イオ関連木星デカメートル電波発生源の経度制限に関するシミュレーション研究

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A simulation study of the longitudinal restriction of the Io-related Jovian decametric radio sources

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Io-related Jovian decametric radiation (Io-DAM) is emitted from limited magnetic longitudes. The radiation energy is considered to be converted from the electron kinetic energy generated by the parallel electric field. The intensity of some Io-DAM components would depend on the current density along a post-energized flux tube by Io and a voltage of the electron acceleration layer. In this study we investigate the dependence of the parallel current density and voltage on the magnetic longitudes of Io flux tube. We simulate the momentum transfer of the Io-Jupiter system in the meridional plane. Hall MHD equations with source terms of the mass loading and centrifugal force are solved by a semi-discrete central scheme. Simulation region includes the plasma torus and Jovian ionosphere. Io has the relative velocity perpendicular to the simulation plane. During the contact time with Io, fresh delayed plasmas are supplied into the plasma torus. Our simulation results showed that when Io passes through near the center of the plasma torus, the parallel current would be large, although when Io passes through the northern edge of the plasma torus, the voltage is expected not to be small. We suggest that our simulation results may be related to the bifurcation of Io-A and Io-B sources in the CML-Io Phase diagram which was reported by [Leblanc et al. 1980, AA].