

Integrated Data Analysis augmented by kinetic modeling

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The Integrated Data Analysis (IDA) approach employs a combination of various diagnostics within a Bayesian probability framework to determine electron density and temperature profiles of ASDEX Upgrade plasmas. These profiles frequently serve as a benchmark for validating transport simulations. However, as some areas of the plasma are not covered by the diagnostics or measurements may be unavailable, IDA relies on non-physics-based priors to mitigate missing or uncertain data. Consequently, the resulting profiles may not align with theoretical expectations and may have steep gradients leading to unphysical high turbulent transport. To improve the estimated profiles and not to be contradictory to transport expectations, additional physical prior information from transport modelling augments the measured data. Simulated profiles and their gradients together with their uncertainties constrain the physically reasonable parameter space. Special emphasis is given to the estimation of the uncertainty of the simulation where methods are explored such as input error propagation and comparison to the high-fidelity turbulence solver GENE.

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