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P2.1050 Global simulations of ion temperature gradient driven modes in Wendelstein 7-X with the gyrokinetic code XGC

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see full abstract here
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In recent work, the total-f global gyrokinetic particle-in-cell code XGC has been extended to stellarator geometries. In this presentation, we show verification studies and initial results with the new stellarator version, XGC-S, for ion temperature gradient driven modes. XGC-S calculations are found to agree well with the gyrokinetic codes XGC1, GENE and ORB5 for a cyclone base case-like scenario in circular tokamak geometry. Growth rates calculated for linear ion temperature gradient-driven modes with XGC-S are found to agree with those calculated with the stellarator core global gyrokinetic code EUTERPE. Results of initial simulations in the Wendelstein 7-X geometry with equilibrium and gyrokinetic profiles derived from experimental measurements will be shown. Preliminary nonlinear results will also be presented.
On-going work extending the XGC-S physics model will be detailed. An interface for the resistive MHD code HINT3D, including island and stochastic field line physics, has been written for XGC-S. Orbit tracing tests in stellarator equilibria calculated by HINT3D will be presented, with preliminary results for electrostatic microinstabilities with HINT equilibria. Improved algorithms for electromagnetic gyrokinetic particle in cell simulation are being investigated and plans for incorporation in XGC will be detailed.
References
[1] M. D. J. Cole, R. Hager, T. Moritaka, S. Lazerson, R. Kleiber, S. Ku and C. S. Chang, Phys. Plasmas, accepted (2019)
[2] T. Moritaka, R. Hager, M. D. J. Cole, S. Lazerson, C. S. Chang, S. Ku and S. Ishiguro, Plasma, submitted

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