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TH/P2-12: Indications of Nonlocality of Plasma Turbulence

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Nonlocality, which may manifest itself as a breaking of the favorable gyro-Bohm scaling of transport via phenomena such as avalanches or turbulence spreading and is an important threat to ITER operation has been considered and observed to various extents in simulations and experiments. Understanding of its details, is an essential challange for the transport community. Here, we present some indications in the form of characteristic observations from experiment, such as the recent results from the Tore Supra tokamak, using detailed high-resolution fluctuation diagnostics, that show the existence of mesoscale structures (Geodesic Acoustic Modes) and their dynamics and simulation results using the GYSELA code, developed by the IRFM-CEA, a full-f, global gyrokinetic code that simulates the ion scales but can also treat neoclassical physics, momentum transport with ripple etc. and finally discuss existing simple models that help understand, and underline the important features of non-locality of plasma turbulence. We discuss possible ways of verification of such models dealing with both turbulence and transport scales and in particular the mesoscale “interface” between these two hypothetically distinct scales. Turbulence spreading, and dynamics of the turbulence intensity field is a critical ingredient of this mixed range, which is also coupled to momentum transport via residual stress generation. It is also argued that nonlocality plays a key role in the L to H transition.

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