

Consistent Recycling in a Coupled Kinetic Plasma - Neutral Transport Code

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Abstract

The role of neutral fueling in the buildup of the H-mode pedestal is a topic of interest for the FY2011 Joint Research Target on Pedestal Structure. The particular effects of kinetic neutral and plasma phenomena in the pedestal buildup are being examined via the coupled DEGAS 2 Monte Carlo neutral and XGC neoclassical particle transport codes, developed as part of the Center for Plasma Edge Simulation. The coupled codes have recently been used to quantify the particle pinch associated with cold ions resulting from recycling at the plasma edge [1].

The next step in the code development is to use the flux of ions striking material surfaces in XGC as the source of recycled neutral atoms and molecules in DEGAS 2. In this way, the poloidal distribution of the neutral source will evolve consistently with the plasma as the pedestal builds up. XGC will also provide the energy of the ions hitting the surface, allowing the application of detailed plasma material interaction models to determine the relative fractions of atoms and molecules generated by recycling. The atom / molecule ratio in turn impacts the velocity distribution of the neutral species and, thus, their penetration into the core plasma. In this presentation, we will describe the present status of this code development effort and the plans for completing it.

This work is supported by the U.S. Department of Energy Contract No. DE-AC02-09CH11466.

¹W. Wan, S. E. Parker, Y. Chen, G. Y. Park, C. S. Chang, and D. Stotler, Phys. Plasmas (in press).