Abstract View

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Geostrophic Control of Fluctuating Barotropic Flow through Straits

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ABSTRACT

A simple model in which the cross-strait sea surface slope is geostrophically balanced and the along-strait slope is balanced by acceleration and friction, is shown to be supported by the results of Buchwald and Miles for fluctuating flow through a gap between two semi-infinite oceans. For a narrow gap (compared with the Rossby radius and the scale of the motion in the far field), the transport through it is exactly the same as that predicted by the model, provided that the gap is regarded as having an elective length as determined in this paper. The importance of the models is that they demonstrate that, at low frequency, the flow may be “geostrophically controlled” and the transport limited to a value much less than that which would arise in a nonrotating system. The neglect of nonlinear advective terms in the models is justified by a comparison or the Bernoulli set-down in the strait with the driving head and the mean water depth. The formula for the flux through a strait may be applied in studies of the forced of ocean basins connected by straits. In particular, we draw attention to the existence of damped low-frequency normal modes for two connected (but frictionless) ocean basins.