



Structure of compressional ULF waves in the topside ionosphere as observed by the Swarm constellation

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Different types of ultra low frequency (ULF) waves, such as dayside compressional Pc3-Pc4 waves, Pc2 and Pc1 waves, Pc3-Pc4 field line resonances, night side and day side Pi2s, etc. have been successfully identified in the topside ionosphere. ULF observations in this region can help us to understand the wave structure in the magnetosphere, wave propagation, and also the effects of the ionosphere (transmission, reflection, mode conversion). Because of the fast orbiting speed of the Swarm satellites Fourier analysis is not applicable in many cases, special techniques (wavelet analysis, maximum entropy method) are needed to resolve ULF signals, as well as to discriminate between spatial and wave structures. In this paper, we summarize the results of a study of Pc3 compressional waves observed at low-Earth-orbit (LEO) by the Swarm satellites. The presented results are based on an almost four-year-long dataset. The particular emphasis has been made on investigating the global coherence and phase structure of these waves. This is the first time that a study of this nature has been carried out using magnetic field data from multiple LEO satellites. We believe that our study provides the first observational evidence to support the prediction by the inductive thin ionosphere model that incident Alfvén mode waves are partially converted into compressional mode waves by the ionosphere.