

Effects of conductivity asymmetry between the northern and southern latitudes on quarter waves

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Quarter-wave modes are standing shear Alfvén waves in geomagnetic field lines and are generated when the ionosphere has very different conductances between the northern and southern ionosphere. Difference between two conductances is most large when one end of the field line is exposed by sun and the other is in Earth's optical shadow. We study how quarter waves are affected by such north-south asymmetry using three-dimensional dipole wave model. Unlike the previous studies mainly showing resonant frequency of the wave, we consider dipole effect on time histories of electric and magnetic fields at different locations including the equatorial region. To compare with the observation in a realistic manner, we study simulations of time histories and mode structure of quarter-wave mode for various conditions. It is found that dipole effect on time histories is very important in determining amplitude and phase at different locations. In addition, we discuss time-dependent feature of fundamental and second harmonics of quarter-wave mode.

Keywords: Quarter-wave, MHD simulation