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Finite frequency zonal flows in multi-scale MHD and ITG turbulence JIQUAN LI, YASUAKI KISHIMOTO, ZHENG-XIONG WANG, MIHO JANVIER, Kyoto University, Japan — Different scale fluctuations, such as the macro-scale MHD and micro-scale drift wave turbulence, may directly interplay each other or indirectly through a zonal flow, which has been widely recognized as a stationary coherent structure. The spatio-temporal nature of the zonal flow is important in the plasma transport. For example, the geodesic acoustic mode (GAM) with a finite frequency leads to a reduction of the suppression role of the zonal flow in transport in a toroidal plasma. In this work, we show an oscillating zonal flow with finite frequency in a multi-scale turbulence simulation in a slab plasma based on a 5-field gyrofluid model in which both ion temperature gradient (ITG) and resistive kink-tearing mode (RKTM) fluctuations can coexist through adjusting the ion temperature gradient and the resistivity. The finite frequency is identified to originate from the nonlinear interaction between MHD and ITG fluctuations in a specific sheared magnetic field geometry, not a linear eigen-mode like the GAM. As a result, the ion heat transport is not efficiently suppressed even if the zonal flows have a large amplitude. This implies that MHD fluctuations may deteriorate the favorable role of ITG zonal flows in fusion plasmas.

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