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Energy partitioning between damped modes in gyrokinetic turbulence K.D. MAKWANA, P.W. TERRY, M.J. PUESCHEL, Dept. of Physics, University of Wisconsin-Madison — Damped modes are stable roots of the plasma dispersion relation. Gyrokinetic simulations have tens of thousands of damped modes spanning the non-periodic phase space dimensions. It has already been shown that these modes are excited nonlinearly to finite amplitude and play an important role in the saturation of turbulence. We take a closer look at the partitioning of energy between these modes. Both proper orthogonal decomposition modes and linear eigenmodes are utilized. As the damping rate increases, the modes develop fine scale structure, and after some threshold they become unresolved. A metric is devised to identify the well-resolved modes. The energy dissipation and amplitude attenuation rates of damped modes are calculated. They show a systematic scaling with mode number (or damping rate) in the range of resolved modes. This indicates a strong dependence of energy partitioning on damping rate. The effects of resolution and collisionality on this scaling are investigated. We also find that the unstable mode transfers energy to all the damped modes simultaneously, in parallel, leading to a nonlocal transfer process in phase space. It is hoped that a simplified theory of damped modes in gyrokinetics can emerge out of these studies.

K. D. Makwana
Dept. of Physics, University of Wisconsin-Madison

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