

2-dimensional FDTD simulations of plasma wave propagations in the ionosphere

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We developed a 2-dimensional FDTD simulation code which can treat wave propagations in magnetized plasma. Though we need to perform full particle simulations in order to recognize accurate characteristics of waves propagating in space plasma, FDTD simulations can be performed with much less computer resources than those necessary for full particle simulations, in memories as well as cpu times. Since space plasma is magnetized, it is necessary to incorporate the dielectric tensor with anisotropy and dispersibility in FDTD simulation code, in order to calculate the electromagnetic field in space plasma. In FDTD simulations, it is essential that how to realize an effective absorbing boundary. We developed PML (Perfectory Matched Layer) absorbing boundary condition with anisotropy and dispersibility, and succeeded to realize very effective absorbing boundary. In this study, we performed FDTD simulations with two-typed of electron density profiles in the ionosphere, ionospheric layer model and electron cloud model, and confirmed characteristics of MF wave propagations in the ionosphere.