3D anisotropy of turbulence in the solar wind

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The solar wind is a supersonic turbulent flow that spreads out radially form the Sun. Several spacecrafts explored different regions of the Heliosphere and provide us in-situ data of plasma and electromagnetic fluctuations from daily to sub-second scales.

The solar wind can be though as a wind tunnel in which spacecrafts serve as probes, making it a unique astrophysical laboratory for turbulence studies.

However, measurements are basically limited to one direction in space and the spherical expansion of the flow introduces important modifications in the energetic and in the symmetry properties of turbulent fluctuations.

I will first give a brief overview of observations at scales larger than the proton scales to highlight the most important features of solar wind turbulence and the limitations of measurements, as compared to an idealized wind-tunnel experiment.

I will then present results from numerical simulations of magnetohydrodynamic (MHD) turbulence that account for the solar wind expansion and can be used to complement observations and can help interpreting some of the aspects of solar wind turbulence, in particular its anisotropy.