Global structure of ITG turbulence-zonal mode system in tokamak plasmas

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Using a global Landau fluid code in toroidal geometry, an electromagnetic ion temperature gradient (ITG) driven turbulence-zonal mode system in tokamak plasmas is investigated. Two different types of zonal flows, i.e. stationary zonal flows in a low q (safety factor) region and oscillatory ones in a high q region which are called geodesic acoustic modes (GAM) [1], are found to be simultaneously excited in a torus. The stationary flows efficiently suppress turbulent transport, while the oscillatory ones weakly affect the turbulence due to their time varying nature [2]. As a result of the different behaviour of the zonal flows, the tokamak plasma divides into the zonal flow dominant region and the turbulent region [3].

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