

Results of the verification and benchmark of GK codes on GAMs obtained in 2017

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A verification and benchmark effort of some selected gyrokinetic (GK) codes on the frequency and collisionless damping of geodesic acoustic modes (GAMs) has been performed during these three years, following the work plan of the Eurofusion project "Verification and development of new algorithms for gyrokinetic codes". In 2015 and 2016, the dependences on the magnetic-flux-surface elongation and on the ion finite-Larmor-radius (FLR) and finite-orbit-width (FOW) have been studied by neglecting the effect of kinetic electrons, and in 2016 and 2017 the effect of kinetic electrons (in electrostatic and electromagnetic simulations) has been studied [1]. This verification and benchmark effort had three main results: 1) an improved understanding of the regimes of validity of the existing analytical theories (which neglect the effect of kinetic electrons), 2) an improved understanding the regimes of different efficiency of the several GK codes and 3) an improved understanding of the linear dynamics of GAMs. Following from these three important milestones, the formulation of a dispersion relation for the linear frequency and collisionless damping of GAMs which includes the effect of elongation, FLR-FOW, and kinetic electrons has been possible, with an interpolation of the results of GK simulations performed for different scans of the relevant parameters [2]. In the presence of energetic particles, a verification study on the linear and nonlinear dynamics of GAMs with different GK codes has also been performed [3, 4].

References

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