

Heavy ion effects on mode conversion between electron and proton whistlers : A simulation study

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Electron whistlers frequently excite proton whistlers. The proton whistlers appear on the dynamic spectrum as rising tones, which start after the reception of a short electron whistler, asymptotically approaching the local proton gyro-frequency. The proton whistlers are dispersed forms of lightning impulses and their dispersion can be explained by the effects of heavy ions such as H^+ and He^+ on the propagation of an electromagnetic wave in the ionosphere. In the ionosphere, a right-handed circularly-polarized electron whistler becomes coupled to a left-handed circularly-polarized proton whistler when the frequency becomes close to a cross-over frequency. By adopting the multi-fluid numerical wave model, we examine how the mode coupling varies as the ion composition changes along altitude in the mid-latitude ionosphere. The time histories and dynamic spectra of electric fields are presented. In addition, we compare our results with the previous theoretical and observational studies.