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Development of a Reduced Fluid Model for Runaway Electrons in NIMROD Simulations[1] A. P. SAINTERME, C. R. SOVINEC, GE WANG, University of Wisconsin - Madison — A reduced fluid model for runaway electrons is incorporated into the NIMROD code. Runaway electrons are treated as a distinct fluid species that flows with a velocity consisting of a large parallel component and a perpendicular component arising from an $\mathbf{E} \times \mathbf{B}$ drift. There is a source density for the runaway species given by the local background density and parallel electric field via the Dreicer mechanism. The runaway evolution couples to the MHD equations via Ohm's law and the momentum evolution in accordance with the assumption that the runaway species does not contribute to the resistive electric field, similar to the work presented in Bandaru, et al. [Bandaru, et al., PRE 99, 063317(2019)]. An iterative scheme ensures the nonlinear continuity equation for the runaway number density advance reaches a converged solution. Further iterations between the magnetic field, temperature, and runaway number density are used to achieve a consistent solution for the change to each quantity within a time step. Simulations in cylindrical geometry demonstrate the implementation of the source mechanism and parallel advection.

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