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Pseudospectral Reduction of Incompressible Two-Dimensional Turbulence

Spectral reduction was originally formulated entirely in the wavenumber domain as a bin-averaged wavenumber convolution in which bins of modes interact with enhanced coupling coefficients. A Liouville theorem leads to inviscid equipartition solutions when each bin contain the same number of modes. We describe a pseudospectral implementation of spectral reduction which enjoys the efficiency of the fast Fourier transform. The model compares well with full pseudospectral simulations of the two-dimensional forced-dissipative energy and enstrophy cascades.