



Power spectral density of ion velocity fluctuations in inertial and kinetic ranges

Jana Safrankova (1), Zdenek Nemecek (1), Frantisek Nemecek (1), Luca Franci (2), Petr Hellinger (3), and Alexander Pitňa (1)

(1) Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic (jana.safrankova@mff.cuni.cz), (2) Queen Mary University of London, UK, (3) Astronomical Institute, Academy of Science, Prague, Czech Republic

This paper analyzes power spectra of solar wind velocity fluctuations that are computed with a time resolution of 32 ms in the frequency range of 0.001–2 Hz. The study uses measurements of the Bright Monitor of the Solar Wind on board the Spektr-R spacecraft that are limited to the 570 km/s bulk speed. The statistics based on more than 42.000 individual spectra show that: (1) the spectra of the ion velocity can be fitted by two power-law segments; (2) the median slopes of the segments attributed to the MHD and kinetic scales are -1.43 and -3.08 , respectively; (3) the break between MHD and kinetic scales as well as the slopes seem to be controlled by the ion beta parameter. These experimental results are compared with the 2D hybrid-PIC code CAMELIA where the electrons are considered to be a massless, charge-neutralizing fluid with a constant temperature, whereas the ions are described by a PIC model. In spite of several limitations of the model (lack of the electron kinetics, lower dimensionality), the model results basically agree with the experimental findings and we can conclude that all principal processes are captured.