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P2.1044 3D global impurity migration simulations with WallDYN and EMC3-EIRENE

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To interpret impurity migration measurements in fusion experiments the evolution of the first wall surface composition and the resulting dynamics of impurity fluxes into the plasma have to be taken into account. The global impurity migration code WallDYN [1] calculates the surface compositions and impurity fluxes self consistently by combining models for implantation, erosion and reflection of impurities with a model for impurity transport through the plasma. As impurity transport model WallDYN uses the DIVIMP code [2] and thus is limited to toroidally symmetric geometries (WallDYN2D). While the plasma and SOL in tokamaks are essentially toroidally symmetric, the first wall contains 3D features like poloidal limiters. Thus impurity migration and resulting deposition patterns are not always fully captured [3]. Making accurate predictions of deposition patterns including 3D features of the first wall or modeling stellarator devices such as W7-X therefore requires taking the full 3D structure of both SOL and first wall into account. To that end WallDYN has been coupled to the 3D SOL and impurity transport code EMC3-EIRENE [4] (WallDYN3D). In [3] a 2D SOLPS plasma background for ASDEX Upgrade shot #32024 has already been used with DIVIMP for WallDYN2D. In this contribution a reproduction of that 2D SOLPS background has been calculated with EMC3-EIRENE as a 3D toroidally symmetric section of ASDEX Upgrade to be used in WallDYN3D. The migration results from WallDYN2D and WallDYN3D on these similar backgrounds and hence the results of the impurity transport models of DIVIMP and EMC3-EIRENE are compared. Furthermore, first 3D calculations of 15N migration results from and to the midplane manipulator in ASDEX Upgrade shot #32024 are presented.

References

[1] K. Schmid et al, Journal of Nuclear Materials, Volume 463, 2015, Pages 66-72
[2] P. Stangeby et al, Journal of Nuclear Materials, Volumes 196-198, 1992, Pages 258-263
[3] G. Meisl et al, Nuclear Materials and Energy, Volume 12, 2017, Pages 51-59
[4] K. Schmid, T. Lunt, Nuclear Materials and Energy, Volume 17, 2018, Pages 200-205

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