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Viriato: a Fourier-Hermite spectral code for strongly magnetised fluid-kinetic plasma dynamics[1] NUNO LOUREIRO, Instituto de Plasmas e Fusao Nuclear, IST, Portugal, WILLIAM DORLAND, University of Maryland, USA, LUIS FAZENDEIRO, Instituto de Plasmas e Fusao Nuclear, IST, Portugal, ANJOR KANEKAR, University of Maryland, USA, ALFRED MALLET, University of Oxford, UK, ALESSANDRO ZOCCO, Max-Planck-Institut fur Plasmaphysik, Greisfwald, Germany — We report on the algorithms and numerical methods used in Viriato, a novel fluid-kinetic code that solves two distinct sets of equations: (i) the Kinetic Reduced Electron Heating Model equations [Zocco & Schekochihin, 2011] and (ii) the kinetic reduced MHD (KRMHD) equations [Schekochihin et al., 2009]. Two main applications of these equations are magnetised (Alfvnénic) plasma turbulence and magnetic reconnection. Viriato uses operator splitting to separate the dynamics parallel and perpendicular to the ambient magnetic field (assumed strong). Along the magnetic field, Viriato allows for either a second-order accurate MacCormack method or, for higher accuracy, a spectral-like scheme. Perpendicular to the field Viriato is pseudo-spectral, and the time integration is performed by means of an iterative predictor-corrector scheme. In addition, a distinctive feature of Viriato is its spectral representation of the parallel velocity-space dependence, achieved by means of a Hermite representation of the perturbed distribution function. A series of linear and nonlinear benchmarks and tests are presented, with focus on 3D decaying kinetic turbulence.

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