NIMROD modeling of poloidal flow damping in tokamaks using kinetic closures\textsuperscript{1} J. R. JEPSON, C. C. HEGNA, Univ of Wisconsin, Madison, E. D. HELD, Utah State University — Calculations of poloidal flow damping in a tokamak are undertaken using two different implementations of the ion drift kinetic equation (DKE) in the extended MHD code NIMROD. The first approach is hybrid fluid/kinetic and uses a Chapman Enskog-like (CEL) Ansatz. Closure of the evolving lower-order fluid moment equations for $n$, $V$, and $T$ is provided by solutions to the ion CEL-DKE written in the macroscopic flow reference frame \cite{Ramos2011}. The second implementation solves the DKE using a delta-f approach. Here, the delta-f distribution describes all of the information beyond a static, lowest-order Maxwellian. We compare the efficiency and accuracy of these two approaches for a simple initial value problem that monitors the relaxation of the poloidal flow profile in high- and low-aspect-ratio tokamak geometry. The computation results are compared against analytic predictions of time dependent closures for the parallel viscous force \cite{Garcia-Perciante2005, Morris1996}.

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