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The General Circulation in a Dissipative Ocean Basin with Longshore Wind Stresses

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ABSTRACT

Solutions of the Stommel equation are presented which take the form of free waves in the interior of the ocean basin, driven by convergences and divergences in coastal transports brought about by the variation of the longshore wind stress around the coast. These waves have been termed “coastal waves” and result from the beta-effect in the presence of a uniform frictional process, such as the loss of momentum by the ocean to the atmosphere. The coastal waves which typically transport 5 Sv extend significantly into the interior of the ocean from all boundaries except the western boundary, and also drive a westward nonlinear current, appear to be an important feature in the general circulation. A good example of a quasi-steady wavefield induced by intermediate-scale coastline geography occurs in the Flinders Current off the south coast of Australia.

The western boundary current, of course, compensates for imbalances in interior transport. Its structure results from forcing, both by this transport and the longshore wind stress on the western coast itself, which produces no net transport outside of the boundary layer.

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