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Evolution of turbulence through interplanetary shocks

Alexander Pitna (1), Jana Safrankova (1), Zdenek Nemecek (1), Frantisek Nemec (1), Lubomir Prech (1), Christopher H. K. Chen (2), and Georgy N. Zastenker (3)

(1) Charles University in Prague, Faculty of Mathematics and Physics, Department of Surface and Plasma Science, Prague, Czech Republic (offelius@gmail.com), (2) Department of Physics, Imperial College London, London SW7 2AZ, UK, (3) Space Research Institute of Russian Academy of Sciences, Moscow, Russia

The solar wind plasma is a turbulent medium in which Alfvenic MHD turbulence is assumed to be a prime candidate for a transfer of large scale variations into smaller spatial scales, up to the ion kinetic scale related to a thermal gyroradius or an ion inertial length. Interplanetary shocks are naturally occurring in the solar wind and provide a unique opportunity to compare a relatively quiet solar wind upstream with the shocked plasma downstream. The BMSW instrument onboard the Spektr-R spacecraft has detected tens of interplanetary (IP) shocks in a course of the 2011–2014 years. The high-time resolution (31 ms) of the ion flux, density and solar wind speed measurements allows us to study spectral properties in the transition region between MHD and kinetic scales. We have found that the overall power of the ion flow fluctuations at all spatial scales increases roughly ten times. The spectral slope of the power spectra in the kinetic range (3–8 Hz) is steeper downstream IP shocks than in the upstream solar wind. If the fluctuation level increases the power law decay of ion kinetic structures gradually changes to the exponential decay already reported for turbulence in interstellar plasmas.