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Adding kinetic effects to finite-difference frequency-domain simulation of ion-cyclotron heating[1] DAVID GREEN, Oak Ridge National Laboratory, RF-SCIDAC COLLABORATION — The kinetic plasma current required for full-wave simulation of radio-frequency (RF) heating of Tokamak plasmas is typically included in frequency-domain simulation by application of the pseudo-spectral method and the Stix hot plasma dielectric tensor. Since the Stix dielectric is derived using a Fourier basis set, the choice of basis when applying the pseudo-spectral method is constrained to also use the Fourier basis. This presents problems when simulating bounded domains with complex geometries (i.e., the antenna and vacuum vessel structures), and is further limited to a uniform spatial resolution. Short of re-deriving the Stix dielectric for a more suitable spectral basis (e.g., the Chebychev basis), here we investigate including a kinetic plasma current through direct integration of the RF force on a discrete set of particle trajectories under a given estimate of the RF electric wave field. With an initial estimate based on a cold-plasma, an iteration where the particle kinetic plasma current updates the finite-difference solution may converge to the correct kinetic solution. Here we present initial work investigating the proposed method for an electron Langmuir wave, with comparisons to the pseudo-spectral solution.

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