Ultra-Low Frequency (ULF) waves originating in solar wind dynamic pressure oscillations and propagating through the magnetosheath to the inner magnetosphere

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Several observational studies have shown that ULF oscillations of the solar wind dynamic pressure can drive periodic fluctuations in magnetic field measurements at corresponding frequencies. In this study, we use multi-spacecraft (Cluster, GOES, THEMIS and Van Allen Probes) mission measurements to investigate the propagation of pressure fluctuations-driven pulsations within the Pc5 and Pc4 frequency range (from ~0.5 to 25 mHz) into the magnetosphere. During intervals of slow solar wind — to exclude waves generated by velocity shear at the magnetopause — common periodicities in electromagnetic fields in the magnetosphere and the solar wind driver are first detected in Lomb-Scargle periodograms. Then, using the cross-wavelet transform, we examine the causal relationship and specifically, in cross-wavelet spectra and wavelet transform coherence. Lastly, spatial and temporal variations of wave properties are mapped from beyond the magnetopause to the inner magnetosphere through frequency, polarisation and power signatures of waves detected at the various probes. The observed dependence of wave properties on their localisation offers an excellent source for verification of the role that solar wind dynamic pressure oscillations as driver of ULF waves propagating through the magnetosheath into the dayside and nightside magnetosphere.