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STUDENT AWARD FINALIST: Control of Electron Energy Distributions Through Interaction of Electron Beams and the Bulk in Capacitively Coupled Plasmas[1] SANG-HEON SONG, MARK J. KUSHNER, University of Michigan — The control of electron energy distributions, $f(\varepsilon)$, in capacitively coupled plasmas is necessary to optimize the fluxes of reactive species to the substrate. Beams of electrons >100s eV are produced by secondary electron emission and acceleration through the sheaths. These beams occur from the rf biasing or can be augmented with an additional dc bias. Although the beam electrons mostly collide with the gas, collisions with bulk electrons also occur. Previous work investigated beam-Langmuir wave interactions that may transfer energy to the bulk electrons [1]. In this paper, we report on a computational investigation of the purely kinetic interaction between the beam and bulk through electron-electron (e-e) collisions, and the consequences on $f(\varepsilon)$. A CCP with and without dc augmentation was investigated with a 2-d plasma hydrodynamics model including an electron Monte Carlo simulation with e-e collisions. Secondary electrons are produced by ion and electron impact on surfaces. The beam electrons collide with low energy bulk electrons, delivering energy to the bulk and depleting the beam, and can shape the $f(\varepsilon)$ in ways not otherwise attainable in self-sustained rf equilibrium plasmas. We will discuss shaping of $f(\varepsilon)$ and changes in plasma properties through the beam-bulk interactions, and use of a dc bias to control $f(\varepsilon)$.

[1] L. Xu et al., Appl. Phys. Lett. **93**, 261052 (2008).

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