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Assessment of Scrape-off Layer Simulations with Drifts against L-Mode Experiments in ASDEX Upgrade and JET

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Recent results of validating scrape-off layer simulations with drifts are summarized, based on detailed comparisons between 2D SOLPS5.0 fluid code solutions and L-mode experiments in the full-metal devices ASDEX Upgrade and JET. The effects of drifts in various divertor power exhaust scenarios are analysed in extensively characterized discharges, in which the levels of deuterium fuelling, seeding of N impurities, and magnetic field direction are varied. In-out asymmetries in the plasma conditions are observed throughout the divertor legs when the ion grad-B drift is towards the divertor, and these asymmetries are observed to reduce with the field reversal. In the modelling, the effects of the various drift terms are analysed in comparison to the geometrical effects, and a pronounced role of the ExB drifts is identified in the resulting asymmetries. At the lowest densities, the simulations with fully activated drift terms reproduce the Balmer line emission and radiation in the JET divertor, several poloidally distributed temperature profile measurements in ASDEX Upgrade, as well as a high-density region in the inner divertor of ASDEX Upgrade. In conditions with strong power dissipation, the modelling captures the incremental effects of impurities on the divertor radiation, but high levels of fuelling and seeding lead to discrepancies between the modelled and measured target conditions. At low levels of fuelling and impurity radiation, the simulations tend to underestimate the strong scrape-off layer flows measured in forward field in ASDEX Upgrade, although a satisfactory agreement is obtained with measurements of the scrape-off layer radial electric field.

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