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Suppression of turbulence and subcritical fluctuations in differentially rotating gyrokinetic plasmas ALEXANDER SCHEKOCHIHIN, EDMUND HIGHCOCK, University of Oxford, STEVEN COWLEY, CCFE and Imperial College London — Differential rotation suppresses linear instabilities in fusion plasmas. However, subcritical fluctuations that grow transiently can lead to sustained turbulence and transport. Here fluctuations driven by the parallel velocity gradient (PVG) and ITG in the presence of perpendicular velocity shear and zero magnetic shear are considered. There are no growing eigenmodes, so all excitations are transient. In the PVG-dominated regime, the maximum amplification factor is e^N with $N \propto q/\epsilon$, the maximally amplified wavenumbers satisfy $k_y\rho_i \approx (\epsilon/q)^{1/3}k_\parallel v_{thi}/S$, where S is the $\mathbf{E}\times\mathbf{B}$ shear. In the ITG-dominated regime, N is independent of k and $N \propto v_{thi}/(L_T S)$. For intermediate ITG-PVG regimes, N is calculated vs. q/ϵ, L_T and S. Analytical results are supplemented by linear gyrokinetic numerical tests. Regimes with $N < 1$ for all k are possible for small enough $q/\epsilon < 7$; ion-scale turbulence is expected to be fully suppressed in such regimes. For cases when it is not suppressed, an elementary heuristic theory of subcritical PVG turbulence and a scaling of the ion heat flux with q, ϵ, S and L_T is proposed; the transport is much less stiff than in the ITG regime.

Alexander Schekochihin
University of Oxford

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