Integrated core transport modeling of NSTX plasmas

G. Avdeeva[1], D.J. Battaglia[2], W. Guttenfelder[2], S.M. Kaye[2],
J. McClenaghan[1], O. Meneghini[1], T. Odstrcil[1], S.P. Smith[1], K.E. Thome[1]
[1] *General Atomics*
[2] *Princeton Plasma Physics Laboratory*

Reliable transport modeling is critical to enable performance assessment and design of future fusion machines. Such modeling should combine different models into a consistent solution and allows straightforward validation against experimental data. The integrated modeling approach described in this work is based on the OMFIT integrated modeling workflow [1]. The OMFIT workflow has been successfully applied on traditional larger aspect ratio tokamaks like DIII-D, and in this work, we demonstrate initial results of adapting this workflow to a tokamak plasma of low aspect ratio tokamak, NSTX. We show how the integrated workflow addresses tasks of kinetic profiles fitting and integrated with a transport code TRANSP [2,3] and EFIT to provide the self-consistent equilibrium reconstruction with kinetic constraints of total pressure, including beam pressure, and total current, including bootstrap current. The interpretive power balance calculations of TRANSP are further used in the the single-time-point TGYRO [4] solver for prediction of plasma profiles based on the combination of reduced turbulent model TGLF [5] and neoclassical code NEO [6]. We begin our study from a low beta L-mode NSTX plasma, where traditional electrostatic drift waves are expected to be dominant. This first investigation is devoted to identifying the sensitivity of profiles prediction to variations in the kinetic profiles fitting and equilibrium reconstruction on the initial steps of integrated transport analysis.

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