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TH/P2-17: Non-diffusive Momentum Transport in JET H-mode Regimes: Modeling and Experiment

Tuesday, October 9, 2012 2:00 PM (4h 45m)

A systematic comparison of theoretical predictions for momentum transport in JET with experimental results has provided detailed insight into the physics of momentum transport, in particular non-diffusive transport. For this project, 400 representative experimental samples, selected from an extensive JET profile database with more than 1000 experimental profiles obtained over the entire baseline H-mode and hybrid operating domains, were used as input for the gyrokinetic code GKW. Linear and non-linear local calculations have allowed to quantify the contributions of diffusive transport, the Coriolis pinch and residual stresses to the overall transport and predict the expected angular velocity gradient R/L_omega for each of these samples. Direct comparisons of modeled and experimental data show that overall, the predicted Coriolis pinch account for approximately 70% of the observed non-diffusive contributions to R/L_omega. First results from linear calculations indicate that the remainder is consistent in magnitude with expectations for residual stresses. The strong contribution of the Coriolis pinch is due to the fact that most of these NBI-heated plasmas are strongly rotating, with Mach numbers in the range 0.05 to 0.35. Regressions were used to determine the overall parameter dependencies, both for the experimental and the theoretical dataset. Remarkably, the experimental scaling for non-diffusive transport matches the theoretical scaling for the Coriolis pinch for the three most relevant parameters R/L_n, q and f_t=sqrt(epsilon), the trapped particle fraction. A scaling with T_i/T_e in the experimental database and not characteristic of the Coriolis pinch, is suggestive of a contribution by residual stresses. Residual stresses are addressed in ongoing linear and non-linear simulations.

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