Abstract Submitted
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Sputtering, Plasma Chemistry, and RF Sheath Effects in Low-Temperature and Fusion Plasma Modeling[1] THOMAS G. JENKINS, SCOTT E. KRUGER, JAMES M. MCGUGAN, ALEXEI Y. PANKIN, CHRISTINE M. ROARK, DAVID N. SMITHE, PETER H. STOLTZ, Tech-X Corporation — A new sheath boundary condition [Jenkins and Smithe, PSST **24**, 015020 (2015)] has been implemented in VSim, a plasma modeling code which makes use of both PIC/MCC and fluid FDTD representations. It enables physics effects associated with DC and RF sheath formation - local sheath potential evolution, heat/particle fluxes, and sputtering effects on complex plasma-facing components - to be included in macroscopic-scale plasma simulations that need not resolve sheath scale lengths. We model these effects in typical ICRF antenna operation scenarios on the Alcator C-Mod fusion device, and present comparisons of our simulation results with experimental data together with detailed 3D animations of antenna operation. Complex low-temperature plasma chemistry modeling in VSim is facilitated by MUNCHKIN, a standalone python/C++/SQL code that identifies possible reaction paths for a given set of input species, solves 1D rate equations for the ensuing system's chemical evolution, and generates VSim input blocks with appropriate cross-sections/reaction rates. These features, as well as principal path analysis (to reduce the number of simulated chemical reactions while retaining accuracy) and reaction rate calculations from user-specified distribution functions, will also be demonstrated.

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