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Coastal Circulation Caused by an Isolated Storm

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ABSTRACT

The strength of storm generated coastal current and the intensity of coastal upwelling depend on the scales of the storm and the position of the storm with respect to the position of measurement. It is known that long coastal trapped waves travel poleward along eastern ocean boundaries and that a storm may generate these waves at its equatorward and poleward edges. If a storm lasts longer than coastal trapped waves take to propagate from the equatorward edge of the storm to the position of measurement, then the strongest current and upwelling occur poleward of the storm. If the storm is brief in this sense, then the strongest current and upwelling appear within the storm region after the storm decays.

A single storm with equatorward winds will generate a poleward traveling upwelling event followed by a more slowly traveling undercurrent event. The alongshore scale and time scale of the upwelling event bear a strong correspondence to the scales of the storm only if the storm starts and stops abruptly and has distinct edges in the alongshore direction. Continental shelf topography and friction alter the circulation quantitatively but not qualitatively.

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