Experimental study of the role of rotation on Parametric Subharmonic Instability (PSI)

Paco Maurer*[1], Sylvain Joubaud†[2], and Philippe Odier‡[2]

[1]Laboratoire de Physique de l'ENS Lyon (Phys-ENS) – CNRS : UMR5672, École Normale Supérieure (ENS) - Lyon – 46 allée d'Italie 69007 Lyon, France

[2]Laboratoire de Physique de l'ENS Lyon (Phys-ENS) – CNRS : UMR5672, École Normale Supérieure - Lyon – 46 allée d'Italie 69007 Lyon, France

Abstract

The ocean is a stratified fluid whose dynamics is believed to be driven by internal waves as they affect mixing and energy transport. In oceanic conditions, rotation plays also a role on the propagation of internal waves and on their instabilities, particularly when it comes to non-linear interaction between internal waves such as Parametric Subharmonic Instability. This instability consists in a destabilized primary wave emitting spontaneously two secondary waves of different wavelength and pulsation and provides an efficient way to transfer energy from large to small scale.

We investigate experimentally the effect of rotation on the PSI threshold of a beam of monochromatic gravito-inertial waves. We observed that in addition to modifying the threshold, rotation also affects the secondary waves character- istics. Experimental results are compared to theoretical predictions and show, on a certain range of rotation, a lowered PSI threshold associated with a richer spectrum of secondary waves pulsation. For certain rotation frequencies, un- expected evanescent waves emerge from PSI.

*Speaker

†Corresponding author: sylvain.joubaud@ens-lyon.fr

‡Corresponding author: philippe.odier@ens-lyon.fr