INTERACTIONS OF 'FAST' AND 'SLOW' MODES IN ROTATING, STRATIFIED FLOWS

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The *slow manifold* of a fluid-dynamical system is a putative, invariant submanifold of the total phase space, upon which the trajectory representing the state of the system is constrained to evolve without ever exciting high-frequency, gravity wave oscillations. The purpose of initialization procedures, which are routinely used in numerical weather prediction models, is to project the atmospheric observations onto the slow manifold before they are used as initial conditions for the forecast. This process filters out any 'fast', small-scale gravity waves, whose effects on the 'slow', synoptic-scale Rossby waves (which constitute our weather systems) are conventionally thought to be negligible. However, if a significant Rossby/gravity wave interaction does exist, it could place a fundamental limit on the accuracy of forecasting models which don't incorporate it.

The interaction has previously been investigated using highly-idealized theoretical and numerical models. Thanks to a recent discovery, it can now be studied for the first time in the laboratory, using a two-layer annulus experiment in which the flow is forced to be baroclinically-unstable by relative rotation of the two layers. In certain parameter regimes, it is found that small-amplitude interfacial gravity waves are generated by the baroclinic wave as it nears the end of its vacillation cycle.

Laboratory experiments are not subject to the *ad hoc* approximations of theoretical analyses, and therefore provide an ideal arena in which to investigate the much-debated existence and character of the slow manifold. We will present preliminary results from the experiments, and indicate what they reveal about the nature of the Rossby/gravity wave interaction.