Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

An Improved Gyrofluid Model to Study Energetic Particles Instabilities[1] YASHIKA GHAI, DONALD A. SPONG, Oak Ridge National Lab, JACOBO VARELA, National Institute for Fusion Science, Toki, Japan, LUIS GARCIA, Universidad Carlos III de Madrid, Leganes, Madrid, Spain — Energetic particle (EP) driven Alfvén instabilities have been extensively studied for fusion devices to evaluate the device first wall heat load as well as to plan experimental scenarios. EP instabilities arise when fast ions from the neutral beam injectors undergo resonant interactions with the Alfvén waves. Models based on gyro-Landau fluid moment closure have been used to model the stability of fast ions in such studies. Precise emulation of kinetic effects for the fast ions in a fluid model requires a reasonable truncation of the gyrofluid moment equations hierarchy. We have developed a gyro-fluid model comprised of six moment equations for fast ions derived by taking velocity moments of the gyrokinetic equation with electromagnetic fluctuations while considering a velocity dependent drift frequency. We optimize our gyrofluid model with the gyrokinetic response function to study instability of Alfvén eigenmodes. Unlike the velocity averaged drift frequency gyro-fluid models currently in use for EP instabilities, the velocity dependent drift frequency leads to coupling with higher order moments and hence presents the opportunity for a new optimal closure technique.

[1]This work was supported by the U.S. Department of Energy under DE-AC05-00OR22725 and the U.S. DOE SciDAC ISEP Center.

Yashika Ghai
Oak Ridge National Lab

Date submitted: 09 Jul 2020 Electronic form version 1.4