

SuperDARNレーダーで観測されたMHD波動のLomb-Scargle解析によるモード特定

Mode identification of MHD waves observed by the SuperDARN radars using the Lomb-Scargle analysis

*森田 洸生¹、西谷 望¹、堀 智昭¹

*Koki Morita¹, Nozomu Nishitani¹, Tomoaki Hori¹

1. 名古屋大学宇宙地球環境研究所

1. Institute for Space-Earth Environmental Research, Nagoya University

Ultralow frequency (ULF) waves are magnetohydrodynamic plasma waves. The ULF waves in the ionospheric plasma motion obtained by the Super Dual Auroral Radar Network (SuperDARN) can be categorized into toroidal and poloidal modes. Since different oscillation modes come from different generation mechanisms, the identification of the mode as a function of geomagnetic latitude (MLAT) and magnetic local time (MLT) might provide clues to the generation mechanisms of ULF waves. We analyzed Pc5 oscillation modes in ULF waves using the SuperDARN Hokkaido East high-frequency radar data. First, we applied the Lomb-Scargle frequency analysis method to the Doppler shifts of ionospheric irregularities obtained from the radar and identified Pc5 oscillation modes by comparing the Doppler velocity amplitude at one geomagnetic latitude with different beam directions. Next, we conducted statistical analysis on Pc5 oscillation modes in order to reveal the MLAT and MLT dependence of the dominant mode. As a result of the initial statistical analysis from Jan. 10 to Feb. 14 in 2008, we find the following characteristics: 1. The occurrence probability of the Pc5 oscillation is the highest at 0 to 1 MLT. 2. The Pc5 oscillation mode was poloidal at 51° to 52° MLAT and toroidal at 48° to 51° MLAT. The former result is explained by the difference in electrical conductivity between day and night. The latter result is interpreted in terms of the external oscillation propagating from higher magnetic latitudes and mode-converted to toroidal mode magnetic field line resonance.

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