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A hybrid kinetic hot ion PIC module for the M3D-C^1 Code J.A. BRESLAU, N. FERRARO, S.C. JARDIN, Princeton Plasma Physics Laboratory, K. KALYANARAMAN, Rensselaer Polytechnic Institute — Building on the success of the original M3D code with the addition of efficient high-order, high-continuity finite elements and a fully implicit time advance making use of cutting-edge numerical techniques, M3D-C^1 has become a flagship code for realistic time-dependent 3D MHD and two-fluid calculations of the nonlinear evolution of macroinstabilities in tokamak plasmas. It is therefore highly desirable to introduce to M3D-C^1 one of the most-used features of its predecessor: the option to use a drift-kinetic delta-f PIC model for a minority population of energetic ions (representing, e.g., beam ions or fusion alpha particles) coupled with the usual finite element advance of the bulk ion and electron fluids through its pressure tensor. We describe the implementation of a module for this purpose using high-order-of-accuracy numerical integration and carefully tuned to take advantage of state-of-the-art multicore processing elements. Verification results for a toroidal Alfvén eigenmode test problem will be presented, along with a demonstration of favorable parallel scaling to large numbers of supercomputer nodes.

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