Study on the global distribution characteristics of Pc 1-2 geomagnetic pulsation with the 10Hz data of the MAGDAS system

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The magnetic field observed on the ground is affected by the space weather phenomena such as magnetic storms and auroral storms.

The Pc1 geomagnetic pulsation (frequency range of 0.2-5.0 seconds) activated mainly around a high-latitude region is understood as a phenomenon accompanied by the excitation of EMIC waves to cause the particle acceleration in the equatorial region of the magnetosphere. Also, it is well known that Pc1 waves propagate horizontally in the ionospheric at the F layer. However, it is not clarified about the global occurrence and propagation properties of Pc1 geomagnetic pulsation on the ground. Moreover, although induction magnetometers are used to observe the high-frequency magnetic field disturbance phenomenon like Pc1 and Pc2 (frequency range of 5.0-10.0 seconds) geomagnetic pulsation, the global observation network with induction magnetometers covering from high-latitude to low-latitude area and equator domain does not exist at this stage. On the other hand, although it is common to use Fluxgate magnetometers for the observation of global space weather phenomenon, it is considered to be unsuitable for analysis of the high-frequency Pc1-2 geomagnetic pulsation because its time accuracy is usually one second value.

The ground multipoint magnetic field observation network which Kyushu University has developed (MAGDAS-9 magnetometer) acquire a 250Hz sampling and 10Hz mean data. Also, it is the only geomagnetic observation network that can investigate the global aspects of Pc1-2 geomagnetic pulsation.

In this study, we investigated the global distribution of Pc1-2 pulsation from polar region to equatorial region with magnetic field data provided by MAGDAS and Dst/AE index provided by the WDC for Geomagnetism, Kyoto. As a result, when the substorm have occurred during a magnetic storm time, generation of Pc1-2 pulsation from high-latitude to middle-and-low latitude region and further arrival of Pc2 pulsation to the dip-equator are identified. The elucidation of occurrence characteristic of the Pc1-2 pulsation on the ground with the EMIC waves excitation is very important not only for space weather application to be able to monitor particle energization process via EMIC excitation but also the elucidation of the super global coupling process from inner magnetosphere to the global ionosphere from polar to equatorial region. In this presentation, we will report the preliminary results of observational analysis of Pc1-2 pulsation by using MAGDAS network. We also discuss the comprehensive approach for understanding global coupling process among inner magnetosphere and high-middle-low latitude to the equatorial region by using FM-CW radar data, PWING induction magnetometer data, and the geo-space environment data from the ERG satellite.

Keywords: Pc1-2 pulsation, EMIC waves, global coupling

