



Multi-station observation of periodic variations in long-term Schumann resonance records

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Lightning has been declared as a new Essential Climate Variable by the World Meteorological Organization. Schumann resonance is a valuable parameter to monitor the global lightning activity, thus, the Atmospheric Observation Panel for Climate accepted Schumann resonance (SR) measurements as an emerging tool for studying lightning-related large-scale processes in the atmosphere. Previous studies showed a clear extraterrestrial influence on the SR parameters at different time scales (e.g., solar cycle). For all these reasons, a growing new interest arises in the scientific community to exploit the potential of SR better in gaining more information on electrodynamic coupling mechanisms taking place in the atmosphere. This has motivated the installation of new instruments worldwide to monitor SR measurements.

We performed a multi-station spectral analysis of the SR parameters (frequency and intensity) by using wavelet transformation. SR records from different monitoring sites around the globe were analyzed simultaneously for the first time: Hornsund (~12 years of data) and Belsk (~7 y.) managed by Poland, Rovaniemi and Ivalo in Finland (~16 y.), Eskdalemuir in Scotland (~10 y.), Nagycenk in Hungary (~22 y.), Boulder Creek in USA (~4 y.) and Shillong in India (~9 y.). For all SR sites, the periodicities of 0.5, 1, ~180 and 365-day appeared both in the frequency and the intensity of SR modes. Evidence was also found for the ~27- and ~45-day periods at specific time intervals. Cross-wavelet transform and wavelet coherence analyses were made between SR frequencies and the Kp index, and between SR intensities and Madden-Julian Oscillation index. Time periods of highly coherent 27-day as well as 45-day periodicities were found in the time series of these parameters intermittently. These preliminary results suggest that these periodicities are likely related to the solar rotation and Madden-Julian Oscillation, respectively. A detailed analysis about our findings

will be presented and discussed.