Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Development of a hybrid gyrokinetic ion and isothermal electron fluid code and its application to turbulent heating in astrophysical plasma[1] YOHEI KAWAZURA, MICHAEL BARNES, University of Oxford, PLASMA THEORY GROUP TEAM — Understanding the ion-to-electron temperature ratio is crucial for advancing our knowledge in astrophysics. Among the possible thermalization mechanisms, we focus on the dissipation of Alfvénic turbulence. Although several theoretical studies based on linear Alfvén wave damping have estimated the dependence of heating ratio on plasma parameters, there have been no direct nonlinear simulation that has investigated the heating ratio scanning plasma parameters. Schekochihin et al. (2009) proved that the turbulent heating ratio is determined at the ion Lamor radius scale. Therefore, we do not need to resolve all the scales up to the electron dissipation scale. To investigate the ion kinetic scale effectively, we developed a new code that solves a hybrid model composed of gyrokinetic ions and an isothermal electron fluid (ITEF). The code is developed by incorporating the ITEF approximation into the gyrokinetics code `AstroGK` (Numata et al., 2010). Since electron kinetic effects are eliminated, the new hybrid code runs approximately $2\sqrt{m_i/m_e}$ times faster than full gyrokinetics codes. We will present linear and nonlinear benchmark tests of the new code and our first result of the heating ratio sweeping the plasma beta and ion-to-electron temperature ratio.

[1]This work was supported by STFC grant ST/N000919/1. The authors also acknowledge the use of ARCHER through the Plasma HEC Consortium EPSRC grant number EP/L000237/1 under the projects e281-gs2.

Yohei Kawazura
University of Oxford

Date submitted: 14 Jul 2017 Electronic form version 1.4