

Multiple-scale Turbulences Interaction

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APPH4990: ITER Seminar Project Proposal

The complexity of micro-instabilities that cause anomalous transport is characterized by multiple spatio-temporal scales. The interaction among the different spatio-temporal scales has been studied, including the interaction between the turbulent fluctuations with separate scales, between turbulent ion temperature gradient/ electron temperature gradient fluctuations and flows with anisotropic spectra such as zonal flows/streamers and also among the mean shear flows, zonal flows and generalized Kelvin-Helmholtz modes in drift wave turbulence.

This project will review the theoretical point of view in studying the turbulence interaction by treating all fluctuations as an interacting dynamical system and its simplified model describing the coupled drift wave turbulence and zonal flows. And it will also review an electromagnetic two-fluid code, which numerically simulates the direct or indirect interactions among the multiple-scale fluctuations and flows and describes some process occurring in some tokamak plasmas.

References

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