Abstract Submitted
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Permutation entropy analysis of dynamical turbulence in the SSX MHD wind tunnel and the solar wind[1] P.J. WECK, E.R. HUDSON, D.A. SCHAFFNER, M.R. BROWN, Swarthmore College, R.T. WICKS, GSFC, V.S. LUKIN, NRL — The statistical character of turbulence in the plasma wind-tunnel configuration at the Swarthmore Spheromak Experiment (SSX) and the solar wind is evaluated using ordinal pattern-based measures of complexity. The SSX MHD wind tunnel measures fluctuations in magnetic field, velocity, and density as highly magnetized spheromaks (typical values are $B \approx 0.1$ T, $n \geq 10^{20}$ m^{-3}, and $T \geq 20$ eV) evolve dynamically into a relaxed state. Flow speeds are measured with a visible light array. $\dot{B}$ time series for 3 spatial directions recorded by a 16-channel, high-resolution probe array embedded in the chamber are analyzed using the permutation entropy and Jensen-Shannon statistical complexity. By calculating the position of signals on a complexity-entropy plane,[2] the degree of stochastic, periodic, or chaotic dynamics can be evaluated. Complexity-entropy positions of SSX signals are compared to those of turbulent fluctuations in the solar wind and the Large Plasma Device (LAPD) as well as Hall-MHD simulations of the SSX plasma, and it is found that the dynamics in the SSX plasma source are more truly turbulent than those in the LAPD but less stochastic than fluctuations in the solar wind.

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[2]Rosso, et al. PRL 99, 154102 (2007).

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