
Interactions between near-inertial waves and mesoscale motion in the ocean

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Abstract

Wind forcing of the ocean generates a spectrum of inertia-gravity waves that is sharply peaked near the local inertial (or Coriolis) frequency. The corresponding near-inertial waves (NIWs) are highly energetic and play a significant role in the slow dynamics of the ocean at large and meso-scales. Using an asymptotic model originally derived by Young & Ben Jelloul (1997), I will discuss some of the properties of NIWs, focussing on their interactions with the mesoscale flow to explain their observed vertical propagation and their concentration in anticyclones. I will then introduce a new coupled model which captures the two-way interaction between NIWs and mesoscale flow. The model is derived using generalised Lagrangian mean theory and preserves energy and an action. Using these conservation laws, I will show how NIWs act as an energy sink for the mesoscale flow through a process of ‘stimulated wave generation’.

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