Interaction between energetic electrons and whistler mode chorus waves in 2-D and 3-D magnetic fields

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To evaluate the validity of a 2-D model magnetic field, we perform test-particle simulations and monitor the resonant trapped electrons in both 2-D and 3-D models. With respect to the adiabatic motions of electrons, the trajectories of electrons in the 2-D motions show agreement with those in the 3-D models in terms of cyclotron and bounce motions. In the case of drift motion, trajectories in the 2-D model are different from those in the 3-D model. When simulations including the whistler mode waves are performed, we find that cyclotron resonance occurs with similar timing in both models. Though relativistic turning acceleration (RTA) is observed in both models, the energy that electrons acquire in the 2-D model is greater than that in the 3-D model. It is confirmed that the 2-D model realizes the Earth's dipole magnetic field adequately only near the equator, which suggests that the results of simulations based on the 2-D model at high-latitude positions may include inaccuracies.

