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Plasma turbulence near heliospheric shocks: generation processes and interplay with suprathermal ions

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The formation of a shock wave requires dissipation of the upstream bulk energy into the downstream medium. At a collisionless interplanetary shock the upstream bulk energy is presumably dissipated into turbulent waves which in turn heat the downstream plasma. We summarize observations on the processes of turbulent wave generation near the shocks driven by interplanetary coronal mass ejections, in particular those of the Bastille Day event in July 2000 and of the 4-6 November 2003 events. The processes of turbulent wave generation include: 1) Alfvén wave amplification in the upstream solar wind plasma by energetic ions, 2) further amplification of the Alfvén waves in course of their passage through the shock layer, and 3) generation of compressional fluctuations near the shock layer. These processes are accompanied by non-linear cascading and wave mixing. The observed signatures in the spatial evolution of energetic H, He, CNO, and Fe ion spectra and their relation to the turbulent wave spectra are discussed in the context of models on first-order and second-order Fermi acceleration. We apply the knowledge gained from the studies on interplanetary shocks to the situation of the region near the solar wind termination shock, where the Anomalous Component of Cosmic Rays is accelerated.