Progress in BOUT modeling of NSTX edge plasma*

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We report on the status of modeling of NSTX edge plasma with the BOUT code [1]. BOUT is an electromagnetic fluid turbulence code for tokamak edge plasma that performs time integration of reduced Braginskii plasma fluid equations in actual tokamak geometry. A new version of the code, BOUT-06, is a substantial redesign emphasizing improved general structure, it has been thoroughly tested on a series of linear and nonlinear verification test problems [2].

Applying BOUT to the edge plasma of NSTX we find general consistency with the experimental GPI data in the cross-field spatial structure of the N_i fluctuations. The characteristic scale $L_\perp$ is on the order of 5 cm, which implies the normalized scale, $L_\perp/\rho_i$, considerably smaller than in most of other tokamaks. Matching the temporal characteristics of fluctuations is currently less successful, as BOUT calculations shows fluctuation time scales about 5-10 μS, while experimental data from the probes give τ~25-30 μS.

Current tasks in the BOUT modeling of NSTX include investigation of the discrepancy in the time scales, understanding characteristics of the radial electric field and flow shear, studying effects of the double-null geometry, and the progress will be presented.

[1] X. Q. Xu et al., Contr. Plas. Phys. 36, 158 (1998).

[2] M.V. Umansky et al., Bull. Amer. Phys. Soc. 51, No. 7, p.262 (2006).

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