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Generalized similarity in finite range turbulence in in-situ temporal, and line-of-sight spatial observations.

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Astrophysical plasmas are often cited as laboratories for MHD turbulence- observations are available that span several decades in scale and the flows are at high Reynolds number. However the key prediction of theories are of scaling in infinite range turbulence, for example a power law range in the PSD of fluctuations of specific exponent. Practically, plasmas such as the solar wind and the sun's corona are of finite range.

Extended or generalized similarity (ESS) is a ubiquitous but not well understood feature of turbulence that is realized over a finite range of scales. We will consider ESS for different observational realizations of finite range turbulence. ULYSSES magnetic field data from solar polar passes at solar minimum provide *in situ* observations of evolving anisotropic MHD turbulence in the solar wind under ideal conditions of fast quiet flow. We find a single generalized scaling function characterizes this finite range turbulence and is insensitive to plasma conditions. The recent unusually inactive solar minimum, with turbulent fluctuations down by a factor of ~ 2 in power, provides a test of this invariance.

Hinode Solar Optical Telescope calcium II H-line *integrated line of sight* observations of a solar quiescent prominence that exhibits highly variable dynamics suggestive of turbulence. These images capture a sufficient range of scales spatially ($\sim 0.1 - -100$ arcsec) and temporally ($\sim$ 16.8 s–4.5 hr) to allow the application of statistical methods used to quantify finite range fluid turbulence. We present the first such application of these techniques to the spatial intensity field of a long-lived solar prominence.

Direct numerical simulations of turbulence offer the possibility to examine both the spatial and temporal evolution of turbulence but are also intrinsically finite range. The implications of generalized similarity in the simulations, and in the data, will be discussed.

References: Chapman et al, Ap. J., 695, L185, (2009); Chapman and Nicol, PRL, 103, 241101,(2009); Leonardis et al, Ap. J., in press, (2012)