Fluid simulations of turbulence in stellarator geometries with BSTING

B Shanahan,1 B Dudson,2 and P Hill2

1Max-Planck Institut für Plasmaphysik, Teilinstitut Greifswald, Germany
2York Plasma Institute, Department of Physics,
University of York, Heslington, York YO10 5DD, UK

The topology of the Wendelstein 7-X edge and scrape-off-layer exhibits stochastic fields, island chains, highly varying connection lengths, and a non-uniform curvature drive for plasma turbulence. These challenges have previously inhibited successful development of a plasma fluid turbulence simulation framework. The BSTING project [1] has extended BOUT++ [2] to stellarator geometries, thereby providing the first nonlinear fluid simulation framework for stellarator geometries. Here we outline recent developments in the BSTING project, including a newly implemented curvilinear grid system suitable for stellarator edge magnetic topology, and present simulations of plasma filaments in stellarator geometries. Simulations of filaments in non-uniform drive scenarios [3], and the effects of strongly-varying connection length will also be presented. The application of these methods to Wendelstein 7-X edge scenarios will also be discussed.