



## **The transmission of upstream waves to the magnetosphere: an analysis at widely separated ground stations.**

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On 18 February 2003 a long duration, almost monochromatic, wave event was detected by Cluster at radial distances from the bow shock smaller than  $\approx 10 R_e$ . The interplanetary magnetic field orientation was such that a wide and almost symmetric foreshock region was generated around the bow shock nose providing highly favorable conditions for a direct wave penetration into the magnetosphere. The general correspondence of the characteristics of the wave trains observed in the foreshock region and at two widely separated ground stations (namely, at Northern low latitudes and in Antarctica) confirms that the ground activity is ubiquitously determined and controlled by the upstream activity, although through different processes at different regions. At low latitudes, the direct propagation of the external waves through the subsolar point is sharply confined to the dayside hemisphere. In Antarctica, the wave activity related to the upstream waves is detected even on field lines stretched into the tail and the polarization pattern suggests a significant contribution of sunward propagating waves in the morning hours; it might be consistent with a wave penetration through the magnetotail lobes. At both stations the transferred wave energy is typically less than  $\approx 10\%$  of the external energy; in addition, in Antarctica the contribution of the cusp turbulence largely overcomes that one related to the penetration of the upstream waves.