

## **Propagation of ULF waves from the upstream solar wind into the magnetosphere**

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### **Abstract**

Ultra-low frequency (ULF; ~1-100 mHz) waves are ubiquitous throughout the magnetosphere. It is widely believed they are generated in the upstream solar wind by cyclotron resonance with backstreaming ions, or at the magnetopause flanks by the Kelvin-Helmholtz instability. The waves may then penetrate the magnetopause and propagate within the magnetospheric cavity, driving field line eigenoscillations under appropriate conditions. Recently a different mechanism has been proposed, in which waves present in the distant upstream solar wind simply propagate direct into the magnetosphere and to low altitudes. This would result in similar wave spectra in the magnetosphere or on the ground, and in the upstream solar wind. We have examined the relationship between ULF wave spectra recorded by magnetometers on the ground, and in the distant solar wind by the Ace and WIND spacecraft. We systematically examined spectra from several months and also specific intervals characterized by unusual solar wind conditions. We paid particular attention to avoiding spectral artifacts. We found no evidence that ULF waves recorded on the ground propagate directly from the distant upstream solar wind. The analysis process and examples are described in this paper.