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Theory of turbulence spreading by penetrative convection and mode coupling O.D. GURCAN, P.H. DIAMOND, C.J. MCDEVITT, UCSD, T.S. HAHM, PPPL — The intensity of inhomogenous turbulence may spread via avalanches or non-local mode couplings. These two processes are related and while mode coupling provides a mechanism for spreading, avalanches also, evolve the turbulence profile separately. Avalanches are the result of accumulation of density gradient in time at a slower time scale, resulting in intermittent, "convective" transport. It is essential to incorporate this effect to understand profile evolution and thus "penetrative convection," which necessarily implies spreading. Here we consider a model that incorporates the effects of zonal flows, zonal "density" and fluctuation-fluctuation mode couplings as well as linear growth, non-linear damping and linear group propagation. We use an EDQNM type analysis of simple drift-wave turbulence within the Hasegawa-Wakatani model, to compute the effect of mode coupling between different k_y modes. We observe it is predominantly the internal energy [i.e. $|\widetilde{n}|^2$], that is nonlinearly affected by these processes, whereas kinetic energy [i.e. $|\nabla\widetilde{\Phi}|^2$] simply follows due to linear coupling. Features, which distinguish between spreading by mode coupling and by penetrative convection will be elucidated and discussed.

Ozgur Gurcan
UCSD

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