



Energy and enstrophy cascades in the atmosphere

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A full theoretical understanding of the atmospheric energy spectrum remains elusive. At synoptic and sub-synoptic scales the energy spectrum exhibits k^{-3} power law behaviour with an enstrophy cascade. A $k^{-(5/3)}$ law is evident at the mesoscales (below 600 km). Attempts using 2D, QG and 3D turbulence theory to explain the "spectral kink" at around 600 km have not been wholly satisfactory. We examine observational evidence and review attempts to explain the spectrum theoretically. We will also consider why the spectral kink is not found by many GCMs.