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EX/P3-22: Dynamical Coupling Between Gradients and Transport in Tokamaks and Stellarators

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Understanding the relation between free energy sources and transport is a fundamental issue in systems far from thermal equilibrium that has been debated for years. Instabilities governed by a gradient will typically produce transport events at all scales connecting different regions of plasma. In the case of a critical gradient mechanism, the functional dependence between the transport flux and the gradient is expected to show a sharp increase as the system crosses the instability threshold and finite background transport below the threshold, implying a non-linear relation between gradients and turbulent transport [1]. It is well known that edge turbulent transport is strongly bursty and that a significant part is caused by few large transport events [2]; this is possibly reflecting the fact that systems out of thermal equilibrium are dynamically exploring different accessible states.
In this paper, the dynamical coupling between gradients and transport has been investigated in the plasma boundary of different tokamak (JET, ISTTOK) and stellarator (TJ-II) devices, showing that the size of turbulent events is minimum in the proximity of the most probable gradient. The local system relaxes to the most probable state in a time comparable to the auto-correlation time of turbulence.
Experimental results were found to be consistent with results from two very different models [3, 4] of plasma turbulence and transport, where non-local effects play an important role. These non-local effects are resulting from a series of feedback mechanisms at different radial locations where at a given point in the plasma the local gradients drive the turbulence and turbulence controls the transport.
These observations [5] provide a guideline for further developments in plasma diagnostics, transport modelling and data processing to characterize transport and gradients in terms of joint probability distribution functions.

[1] F Ryter et al., Phys. Rev. Lett. 86 (2001) 2325
[2] M. Endler et al., Nuclear Fusion 35 (1995) 1307
[3] L. Garcia et al., Phys. Plasmas 9 (2002) 841
[4] L. Garcia et al., Phys. Plasmas 8 (2001) 4111.
[5] C. Hidalgo et al., Phys. Rev. Lett 108 (2012) 065001.

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