STRUCTURE OF MEDIUM OBLIQUE SHOCK WAVE

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Low Mach number, sub-critical shocks are dominated by two main processes: anomalous resistivity and non-linear dispersive generation of a whistler wave train. Strong, supercritical shocks are dominated by reflected protons. We show results of a 2D hybrid simulations of a shock with Alfvén Mach number $M_A = 3.5$ and angle between shock normal and upstream magnetic field $\theta_{BN} = 45^o$. This shock has sub-critical features (whistler wave train) as well as super-critical: a small portion of incident protons is reflected from the shock and escape upstream. The upstream turbulence is dominated by two types of whistler waves: the dispersive ones and beam generated. With these standard waves an unusual mode coexists: an highly oblique compressive mode that is standing in the upstream rest frame. Figure 1 shows results from the hybrid simulation: the proton density $\rho = \rho(x, y)$ as gray scale plot (white corresponds to minimum density while black corresponds to maximum density) in the coplanarity plane in the vicinity of the shock front (located near $x = 140c/\omega_{pi}$). Figure 1 clearly show the existence of the compressive waves that are convected to the shock, strongly amplified and generate an important shock rippling. We study the property of this mode and its generating mechanism. We also discuss the influence of the rippling on the shock properties and on the radio wave propagation through such shocks [*Steinberg et al.*, *J. Geophys. Res.*, p. 23.565, 1998].

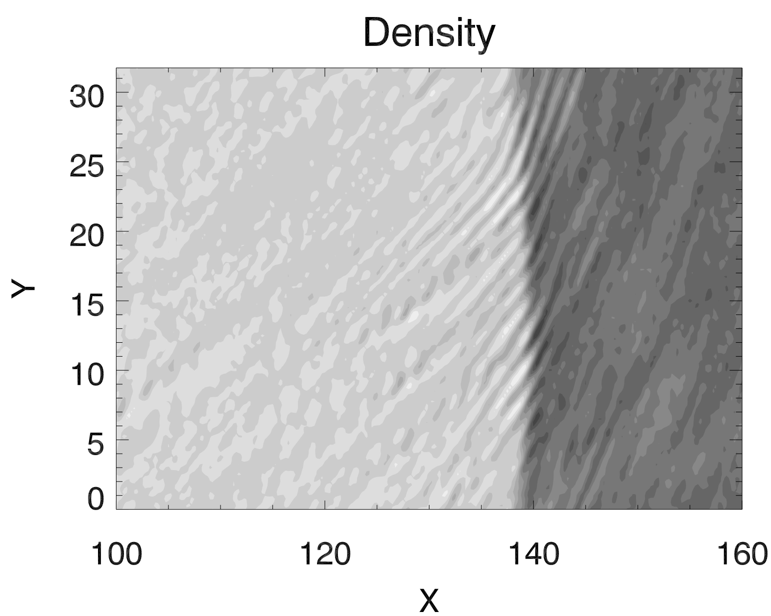

Fig. 1: Proton density variation $\rho = \rho(x, y)$ in the vicinity of the shock front (located near $x = 140c/\omega_{pi}$).