Abstract Submitted
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Validation of gyrokinetic impurity transport models and experimental measurement of rotodiffusion in DIII-D tokamak[1] TOMAS ODSTRCIL, NATHAN HOWARD, MIT PSFC, COLIN CHRYSTAL, General Atomics, FRANCESCO SCIORTINO, MIT PSFC, DIII-D TEAM — Validation of gyrokinetic particle transport models is crucial for predictions of low-Z impurity profiles in fusion reactors and helps to advance research of high-Z impurities which cannot be diagnosed with sufficient accuracy. The peaking of carbon density is investigated in a database of 143 H-mode discharges. Experimental R/L_{n_C} values are contrasted with quasilinear gyrokinetic modeling by CGYRO. Linear multi regression analysis identified ω_r and parallel compressibility $k_{||}^2 = (\hat{s}/qR)^2$ as the major parameters, explaining 93% of non-random variance in the measured R/L_{n_C}. In ITG cases, CGYRO reproduced 95% of dependence on ω_r, however only 36% of variation connected to $k_{||}^2$. Such discrepancy points to a significantly under-predicted parallel compressibility drift in the model. The remaining discrepancy indicates a too high sum of inward curvature drift together with outward thermo-diffusion. The rotodiffusion contribution in the rotation scans was near zero. Finally, we have compared the database with nonlinear ion scale CGYRO runs, and gyrofluid TGLF runs. While quasilinear runs reproduce R/L_{n_C} from nonlinear runs remarkable well, a significant discrepancy is found in TGLF thermodiffusion.

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