Status on the computational aspects of developing a fully gyrokinetic transport code

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Abstract

The primary goal of Steady State GyroKinetic Transport (SSGKT) SciDAC project is to develop a prototypical steady state gyrokinetic transport code that integrates micro-scale gyrokinetic turbulence simulations into a framework for practical multi-scale simulation of a burning plasma core. This multi-scale simulation will be used to predict the performance (the fusion energy gain, Q) given the H-mode pedestal temperature and density. Our goal is to make these performance projections with precise nonlinear gyrokinetic simulations.

The method of approach is to use a lightweight coupler code to coordinate feedback between a transport code and multiple independent gyrokinetic simulations using the GYRO [J. Candy and R.E. Waltz, J. Comput. Phys. **186** 545 (2003)] code. There are various computational aspects of this design that must be dealt with including what data to exchange, how to exchange that data, how to interpolate or translate the data between codes potentially using different grids and timescales, and basic structure of the code coupling.

This poster will describe the current design choices for our prototype code, TGYRO, and will also present what we believe are our future computational science challenges and how we might tackle them.