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Application of a deconvolution method for identifying burst amplitudes and arrival times in Alcator C-Mod far SOL plasma fluctuations
AUDUN THEODORSEN, ODD ERIK GARCIA, RALPH KUBE, UiT - The Arctic University of Norway, BRIAN LABOMBARD, JIM TERRY, MIT Plasma Science and Fusion Center — In the far scrape-off layer (SOL), radial motion of filamentary structures leads to excess transport of particles and heat. Amplitudes and arrival times of these filaments have previously been studied by conditional averaging in single-point measurements from Langmuir Probes and Gas Puff Imaging (GPI). Conditional averaging can be problematic: the cutoff for large amplitudes is mostly chosen by convention; the conditional windows used may influence the arrival time distribution; and the amplitudes cannot be separated from a background. Previous work has shown that SOL fluctuations are well described by a stochastic model consisting of a super-position of pulses with fixed shape and randomly distributed amplitudes and arrival times. The model can be formulated as a pulse shape convolved with a train of delta pulses. By choosing a pulse shape consistent with the power spectrum of the fluctuation time series, Richardson-Lucy deconvolution can be used to recover the underlying amplitudes and arrival times of the delta pulses. We apply this technique to both L and H-mode GPI data from the Alcator C-Mod tokamak. The pulse arrival times are shown to be uncorrelated and uniformly distributed, consistent with a Poisson process, and the amplitude distribution has an exponential tail.

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