

Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

A Model Experiment of the Quasi-Biennial Oscillation BENOIT SEMIN, CNRS, FRANCOIS PETRELIS, CNRS ENS, STEPHAN FAUVE, ENS — The quasi-biennial oscillation is the periodic reversal of the wind in the lower equatorial stratosphere. The period of the oscillation is 28 months on average, and is not linked to the year duration. This wind is known to be generated by atmospheric waves, in particular internal gravity waves. We have set up an experiment which reproduces this phenomenon in the laboratory. This experiment is inspired by the one of Plumb and McEwan (1978). Linearly stratified salty water is located between two plexiglas cylinders. Internal gravity waves are generated in the fluid using 16 membranes located at the top of the fluid. Each membrane oscillates sinusoidally in the vertical direction, in opposition of phase with its two neighbors. When the amplitude of the forcing is large enough, a mean flow is generated, and oscillates with a period which is much larger than the wave period. This oscillation of the mean flow is similar to the one observed in the atmosphere. We report the first quantitative measurements of the saturated velocity of the mean flow. We show experimentally and theoretically that the QBO is generated by a bifurcation that is either supercritical or subcritical depending on the dominant dissipative process (Semin et al., Phys. Rev. Lett., 2018).

Benoit Semin
CNRS

Date submitted: 31 Jul 2020

Electronic form version 1.4