. In this study we show the results of implementation of deep learning approach for ionogram parameters scaling. We trained the model on 13 years ionogram dataset of Sodankyla ionosonde at high latitude region (67°N). We tested our autoscaling program tool on 2021 year dataset and evaluate errors between operator and automatic parameters scaling. The root mean square errors for critical frequencies foF2, foF1, foE, foEs, fmin, fbEs and virtual heights h′F, h′E, h′Es are estimated as 0.12 MHz (2 pixels), 0.07 MHz (1.16 pixels), 0.15 MHz (2.5 pixels), 0.33 MHz (5.5 pixels), 0.15 MHz (2.5 pixels), 0.17 MHz (2.83 pixels), 7.7 km (1.34 pixels), 7.0 km (1.22 pixels), 7.1 km (1.24 pixels), respectively.