Development of SSUBPIC code for modeling the neutral gas depletion effect in helicon discharges[1] JEFFREY KOLLASCH, CARL SOVENIC, OLIVER SCHMITZ, University of Wisconsin – Madison — The SSUBPIC (steady-state unstructured-boundary particle-in-cell) code is being developed to model helicon plasma devices. The envisioned modeling framework incorporates (1) a kinetic neutral particle model, (2) a kinetic ion model, (3) a fluid electron model, and (4) an RF power deposition model. The models are loosely coupled and iterated until convergence to steady-state. Of the four required solvers, the kinetic ion and neutral particle simulation can now be done within the SSUBPIC code. Recent SSUBPIC modifications include implementation and testing of a Coulomb collision model (Lemons et al., JCP, 228(5), pp. 1391-1403) allowing efficient coupling of kineticly-treated ions to fluid electrons, and implementation of a neutral particle tracking mode with charge-exchange and electron impact ionization physics. These new simulation capabilities are demonstrated working independently and coupled to "dummy" profiles for RF power deposition to converge on steady-state plasma and neutral profiles. The geometry and conditions considered are similar to those of the MARIA experiment at UW-Madison. Initial results qualitatively show the expected neutral gas depletion effect in which neutrals in the plasma core are not replenished at a sufficient rate to sustain a higher plasma density.

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