



## **Wave interactions measured via wavenumber mismatch in the terrestrial foreshock**

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Upstream regions of quasiparallel collisionless terrestrial shock consist of turbulent solar wind and large amplitude EM waves generated by kinetic plasma instabilities. These large amplitude EM waves interact with background plasma modifying particle velocity distribution function, but can also interact with each other. Such non-linear wave-wave interactions distribute the energy from few dominant modes to a broad band spectrum of modes, aiding energy dissipation. Here, we examine such non-linear interactions in terrestrial foreshock, using Cluster data and multi-point analysis technique capable of resolving the wave number mismatch of resonant sets of waves, which satisfy resonant frequency condition. We demonstrate that low frequency waves, these propagating along the magnetic field lines, participate in three wave interaction processes, that is the quadratic nonlinearity is dominant in these interactions. Higher frequency wave refract significantly and the change in the dimensionality of the propagation, from 1-D to 2-D, allows four wave coupling to be realized. This is consistent with the cubic nonlinearity also contributing to the evolution of these waves.