

Multiple roles of plasma waves in geospace and radiation belts: Arase observations

There are different kinds of plasma waves at the wide frequency range from ULF to HF frequency range in geospace. Geospace is often referred as “zoo of plasma waves”, i.e., there exist MHD waves in the low-frequency range, ion cyclotron waves, whistler mode waves, Z, LO, RX-free space mode waves, and several kinds of electrostatic waves. These waves work essential roles for dynamical evolutions of plasma/particles in geospace including energetic particles in the radiation belts. The geospace exploration satellite Arase (ERG) has been launched in 2016 and started the prime mission from the end of March 2017 [Miyoshi et al., 2018]. The Arase satellite measures electric fields from DC to 10 MHz with three different receivers and magnetic fields from DC to 100 kHz with fluxgate and search coil magnetometer [Kasahara et al., 2018, Matsuoka et al., 2018]. These instruments as well as newly developed wave-particle interaction analyzer [Katoh et al., 2018] has provided new picture of multiple roles of plasma waves. For example, heating and acceleration of plasma and energetic electrons are identified by Arase. Arase also observed direct evidence to show scattering of energetic electrons by whistler mode waves, which cause the aurora emissions in the ionosphere. In this presentation, we will show some highlight observations from Arase and discuss future directions of measurement of plasma waves in geospace.