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Foreshock Dynamics Controlled by Hot Flow Anomaly: Relation between Dawn and Dusk Sector Events

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On 21 January 2005, the passage in the magnetospheric dawn sector of a tilted solar wind current sheet at the periphery of an Interplanetary Coronal Mass Ejection (ICME) is not observed by Cluster in the dusk sector, where the Interplanetary Magnetic Field (IMF) points in such a way as to form a foreshock. It coincides however with the momentary transition of Cluster from the solar wind into a foreshock Ultra-Low-Frequency (ULF) wave field. The 4-spacecraft Cluster analysis shows that the ULF waves are intrinsically left-handed and tailward propagating, and cannot be produced by local field-aligned beams. Moreover, on the dawn side, Double Star TC-1 and Geotail experience large variations in plasma parameters consistent with the tailward effects at the magnetopause and in the magnetosheath, respectively, of a Hot Flow Anomaly (HFA) expected to form as a result interaction of the current sheet with the bow shock. We propose that the generation of the identified ULF waves on the dusk side is controlled by the production of beams of energetic particles, sufficiently hot for the ion/ion left hand resonant instability to emerge, consistent with those particles backstreaming in the solar wind from the presumed HFA site upstream of the bow shock.