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Local slope of magnetic field power spectrum in inertial and kinetic ranges of solar wind turbulence

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Solar wind, a supersonic flow of plasma embedded in the magnetic field, exhibits turbulent behavior. The character of turbulent fluctuations has been investigated through low cadence measurements of particle distribution function and high cadence magnetic field measurements. One of the most frequently adopted approach in the analysis of the 'measured' time series of any particular quantity is the estimation of its power spectral density (PSD). The shape of the PSD then may infer which physical mechanisms govern the evolution of turbulent fluctuations. Generally, every 'measured' time series is 'noisy' and it differs from the 'true' one (measured by an ideal instrument). In turn, the shape of PSD is affected as well. In this paper, we focus on a special case where the signal and noise are independent, i.e., the noise is additive and therefore, the PSD of measured signal can be expressed as a sum of 'true' and 'noise' PSDs. Moreover, we define a so-called local slope in the framework of continuous wavelet transform as the finite difference derivative between the two consequent values of a global PSD. Employing this technique, we show that the noise of magnetic field measurements of the MFI instrument on board the Wind spacecraft is additive. Finally, we applied the technique to measurements of the Parker Solar Probe close to the Sun. Our preliminary results suggest that our technique may lead to a more accurate estimations of the kinetic range spectral indices.