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Robust energy transfer mechanism via precession resonance in nonlinear turbulent wave systems[1] DAN LUCAS, MIGUEL BUSTAMANTE, Univ Coll Dublin, BRENDA QUINN, Tel-Aviv University — The precise mechanisms by which energy is most efficiently transferred in a turbulent system remain an important open question for the fluid mechanics community. In this talk we present a newly discovered resonance which is found to drive transfers across the spectrum of Fourier modes in a nonlinear wave system. Quadratic nonlinearity results in modes interacting in triads and, by considering the "truly dynamical degrees of freedom" (amplitudes and triad phases) and the precessional frequencies of the triads, we show transfers are maximal when the precession resonates with the nonlinear temporal frequencies. This can lead to a collective state of synchronised triads with intense cascades at *intermediate* nonlinearity; we find greatest transfer *between* the traditional weak and strong turbulence regimes and discover that this new mechanism is dominant here. We present the effect in a hierarchy of models including a full DNS of the Charney-Hasegawa-Mima equation and confirm analytical predictions.

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Dan Lucas
Univ Coll Dublin

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