

Aspect ratio effects in quasi-2D turbulence

David Straub

Department of Atmospheric and Oceanic Sciences

McGill University

805 Sherbrooke, W.

Montréal, Québec H3A 2K6

Abstract

Although the hydrostatic approximation underlies much of theoretical geophysical fluid dynamics, aspect ratio effects have rarely been examined directly. In this work we consider aspect ratio effects in the context of an idealised problem: decaying, homogeneous turbulence.

Starting from previous work on the three-dimensionalization of decaying 2-D turbulence, we show that the aspect ratio strongly affects the saturation level of the perturbation and its feedback on the base flow. The saturation level scales linearly with the aspect ratio, as does the total damping exerted by the perturbation. A surprising result is the persistence of coherent vortices even after the saturation of the perturbation. The return to isotropy is slow.

Join work with Keith Ngan and Peter Bartello.

Reference

K. Ngan, D.N. Straub and P. Bartello, *Three-dimensionalization of freely-decaying two-dimensional turbulence*, Phys. Fluids **16** (2004), 2918.