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Characteristic ion length scales for four types of interplanetary shocks

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The interaction between interplanetary (IP) shock and solar wind has been studied for the understanding of the energy dissipation mechanism within the collisionless plasma. The power spectra of the magnetic field exhibit breaks, where steepening of these spectra occurs. These breaks have been observed and also regarded as a threshold distinguishing the kinetic range from the inertial range of turbulence. Different heating processes can be related mainly to two characteristic ion length scales — ion inertial length and ion gyroradius. We attempt to establish the relation between these length scales and the spectral break. Data for four different types of IP shocks (fast forwards, fast reverse, slow forwards, slow reverse) measured for 2 hours (one hour for up and downstream plasma) by WIND at 1 AU were used. Continuous wavelet transform for the estimation of the power spectra of measured magnetic field was employed. Spectral breaks were determined by fitting 2-segment piecewise linear function around the expected break position in log-log space. Preliminary analysis of these spectral breaks and the characteristic length scales in fast shocks yields results consistent with the previous studies. Additionally, we extended this analysis towards slow shocks and obtained similar results. While the level of power enhancement of the magnetic field due to fast shocks reaches the order of ten on average, only the order of one was shown for slow shocks. The level of the compression of the characteristic spatial scales, however, is approximately similar for fast and slow shocks.