Contribution ID: **3246** Type: **not specified**

P2.1039 Impact of incorporating nonlocal thermal transport in 1D modelling of the ITER SOL

Tuesday, 9 July 2019 14:00 (2 hours)

See full abstract here
http://ocs.ciemat.es/EPS2019ABS/pdf/P2.1039.pdf

The divertor heat-flux problem remains a major challenge for both present and future high power tokamak fusion experiments and pilot power plant designs. Current divertor designs are informed by large-scale fluid simulation codes, e.g. SOLPS, UEDGE, EDGE2D, but none of these presently capture important kinetic effects in scenarios of steep parallel temperature gradients [1], where the thermal transport is not well described by local diffusive treatment but instead becomes 'nonlocal' - depending on conditions in distant regions of the plasma. Such scenarios are becoming increasingly relevant for high-power devices, where large reductions in Scrape-Off-Layer (SOL) temperature are required to operate in fully/partially detached divertor conditions. Incorrectly calculating parallel thermal transport may have significant implications for divertor target heat-flux predictions and mitigation designs employed.

Various models have been proposed for capturing nonlocality in SOL heat-flux calculations [2]. In this work, we applied the nonlocal thermal transport model developed by Ji et al [3] and Omotani [4] to the BOUT++ 1D complex SOL model SD1D' [5] to produce theSD1D-nonlocal' code. The model is applied to 1D ITER conditions to investigate the relevance and potential impact of nonlocality for the ITER divertor, focusing particularly on predictions for plasma conditions and heat-flux at the divertor target plate. Results find the nonlocal model to be in broad agreement with the flux-limited Braginskii model (with a 'flux-limiter factor' of 0.6) for standard steady-state ITER conditions, but the nonlocal model is itself able to self-consistently determine the level of flux limitation as density/collisionality regimes are varied, for which varying is required to reproduce. The ability to have self-calculated, temporally/spatially varying flux limitation has useful applications for extension into 2D SOL modelling.

[1] Batishchev, O.V. et al, Phys. Plasmas, 4, 1997, 1672. [2] Brodrick, J.P. et al, Phys. Plasmas, 24, 2017, 092309. [3] Ji, J. et al, Phys. Plasmas, 16, 2009, 022312. [4] Omotani, J. et al, Plasma Phys. Cont. Fusion, 55, 2013, 055009. [5] Dudson, B. et al, arXiv:1812.09402, submitted to Plasma Phys. Cont. Fusion, 2018.
Work supported by The Univ. of York and the UK EPSRC (under grant EP/LO1663X/1)

Presenter: WIGRAM, M.R. (EPS 2019)

Session Classification: Poster P2

Track Classification: MCF