Solar Wind Turbulence at Kinetic Scales in the inner Heliosphere

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We study magnetic fluctuations at sub-ion scales and down to sub-electron scales using Helios/SCM measurements in the inner Heliosphere and Cluster/STAFF data at the Earth’s orbit. Using these data we test the generality of the kinetic spectrum and we show that it follows the \(-k^{8/3}\exp(-kl_d)\) law at different radial distances from the Sun (k being a wavenumber). We show as well that the dissipation scale \(l_d\) correlates well with the electron Larmor radius \(\rho_e\) at 0.3 AU and at 1 AU. Then, in the time domain, at 1 AU, using the wavelet transform, we study the nature of magnetic fluctuations, which form the kinetic spectrum. It appears, that the spectrum is dominated by non-linear coherent structures in the form of magnetic vortices with the smallest resolved scale of the order of \(\rho_e\). Finally, we comparer our results with measurements of the Parker Solar Probe/FIELDS and, hopefully, of the Solar Orbiter/RPW in the inner Heliosphere.