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Precessional forcing of a mean geostrophic flow in a rotating cylinder THOMAS ALBRECHT, Monash University, Australia, PATRICE MEUNIER, RPHE, CNRS, and Aix-Marseille Universit ?e, Marseille, France, HUGH BLACKBURN, Monash University, Australia, JUAN LOPEZ, Arizona State University, USA, RICHARD MANASSEH, Swinburne University of Technology, Australia —
It has often been observed that inertial waves in rotating flows can interact nonlinearly to create a mean geostrophic motion due to a streaming effect. This mean geostrophic flow has a large effect in rotating flows since it changes the base flow and thereby detunes all the possible resonances. However, in a cylinder, inviscid Kelvin modes (KM) are known theoretically to create *no* mean geostrophic motion by nonlinear coupling. It was thus assumed that the observed geostrophic flow relies on viscous effects in the Ekman boundary layers together with nonlinear interaction. We present here a simple flow configuration where both the KM and the geostrophic flow can be quantified in order to analyse this mechanism in detail. We have studied the case of a KM forced by precession. This allows to reach a very large amplitude of the KM at the resonance, even for small precession angles. PIV measurements are compared to numerical simulations. The profiles of mean azimuthal velocity are studied in the laminar and in the turbulent case. They seem to be correlated to the profiles of velocity of the forced KM. The amplitude of the geostrophic flow seems to agree with the viscous nonlinear theory which predicts that it scales as the square of the forced KM's amplitude.

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