Statistical analysis of plasmaspheric magnetosonic mode waves from Van Allen Probes observations

Koji Nomura[1]; Yoshizumi Miyoshi[2]; Kunihiro Keika[3]; Masafumi Shoji[4]; Satoshi Kurita[5]; Naritoshi Kitamura[6]; Shinobu Machida[3]; Craig A. Kletzing[7]; Ondrej Santolik[8]; Scott Boardsen[9]

[1] STEL, Nagoya Univ; [2] STEL, Nagoya Univ.; [3] STEL, Nagoya Univ.; [4] STEL, Nagoya Univ.; [5] STEL, Nagoya Univ.; [6] ISAS/JAXA; [7] Department of Physics and Astronomy, UoI; [8] The Czech Academy of Sciences; [9] NASA/GSFC

Magnetosonic waves (MSWs) are electromagnetic emissions whose properites can be described by the cold plasma extraordinary mode, which are typically generated between the proton cyclotron frequency and the lower hybrid resonant frequency. It has been suggested that MSWs can contributed to the acceleration of relativistic electrons in the radiation belts. In this study, we investigate the Poynting vector of plasmaspheric MSWs using the spectral matrix data from the EMFISIS instrument onboard the Van Allen Probes spacecraft. Our Poynting vector analysis showed that the observed MSWs propagate azimuthally around the Earth, which have been suggested by previous ray tracing studies (Kasahara et al, 1994). We also identified MSWs propagate radially across the field line. In particular, the occurrence of MSWs propagating inward from higher L-shells increases during magnetically active periods. We investigated the polarization of MSWs derived from the spectral matrix using the SVD method (Santolik et al., 2003). We found that MSWs can be converted to the left-hand polarized EMIC waves when the frequency of MSWs becomes lower than the local cross-over frequency. We thus suggest that one of the origins of the plasmaspheric EMIC waves is the mode conversion from MSWs.