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Inference of Experimental Impurity Transport and Impact of Charge Exchange Processes on Forward Modeling (PhD Oral-24)[1] FRANCESCO SCIORTINO, NATHAN T. HOWARD, EARL S. MARMAR, TOM ODSTRIL, JERRY W. HUGHES, PABLO RODRIGUEZ-FERNANDEZ, JOHN E. RICE, Massachusetts Institute of Technology, MATTHEW L. REINKE, Oak Ridge National Laboratory — We present a fully-Bayesian approach for the inference of radial profiles of experimental impurity transport coefficients [Sciortino et al. 2020, submitted] and examine the effect of charge exchange processes with background neutrals. Our forward model for laser blow-off injections of calcium (Z=20) is based on the pySTRAHL code, optimized for iterations in high-performance computing environments. Alcator C-Mod offers opportunities to examine high-performance cases where the only source of deuterium neutrals is due to wall recycling, thus avoiding complex modeling of neutral beams. Even in the C-Mod high-density, high neutral edge opacity conditions, charge exchange is demonstrated to be remarkably important in the outer confined regions. We present results from multiple operating regimes and compare to neoclassical, gyro-fluid and gyrokinetic models (both quasi-linear and non-linear) in each case, demonstrating quantitative agreement in diffusion profiles. Convection can be matched under certain assumptions, but is more weakly constrained; in particular, inferred pedestal profiles can be significantly modified by the inclusion of charge exchange in forward modeling.

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Francesco Sciortino
Massachusetts Institute of Technology

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