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北海道-陸別 HF レーダー観測に基づく中低緯度電離圏 Pc5 波動の統計的性質の研究
Statistical properties of Pc5 waves in the mid-latitude ionosphere observed by the SuperDARN Hokkaido HF radar

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The Pc5 wave, which is one of ULF waves, is defined as the continuous pulsation in the frequency range between 1/600 and 1/150 Hz. It has been considered that the magnetospheric Pc5 waves are globally and directly generated either by solar wind dynamic pressure variations on the dayside or by Kelvin-Helmholtz surface waves on the dawn/dusk flank, and partially and indirectly on the nightside by wave-particle interactions. Pc5 waves can play an important role in the mass and energy transport in the inner magnetosphere. The radiation belt electrons in the inner magnetosphere can be significantly accelerated by the Pc5 waves, as suggested by previous studies. One of outstanding problems in Pc5 studies is to clarify its global distribution, generation mechanisms, and especially their dependence on the solar wind parameters.

We conducted a statistical analysis of data from the SuperDARN Hokkaido HF radar in mid-latitude ionosphere. The beams 5 and 14 data of the HF radar and the OMNI solar wind data for the period from January, 2007 to December, 2012 are used. We identified Pc5 wave events through an automatic Pc5 selection with criteria to extract coherent variation over a certain range of the magnetic latitude and by the visual inspection after the automatic selection. Out of the 60 events identified, and we examined 55 events during which the OMNI data are available. As a result, the Pc5 waves in the mid-latitude ionosphere are roughly categorized into two types, i.e., events under low-speed solar wind and high-speed solar wind conditions. The amplitude of the high-speed solar wind Pc5 events tends to increase with increasing solar wind velocity. This result is consistent with the idea that they are driven by the Kelvin-Helmholtz instability at the magnetopause. On the other hand, the amplitude of the low-speed solar wind Pc5 events has a positive correlation with the variances of the solar wind dynamic pressure. It is thus implied that the Pc5 events under the low-speed condition in the low-latitude are directly driven by the solar wind dynamic pressure variations.

キーワード: 内部磁気圏, ULF 波動, 北海道-陸別 HF レーダー, Pc5 波動
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