Velocity Field Analysis of Edge Turbulence Images from NSTX[1]

B.T. BROWN, T. MUNSAT, Center for Integrated Plasma Studies, University of Colorado, R. MAQUEDA, Nova Photonics, S.J. ZWEBEN, PPPL — The HOP-V (Hybrid OPtical-flow Velocimetry) code has been developed for extracting time-resolved 2-D velocity maps from turbulence imaging diagnostics, including the NSTX Gas Puff Imaging (GPI) instrument. The HOP-V code combines optical-flow and local pattern-matching techniques to derive "dense" velocity fields at the full temporal resolution and a fraction of the spatial resolution of the underlying image frames, which in this case is 64x64 pixels, 300 timepoints, taken at 4 μs per frame at a spatial resolution of $\sim$4 mm. The code has been validated for a variety of artificial test patterns of convective flow, including highly sheared cases. Recent work includes statistical analysis of a large number of NSTX shots in both L-mode and H-mode, with an investigation into a wide variety of flow properties, including flow shear, the relationship between flow evolution and H-mode behavior, the connection between flow, filament birth and evolution, and NSTX operating parameters/regimes, and the identification of zonal flows. Recent results and outstanding questions are presented.

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