Drift effects in SOLPS-ITER simulations for the TCV divertor upgrade

M. Wensing[1], H. De Oliveira[1], C. Dodson[1], B. P. Duval[1], O. Février[1], A. Fil[2], D. Galassi[1]
L. Martinelli[1], R. Maurizio[1], A. Perek[3], H. Reimerdes[1], C. Theiler[1], A. Thornton[2],
K. Verhaegh[1,4], M. Wischmeier[5], the EUROfusion MST1[6] team and the TCV team[7]

[1] *EPFL - Swiss Plasma Center (SPC), Lausanne, Switzerland*

[2] *CCFE, Culham Science Centre, Abingdon, Oxon, OX14 3DB, UK*

[3] *DIFFER - Dutch Institute for Fundamental Energy Research, Eindhoven, The Netherlands*

[4] *University of York - Plasma Institute, York, United Kingdom*

[5] *Max-Planck-Institut für Plasmaphysik, Garching, Germany*

[6] *See the author list of H. Meyer et al., Nucl. Fusion 57 (2017) 102014*

[7] *See the author list of S. Coda et al., Nucl. Fusion 57 (2017) 102011*

The effect of the upcoming TCV divertor upgrade on the distribution of neutrals and the onset of detachment is studied using 2D transport simulations. The divertor upgrade is centered around the installation of a gas baffle to form a closed divertor chamber [1]. SOLPS-ITER simulations predict that the baffle geometry selected to be installed in TCV in 2019 will increase the divertor neutral density by a factor ~ 5 and the neutral compression by an order of magnitude for typical TCV single null, Ohmic heated, scenarios, significantly facilitating access to deeper detachment [2].

As the conditions for the onset of detachment depend on the power entering each divertor leg, its simulation requires defining correct inboard/outboard power asymmetry that is, to large extent, determined by scrape-off layer drifts. The inclusion of such drift effects in transport codes remains to date numerically challenging. Such an attempt, that includes self-consistent electric fields and full drift effects, is presented. Drift simulations in which the targets detach are found to be numerically more stable as radial gradients in the target temperature profiles are reduced and thus the local radial electric fields are decreased.

Comparison to unbaffled well-diagnosed TCV experiments is made and quantitative predictions for future baffled experiments are described employing synthetic diagnostics. TCV operation with baffles will not only enhance our understanding of the role of neutrals for detachment but also provide a direct test of the SOLPS-ITER model for initial ITER operation and beyond.

References

[1] A. Fasoli, and the TCV team, *TCV Heating and Divertor Upgrades*, Fusion Energy Conference 2018

[2] M. Wensing et al., *SOLPS-ITER simulations of the TCV divertor upgrade*, to be submitted to Plasma Phys. Contr. F.