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The coronal footprint in the scaling properties of inertial range turbulence as seen by ULYSSES.

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Solar wind fluctuations typically are suggestive both of intermittent turbulence (for example, a robust power law region of the power spectrum with $\sim -5/3$ exponent) and at lower frequencies, of fluctuations of coronal origin (with scaling close to $\sim 1/f$). We examine ULYSSES magnetic field data during intervals when the spacecraft spent many months in the quiet fast solar wind above the Sun's polar coronal holes. We quantify the scaling properties of fluctuations in a statistical sense, on different time-scales τ using generalised structure functions (GSF) to test for a power law scaling $\sim \tau^{\zeta_p}$. We recover approximate power law scaling for the "1/f" range using GSF and test the scaling exponents for secular trend with latitude and radial distance from the sun. At higher frequencies, were we would expect an inertial range of turbulence, the structure functions do not show power law scaling with τ; however power law scaling is recovered under Extended Self Similarity (ESS), that is, in the ratios of structure functions. Thus the inertial range scaling is of the form $g(\tau)^{\zeta_p}$. We show that a single function $g(\tau)$ captures all the time periods examined, i.e. no latitudinal or radial dependency was found. This is highly suggestive that the higher frequency range is indeed generated by local phenomenology, that is, evolving turbulence, whereas at lower frequencies (the "1/f" range) the relevant phenomenology may be coronal. Importantly, the function $g(\tau)$ which we determine is the 'footprint' of the overall driving, and topological constraints on expansion, of the inertial range turbulence; it yields a characteristic length and timescale which we discuss in the context of the driving of the quiet fast solar wind.