ARASE and MMS satellite observations of a Pc5 wave and the ion flux oscillations

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A large amplitude Pc5 wave is observed by Magnetic Filed Experiment (MGF) onboard the Exploration of energization and Radiation in Geospace “ARASE” satellite, when the satellite is flying in the inner magnetosphere (L ~ 5.5–6.0) near post-midnight (MLT ~ 1–3 h) at 1830–1930 UT on 27 March 2017. This Pc5 wave has radial and azimuthal components with a period of ~ 500 s and is preceded by a magnetic field oscillation with the shorter period of 60–100 s.

The O^+ flux oscillations in the energy range of 10–70 keV are simultaneously observed by Medium-Energy Particle Experiments - Ion Mass Analyzer (MEPi) with almost the same period of the Pc5 wave. These O^+ flux oscillations are thought to be generated through drift-bounce resonance. The resonance energy is estimated to be ~15 keV because the O^+ flux oscillation has a largest amplitude at 15 keV. The start of the O^+ flux oscillations coincides with the period change of the magnetic field oscillation.

This Pc5 wave and the sudden variation of the wave period are also observed by MMS1 (Magnetospheric Multiscale satellite), which is located near ARASE at L ~ 5.5–8.0 and MLT ~ 2–3 h.

We estimate the m-number of the Pc5 wave by different three methods: (1) comparison of observations between the ARASE and MMS satellites, (2) comparison of ground magnetometer observations between Tiksi (TIK) and Pebek (PBK), and (3) theoretical calculation based on the drift-bounce resonance. All of the three methods give the similar estimation of the m-number around −13. In addition, we examine the phase space density for H^+ and O^+. The phase space density of O^+ decreases, while that of H^+ does not change. We suppose that the energy is transferred from O^+ ions to the Pc5 wave.

