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Magnetic turbulence spectrum at electron scales in the solar wind

Olga Alexandrova, Catherine Lacombe, and Andre Mangeney
LESIA, Observatoire de Paris, Meudon, France (olga.alexandrova@obspm.fr)

Dissipation of the magnetic turbulence in the collisionless plasma of the solar wind is still an open question. Kolmogorov scaling observed at MHD scales in the solar wind comes to end at ion scales, where a spectral break is observed. This indicates that a partial dissipation on ions happens. However, above this break another power-law is observed indicating that a new cascade takes place. It was supposed that this small scale cascade ends at electron scales. Recently, observations at electron scales become possible with STAFF instrument on Cluster mission. In the works of Alexandrova et al. [2009, 2010], it was shown that the turbulent spectrum at electron scales is curved and not a power-law. This curvature of the spectrum at electron scales indicates the onset of dissipation. In the present study we verify the universality of this finding. We analyze 170 spectra calculated over 10 minutes time intervals in the free solar wind, not connected to the Earth's bow-shock. Among these spectra, only ~ 20 of them show signatures of parallel propagated whistler waves. Other 150 spectra have a curved shape and no signatures of particular wave modes. These curved spectra seem to represent a usual state of turbulence at electron scales. The superposition of these spectra gives one quasi-universal curved spectrum, that is the most important result of the present study. We show as well that the spectral level at electron scales varies mainly with the solar wind thermal pressure. Correlations with magnetic and dynamic pressures are also observed.