Modeling of Heat Transport Driven by Two-Scale Turbulence

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Abstract

The possibilities of modeling anomalous transport driven by two-scale turbulence are investigated. First, the nonlinear coupling of high frequency Alfvén waves with the low frequency interchange instability is considered. It is shown that the evolution equation for the large scale mode can be reduced to the "overturned pendulum" equation, which in the plasma case means the appearance of convective cell layers near the rational surfaces. Second, the heat transport across an inhomogeneous plasma consisting of layers with high and low thermal diffusivities is studied. Third, extensive numerical simulations of the modified Hasegawa-Wakatani model, taking into account the parallel wave number variation near the rational surfaces, are done. It was found that the large scale mode works like a generator of perturbations and the small scale mode works like a transmitter, which carries the perturbations to the edge. In this regime, the turbulent transport consists of avalanche like events spreading across a layered medium with low and high thermal conductivities.

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