



Free jets solutions of inertial ocean circulation

A. Venaille (1,2), F. Bouchet (2)

(1) Coriolis-LEGI, 21 avenue des martyrs, 38000 Grenoble, France (2) INLN 1361 route des Lucioles Sophia Antipolis 06560 Valbonne, France (venaille@coriolis-legi.org [00 33 (0)4 76 87 97 93])

Both Gulf Stream and Kuroshio are intense midlatitudes eastward jets in North Atlantic and North Pacific oceans. The purpose of our study is to see if those jets exist in some class of stable steady solutions of the quasi-geostrophic equations.

We generalize the usual Fofonoff modes to a non linear Potential Vorticity-Stream function relationship in both one layer and multi-layer models. We give both theoretical and numerical results to describe the structure of the flow, for different parameters (topography, circulation of each layer, total energy of the flow, baroclinic Rossby deformation radius, geometry of the domain). We describe a rich variety of solutions, that differ from the usual Fofonoff modes.

By contrast with the common belief, we observe intense baroclinic jets either westward or eastward, at the middle of the domain. We describe in details those cases of interest for ocean dynamics. Such modes are an interpretation of average flows, observed in real geophysical flows. From this point of view, we discuss the very important question of the barotropisation of the flow.