Axisymetric internal waves attractor experiments to excite instabilities in enclosed bassin

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Reflection of inertia-gravity waves differ from the Snell-Descartes law since the absolute value of the angle between the group velocity and the vertical is fixed by the dispersion relation once the pulsation ω, the buoyancy frequency N and the rotation frequency Ω of the fluid are given.

An inertia-gravity wave beam is therefore geometrically focused (or defocused) by a reflection on an inclined slope. Inside a closed domain, successive focusing reflections may result in the formation of an attractor, a limit cycle for the beam. Energy being concentrated along this structure, (weakly) non-linear regimes can be reached, mostly through triadic interactions and wave turbulence conditions are expected [1].

Attractors have been experimentally observed and extensively studied mainly in a 2D trapezoid geometry, for both inertial waves and internal gravity waves. In parallel, experiments and numerical simulations recently extended the study of inertia-gravity waves along these lines to three-dimensional geometry, and attractors have been recently observed in an axisymmetric 3D cylindric shell [2].

A new experimental setup using a truncated conical shaped tank allows the formation of inertia-gravity waves attractor in a more open geometry. By increasing the amplitude of the forcing, one can observe an evolution of the attractor characteristics and the apparition of waves at frequencies different from the forcing frequency ω_0. Preliminary results suggest that most results obtained in 2D can be generalised in this less constrained geometry.

Références

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