



STEREO Observations of Waves Near Interplanetary Shocks

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We study the characteristics of low frequency waves upstream and downstream of interplanetary (IP) shocks observed by STEREO. The use of dual spacecraft observations allows us to understand scales and evolution of these shock waves and their associated phenomena. Knowing the characteristics of these shocks and their surrounding regions is of great interest as they play a major role in the acceleration of solar energetic particles (SEPs). In the upstream region waves can be generated by ion beams reflected or otherwise energized at the shock. A second possibility is the generation of waves at the shock plus their subsequent propagation upstream. Downstream the wave spectrum may be formed by both waves generated locally and waves transmitted through the shock. The efficiency of wave generation and wave convection to the shock depends on the shock Mach number and the angle between the IMF and the shock normal. Waves can disturb the shock and participate in ion acceleration processes. STEREO dual observations show that the characteristics of IP shocks can change dramatically from one region to another and this also happens to the upstream and downstream wave spectra. While some shocks are preceded by whistler type waves with a significant compressive component, others are associated with upstream small amplitude transverse fluctuations. Downstream we find regions where magnetic field data suggest the existence of mirror modes.