Progress on TGYRO: the steady-state gyrokinetic transport code

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Abstract

We report on the status and development of a prototype steady-state gyrokinetic transport code, TGYRO. This prototype is being developed as part of a SciDAC-funded project (partner to the larger FACETS project) to develop software to integrate micro-scale gyrokinetic turbulence simulations into a framework for practical multi-scale simulation of a burning plasma core. It is our intention to aggressively pursue the International Thermonuclear Experimental Reactor (ITER) as an eventual simulation target after a period of code validation.

Currently, the TGYRO code has two operational modes:

1. **global**: a feedback scheme is applied to a single global GYRO simulation for which target fluxes are specified. The temperature and density profiles are then adjusted dynamically until the GYRO fluxes match the target fluxes;

2. **local**: in the spirit of traditional local transport codes, the flux is calculated independently at points along the minor radius, and profiles are adjusted in order to satisfy steady-state power balance. At each radius, one can run call a nonlinear gyrokinetic simulations (GYRO) [1], an advanced gyrofluid model (TGLF) [2] or simple transport model (IFS-PPPL).

There is a unified software interface to control both of these operational modes which resembles closely the more well-known GYRO user interface. The global feedback scheme is currently being beta tested by selected GYRO users, whereas the local scheme is still under development.

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