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Coupled turbulence and transport simulations for edge plasmas.[1]
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Coupling between edge turbulence and transport has been demonstrated in the past using a type of Relaxed-Iteration Coupling (RIC) scheme [Shestakov et al., JCP 185 (2003) 399] where time-averaged turbulent fluxes (BOUT) are coupled to a transport code (UEDGE) in a series of time-lagged iteration to find a steady-state solution [Rognlien et al., JNM 337-339 (2005) 327]. A key issue for such a method applied to edge turbulence relates to the fact that here the transport events can be large, intermittent, and have spatial scales comparable to equilibrium gradients. Thus, the long-time averages of the resulting transport fluxes coupled to the transport code may not faithfully represent the actual transport/profile-modifications from large events. This issue is quantified by comparing BOUT/UEDGE simulations using the RIC algorithm to more time-consuming direct simulations where BOUT evolves the edge plasma profiles at each step of the turbulence simulation during the course of a long transport timescale simulation.

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