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Noise control in global gyrokinetic particle simulations BEN MCMILLAN, SEBASTIEN JOLLIET, PAOLO ANGELINO, TRACH-MINH TRAN, LAURENT VILLARD, Ecole Polytechnique Federale de Lausanne (EPFL), Centre de Recherches en Physique des Plasmas, Association Euratom-Suisse, ALBERTO BOTTINO, Max Planck Institut fur Plasmaphysik, IPP-EURATOM Association, Garching — The use of gyrokinetic PIC codes for long simulations is hindered by the accumulation of noise: we explore the use of a relaxation operator to prevent this noise accumulation. The simplest relaxation operator is the Krook operator, which acts somewhat like an artificial collisionality, and can effectively control noise; it also introduces an unphysical dissipation, which may damp persistent structures like zonal flows and significantly modify simulation results even when the relaxation time is very long. We describe a method for projecting out the effects of the Krook operator on the zonal flows, and use this in the ORB5 gyrokinetic code [1], thereby preventing the secular accumulation of noise without introducing a large inaccuracy in the model. The results of the simulations are consistent with previous studies. Numerical efficiency is greatly improved due to the smaller number of markers required per mode compared to long simulations without a relaxation operator.
[1] S. Jolliet *et al.*, to appear in Comput. Phys. Commun.

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