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太陽風動圧パルスにより駆動された中低緯度 ULF 波動の伝播特性
Propagation characteristics of ULF waves into middle latitude driven by solar wind dynamic pressure pulses

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Many ULF waves (Pc5) in the magnetosphere are directly driven by the solar wind. It has been considered that these magnetospheric ULF waves are generated either directly on the dayside by solar wind dynamic pressure pulses, Kelvin-Helmholtz surface waves, or indirectly on the nightside by mechanisms like substorms. ULF waves can play an important role in mass and energy transport within the inner magnetosphere. It is well known that energetic particles in the inner magnetosphere can be significantly affected by ULF waves and many studies have suggested their importance in acceleration process of radiation belt electrons. One outstanding problem in ULF studies is to clarify their global characteristics, especially, how energy is transported from the solar wind to the magnetosphere, and finally to the ionosphere.

We have conducted a survey of high-intensity ULF waves observed around 45 deg MLAT by the SuperDARN Hokkaido HF radar at middle latitudes. The ULF events can be categorized into two types in terms of the solar wind velocity, i.e., high- and low-speed solar wind events. In this study, we focus on a low-speed solar wind event on January 31, 2008 to investigate propagation characteristics of the ULF waves based on multi-point observations from geospace to the ground. The SuperDARN Hokkaido HF radar observed the ULF wave at 3.9mHz at about 14:40UT and at 2.6mHz at about 15:30 at MLT=02:00. In this event, the Cluster spacecraft, located at (X,Y,Z)=(15.8,8.9,-9.4) Re in GSM coordinates, observed pressure pulses driven by the high-density solar wind. The propagation time from Cluster to the ground (radar location) was about 400 seconds. In the magnetosphere, GOES-11 and GOES-12 were at 05:40 and 09:40 MLT at geosynchronous orbit, respectively. THEMIS A and D satellites were located on the nightside at (-5.3, 3.2, -1.5) and (-7.1, -5.0, -2.4) Re, respectively. We will report characteristics of the global propagation of the ULF waves obtained from the time delays between these observations.