**S3-03**

# The Frequency-Domain Characterization of Cosmic Ray Intensity Variations Before Forbush Decreases Associated with Geomagnetic Storms

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Non-recurrent geomagnetic storms caused by Coronal Mass Ejection (CME) can induce serious impacts on space- and ground-based equipment. However, these non-recurrent geomagnetic storms are hard to predict since CMEs are not periodic. Previous studies have shown that the variations of Cosmic Ray Intensity (CRI) before non-recurrent storms may forebode the coming geomagnetic storm. But it is difficult to extract the variations since the cosmic ray flux is a complex signal. In order to identify the precursory signal in CRI variations triggered by CME, an ensemble self-adaptive time-frequency analysis method was proposed and applied to 65 non-recurrent geomagnetic storms occurred between 1998 and 2019. The results indicate that the precursory signals are successfully identified in 43 of 45 storms, after excluding 20 storms accompanied by ground level enhancement. In addition, it is also found that the spectral density of the precursory signal could reflect the active level of geomagnetic condition, which is lower during geomagnetic quiet period.