Low-dimensional gyrokinetic modelling of strong-flow-turbulence dynamics

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We report corrections to an arbitrary-wavelength gyrokinetic formalism[1], which orders only the vorticity to be small and allows strong, time-varying flows on medium and long wavelengths. In the weak-flow limit, the corrected Poisson equation is now in agreement with that of the standard gyrokinetic formalism[2] at all wavelengths. The corrected formalism has been numerically implemented as an MPI parallel 2D collisionless δf PIC code. An implicit dependence of the equations of motion on the time derivative of the electric field was discretised using an iterative scheme. Strong-flow effects on blobs and the Kelvin-Helmholtz instability have been found to manifest as asymmetries in the propagation and growth rates, respectively, that depend on the sign of the parallel vorticity. A Hasegawa-Mima-like equation has been derived for strong flows. Comparative weak- and strong-flow-turbulence interaction simulation results are to be presented.

[1] A. M. Dimits. *Phys. Plasmas*, 17:055901, 2010.

[2] T. S. Hahm. *Phys. Fluids*, 31:2670, 1988.