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Magnetopause transport by ion-cyclotron resonant wave-particle interaction

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Transport through a very thick magnetopause above the magnetospheric lobe is investigated. A magnetopause boundary layer of diffused magnetosheath particles is found between the magnetopause and a plasma mantle. Field fluctuations reveal electromagnetic ion-cyclotron waves in a hot-ion, cold-electron plasma inside the magnetopause current sheet and in the magnetopause boundary layer. These waves propagate parallel to the magnetic field and have left-hand polarization. The source of free energy for the excitation of the waves is local proton distribution function anisotropy. The proton pitch-angle distribution demonstrates that most of the protons move quasi-perpendicular to the magnetic field within a very narrow resonant pitch-angle. The scattering of charged particles on the waves results in a fast anomalous diffusion of particles across the magnetopause tens of thermal proton gyro-radii deep into the magnetosphere.