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**Multi-code benchmark of global gyrokinetic electromagnetic instabilities**[1] TOBIAS GOERLER, ALBERTO BOTTINO, WILLIAM A HORNSBY, RALF KLEIBER, NATALIA TRONKO, Max Planck Institute for Plasma Physics, Boltzmannstr.2, 85748 Garching, Germany, VIRGINIE GRANDGIRARD, CLAUDIA NORSCINI, CEA, IRFM, F-13108 Saint-Paul-lez-Durance, France, ERIC SONNENDRUECKER, Max Planck Institute for Plasma Physics
— Considering the recent major extensions of global gyrokinetic codes towards a comprehensive and self-consistent treatment of electromagnetic (EM) effects, corresponding verification tests are obvious and necessary steps to be taken. While a number of (semi-)analytic test cases and benchmarks exist in the axisymmetric limit, microinstabilities and particularly EM turbulence are rarely addressed. In order to remedy this problem, a hierarchical linear gyrokinetic benchmark study is presented starting with electrostatic ion temperature gradient microinstabilities with adiabatic electron response and progressing finally to the characterization of fully EM instabilities as a function of $\beta$. The inter-code comparison involves contributions from Eulerian Vlasov, Lagrangian PIC, and Semi-Lagrange codes at least in one level of this verification exercise, thus confirming a high degree of reliability for the implementations that has rarely been achieved before in this context. Additionally, possible extensions of this benchmark into the physically more relevant nonlinear turbulence regime will be discussed, e.g., relaxation problems or gradient-driven setups.

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