内部磁気圏におけるホイッスラーモード・コーラス波動の非線形成長領域：電磁流体-移流シミュレーション

海老原 祐輔 [1]; 池田 拓也 [2]; 大村 善治 [3]; 田中 高史 [4]; フォック メイチン [5]
[1] 京大生存圏; [2] 京大・工・電気; [3] 京大・生存圏; [4] 九大・国際宇宙天気科学教育センター; [5] NASA/GSFC

Preferred region of nonlinear growth of whistler-mode chorus waves in the inner magnetosphere: MHD and advection simulations

Yusuke Ebihara[1]; Takuya Ikeda[2]; Yoshiharu Omura[3]; Takashi Tanaka[4]; Mei-Ching Fok[5]
[1] RISH, Kyoto Univ.; [2] Electronics, Kyoto Univ.; [3] RISH, Kyoto Univ.; [4] REPPU code Institute; [5] NASA/GSFC

Using a global magnetohydrodynamics (MHD) simulation and a drift advection simulation, we show preferred regions of nonlinear growth of whistler-mode chorus waves in the inner magnetosphere. The MHD simulation provides large-scale electric and magnetic fields. A comprehensive inner magnetosphere-ionosphere (CIMI) model solves the advection of phase space density of electrons under the electric and magnetic fields obtained by the MHD simulation. We imposed the southward interplanetary magnetic field condition on the boundary condition of the MHD simulation. Hot electrons penetrate deep into the inner region due to a combination of the enhanced convection and substorm-associated electric fields. Cold electrons also drift sunward, resulting in a contraction of the plasmasphere. We obtained the following results. First, the nonlinear growth rates can be ˜3 orders of magnitude larger than the linear ones at wave frequency of maximum linear growth. Secondly, the optimum wave amplitude is high outside the plasmapause, suggesting that the nonlinear growth is effective. These results imply that the nonlinear growth of chorus waves is preferred to occur in the wide area outside the plasmapause, and that nonlinear growth of the chorus waves could make a significant contribution to loss and acceleration of electrons trapped in the inner magnetosphere.