Interpretation of the Pc1 emission properties inferred from low-altitude observations of the energetic proton precipitation

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Relationship between EMIC waves (seen on the ground as Pc1-2 geomagnetic pulsations) and specific localized proton precipitation detected by low-altitude satellites was recently evidenced on the basis of statistical and case studies. This precipitation can be used as an indicator of the Pc1 source and, therefore, as a tool for investigation of the Pc1 generation. In this report, three kinds of the Pc1 observational features are discussed taking into account the properties of the related precipitation. One of those features is the seasonal behaviour of the Pc1 frequency. We demonstrate that changes of the monthly averaged Pc1 frequency correspond to variations in the latitude of Pc1 related precipitation, which in turn correlate with seasonal changes of the global geomagnetic activity. Another discussed feature is the often-observable multi-band structure of the Pc1 emission. We argue that different emission bands are often generated by different sources located at different latitudes. In particular, it is evidenced by simultaneous observations of the multi-band Pc1s and specific proton precipitation in different MLT sectors at different latitudes. Finally, we check if the Pc1 events observed near the source footprint are associated with observations of the spectral resonant structures (SRS) of the background electromagnetic noise, which are the result of the ionospheric Alfven resonator (IAR). We do not find SRS signatures during such Pc1 events, but sometimes SRS starts immediately after the Pc1 train or vice versa. This agrees with the idea that Pc1s are generated at frequencies near the maximum ionospheric reflection, but propagate to the ground under conditions where the IAR quality is bad or where the Pc1 frequency is close to the frequency of the minimum ionospheric reflection.
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