

# 北海道-陸別 HF レーダーによって観測された中低緯度 Pc5 波動の統計的性質の研究

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## Statistical properties of mid-latitude Pc5 waves observed by the SuperDARN Hokkaido HF radar

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Ultra-low-frequency Pc5 waves are defined as continuous pulsations with periods between 150 and 600 sec. It has been demonstrated that magnetospheric Pc5 waves are globally and directly generated on the dayside by solar wind dynamic pressure variations [e.g., Takahashi et al., JGR, 2012] and/or on the dawn/dusk flank by Kelvin-Helmholtz surface waves [e.g., Pahud et al., JASTP, 2009]. In addition, the storm-time Pc5 wave has been observed on the dusk side magnetosphere, which is excited by instabilities in the storm time ring current associated with particle injections from the magnetotail [e.g., Mathie and Mann, GRL, 2000]. Pc5 waves can play an important role in mass and energy transport within the inner magnetosphere, especially in the radial diffusion of outer radiation belt electrons [e.g., Zong et al., JGR, 2009]. One of the outstanding problems in Pc5 studies is to clarify their global characteristics of distribution, generation mechanisms, and dependence on the solar wind parameters.

We conducted a statistical analysis of the data from the SuperDARN Hokkaido HF radar observing the mid-latitude ionosphere. We used the beams 5 and 14 of the radar and the OMNI solar wind data during winter and nightside periods from 2007 to 2012. We first identified candidate Pc5 wave events automatically with criteria to extract coherent Doppler-velocity variations over a magnetic latitude range from 42 to 55 degrees and a peak power spectrum density over 5000 (m/s)<sup>2</sup>. The candidate events were further checked by visual inspection to exclude misidentified events. Out of 42 events finally identified, we examined 40 events during which the OMNI solar wind data are available. As a result, it is shown that the occurrence probability of the north-south oscillation is high at the pre-midnight MLT and the occurrence of the Pc5 waves that include the east-west component is high at the post-midnight. In addition, the Pc5 waves in the mid-latitude ionosphere are roughly categorized into two types, i.e., events associated either with low-speed solar wind or high-speed solar wind condition. The amplitude of the low-speed solar wind Pc5 events has a positive correlation with the solar wind dynamic pressure and its variance. The result suggests that the solar wind dynamic pressure is more important for Pc5 waves under the low-speed conditions in the mid-latitudes than the solar wind speed itself.

### References

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