RESONANT ABSORPTION AT MERCURY'S MULTI ION PLASMAS

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Ultra low frequency (ULF) waves have been observed in the magnetic records returned by the Mariner 10 and MESSENGER spacecrafts. Theses waves are oscillating between sodium and proton gyro-frequencies. Because the presence of different ion species has an influence on the plasma's dispersion characteristics near the ion gyro-frequencies, magnetospheric eigenoscillations at Mercury with frequency above sodium gyro-frequency require a multi-fluid treatment for the plasma. Mercury's field line resonance are different from the Earth's described in terms of magnetohydrodynamics (MHD). Recently, a wave simulation in electron-hydrogen-sodium plasmas suggested that the field line resonance at Mercury is expected to occur when the IIH and/or Alfven resonance conditions are satisfied. In order to understand the efficiency of wave absorption at the IIH and/or Alfven resonances in the context of Mercury's magnetosphere, we evaluate absorption coefficients for variable concentrations of sodium, $C_{Na} = N_{Na} / N_e$, where N_j is number density for particle species j, and azimuthal wave number, k_y. When the compressional wave encounters a single resonance (the Alfven or IIH resonances), wave absorption at the Alfven resonance occurs in wide range of C_{Na} and $k_y R_M \geq 1$, where R_M is Mercury's radii, but the absorption at the IIH resonance occurs in narrow range of $0.15 < C_{Na} < 0.55$ and $k_y R_M \leq 1$. We also present the absorption when the compressional waves from low magnetic field side encounter both the IIH and Alfven resonances and compare the results with for single resonance cases.

Mercury, ULF wave, field line resonance

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