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P2.1096 Numerical simulations of intermittent fluctuations in 2D scrape-off layer turbulence

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Intermittent fluctuations in the scrape-off layer (SOL) are investigated by numerical simulations of two dimensional reduced fluid models describing the evolution of the electron density and electric drift vorticity in the two dimensional plane perpendicular to the magnetic field [1, 2, 3]. Long time series obtained by artificial Langmuir probes are compared to predictions of a stochastic model, describing the plasma fluctuations as a super-position of uncorrelated exponential pulses arriving according to a Poisson process. For all investigated fluid models the probability density functions for the particle density fluctuations change from a normal distribution near the last closed flux surface to an exponential tail in the far SOL. The waiting times and peak amplitudes of the bursts have both an exponential distribution. The average burst shapes are well described by a two-sided exponential pulse function. The effects of reducing the sampling frequency of the artificial Langmuir probes and adding Gaussian noise are shown to result in a frequency power spectral density with a Lorentzian shape. The fluctuation statistics obtained from the numerical simulations are in excellent agreement with experimental measurements [4, 5, 6] . These findings are discussed in the light of prevailing theories for a stochastic model for intermittent scrape-off layer plasma fluctuations and recent experimental measurements.

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