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GEOMAGNETIC ACTIVITY AT HIGH-LATITUDE: CASE STUDY AT THE AURORAL SODANKYLÄ STATION

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Here we study long-term properties of two traditional analogue indices (Ak and Aq) and four recent digital measures (IHV, IHV24, Ah, Ah-night) of geomagnetic activity at the auroral Sodankylä station. With this selection of indices we can compare the effects of i) analogue vs. digital technique, ii) full-day (Ah, IHV24) vs. night-time coverage (Ah-night, IHV), and iii) absolute (Aq) vs. relative deviation (Ak) from Sq curve on quantifying geomagnetic activity.

We find that the most used Ak index correlates better with the digital indices with full-day coverage than with any night-time index or Aq. Ak is relatively more disturbed than the digital full-day indices in the declining phase of solar cycle, indicating that indices based on hourly data are less sensitive to high frequency variations driven by Alfvén waves of high speed streams. On the other hand, the night-time indices and Aq have an even stronger response to solar wind speed than Ak. The full-day indices depict stronger correlation with the heliospheric magnetic field strength, while the night-time indices and Aq have higher correlation with solar wind velocity. We also discuss that the stronger overall correlation at high latitudes with solar wind speed, with respect to mid and low latitudes, indicates a larger relative importance of the storage-release system of the magnetotail compared to the directly driven activity. The results show that different types of geomagnetic activity indices, in particular those using night-time vs. full-day coverage, or based on analogue vs. digital technique cannot readily be used interchangeably, as they are dominantly driven by different properties of solar activity.