



When can the magnetosphere support cavity modes?

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The Earth's magnetosphere supports several types of Ultra Low Frequency (ULF) waves; these include trapped fast mode waves often referred to as cavity modes, waveguide modes, and tunneling modes/virtual resonance. All trapped fast mode waves require a stable outer boundary to sustain wave activity. The magnetopause, often treated as the outer boundary for cavity/waveguide modes in the dayside magnetosphere, is often not stable, particularly during geomagnetic storms. We examine how magnetopause motion affects the magnetosphere's ability to sustain trapped fast mode waves on the dayside using idealized simulations obtained from the BATSRUS global magnetohydrodynamic (MHD) code. We present the first observations of cavity modes in BATSRUS, replicating results from other global MHD codes. We further show how varying solar wind conditions – in particular, increasing density and dynamic pressure fluctuations – affect magnetopause motion and, in turn, trapped fast mode waves.