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Evidence for a single stochastic physical process for fast solar wind magnetic field magnitude fluctuations at 1AU across turbulent and 1/f temporal scales

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The power spectral density of magnetic field components in the fast solar wind on magnetohydrodynamic scales typically shows two power law regions, identified with an inertial range of turbulence, and at lower frequencies, a $\sim$1/f range of coronal origin. The power spectral density of field magnitude shows a single power law region across these scales. We present the first scale-by-scale quantitative comparison of the averaged statistical properties of magnetic field magnitude and component fluctuations over timescales of $\sim$2 minutes to 5.6 hours observed in-situ in the fast quiet solar wind at solar minimum at 1AU with the ACE spacecraft. Fluctuations in the field components show an 'inertial range' of scaling up to $\sim$30 minutes and beyond this, uncorrelated Gaussian statistics. In contrast, the magnetic field magnitude fluctuations show a single scaling behavior up to 5 hours and are non-Gaussian over this entire range of scales. Thus unlike for the components, a single stochastic process could account for the fluctuations in field magnitude over both the inertial range and 1/f range of timescales the fast solar wind.