

地磁気脈動の可視化の新しい手法

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A new data display technique for magnetic pulsations

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We studied the spatiotemporal structure of ground magnetic pulsations on the dayside by displaying magnetic field perturbations detected by the European quasi-Meridional Magnetometer Array (EMMA) as 2-D images in the magnetic L value versus time space, called EMMAgrams. We generated EMMAgrams from observations made on 15 August 2015, including a previously studied pulsation event associated with an interplanetary shock. In addition to signatures of field line resonance (FLR) driven by a cavity mode oscillation, we found poleward-propagating structures with L-independent periods in the Pc2 band. The Pc2 structures are attributed to periodic magnetohydrodynamic pulses (upstream waves) originating from the ion foreshock and propagating in the magnetosphere along the path proposed by Tamao. Ringing of local field lines at L-dependent periods (transient pulsations) is also clearly detected as dispersive poleward-propagating structures not only immediately after the shock impact but also during time periods of less obvious external disturbances. A transient pulsation decays after a few wave periods, and cross-spectral analysis of transient pulsations detected at two stations with a small latitudinal separation indicates elevation of the cross phase in a band delimited by the FLR frequencies at the stations. Successive excitation of transient pulsations by variations of the solar wind dynamic pressure contributes to formation of similar cross-phase peaks that are widely used in magnetoseismic studies.