Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Nonaxisymmetric modelling in BOUT++; toward global edge fluid turbulence in stellarators JARROD LEDDY, BRENDAN SHANAHAN, PETER HILL, BEN DUDSON, York Plasma Institute, University of York — As Wendelstein 7-X has been optimized for neoclassical transport, turbulent transport could potentially become comparable to neoclassical losses. Furthermore, the imminent installation of an island divertor merits global edge modelling to determine heat flux profiles and the efficacy of the system. Currently, however, nonaxisymmetric edge plasma modelling is limited to either steady state (non-turbulent) transport modelling, or computationally expensive gyrokinetics. The implementation of the Flux Coordinate Independent (FCI) approach to parallel derivatives has allowed the extension of the BOUT++ edge fluid turbulence framework to nonaxisymmetric geometries. Here we first investigate the implementation of the FCI method in BOUT++ by modelling diffusion equations in nonaxisymmetric geometries with and without boundary interaction, and quantify the inherent error. We then present the results of non-turbulent transport modelling and compare with analytical theory. The ongoing extension of BOUT++ to nonaxisymmetric configurations, and the prospects of stellarator edge fluid turbulence simulations will be discussed.

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Date submitted: 10 Oct 2016 Electronic form version 1.4