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Electron-hybrid and MHD cross-reference simulations of whistler-mode chorus in planetary magnetospheres

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We carry out a series of electron hybrid and MHD "cross-reference" simulations for the study of the generation process of whistler-mode chorus emissions in planetary magnetospheres. Chorus emissions are electromagnetic plasma waves commonly observed in planetary magnetospheres and are a group of coherent wave elements showing a variety of frequency shifts in time. Numerical experiments have revealed that nonlinear wave-particle interactions between chorus and energetic electrons play essential roles not only in generating chorus but in energizing relativistic electrons. Previous studies revealed similarities and differences of the spectral characteristics of chorus in planetary magnetospheres, which has not been understood yet. In the present study, by carrying out cross-reference simulations by electron hybrid and MHD codes, we investigate physical processes which differentiate the spectral characteristics of chorus emissions in planetary magnetospheres. We use the MHD code for the investigation of the range of variation of the spatial scale of the Terrestrial, Jovian, and Hermian magnetospheres and conduct electron hybrid simulations for the generation process of whistler-mode waves. By a series of electron hybrid simulations for different properties of energetic electrons at the equator, we clarify the condition for the chorus generation in the planetary magnetospheres.