

Balance and gravity waves in spherical shallow water turbulence.

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We present a thorough investigation of the properties of freely decaying turbulence in a shallow fluid layer on a sphere. A large number of numerical simulations, covering an extensive range of Froude and Rossby numbers, are performed using a novel numerical algorithm that exploits the underlying properties of the flow. Some general features of these flows, such as equatorial waves, vortex merger and cyclone/anticyclone asymmetry, are discussed. We then apply a new method for decomposing the flow into balanced and imbalanced components. By comparison with other balancing routines, we find that this new technique produces a much better representation of both components in that it attributes much more of the motion to the PV-controlled, balanced part of the flow. We find that all flows stay close to balance, even at large Froude number where wave motion may previously have been expected to become more important.