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Generation of Annual Rossby Waves in the North Pacific by the Wind Stress Curl

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ABSTRACT

The Rossby wave field generated by the annual cycle of the observed wind stress curl over the North Pacific Ocean (15°N–53°, 100°W–175°E) has been obtained through numerical integration of the linearized, reduced-gravity vorticity equation in spherical coordinates. The dominant source region of Rossby waves is adjacent to the eastern boundary between 20°–44°N. More specifically this source is shown to be made up essentially of two distinct parts: a southern region off California-Baja California, which was first identified by White and Saur, and a northern region corresponding to a generation area first proposed by Mysak. In addition, a second, midocean generation region has been identified over the central North Pacific from 35° to 45°N, 150° to 160°W.

The behavior of the model is strongly affected by wave refraction due to the variation of phase velocity with latitude as described in Schopf et al. As waves emanate from the eastern boundary they are refracted such that the wavenumber vector, initially aligned zonally, becomes reoriented to the northwest. Associated with this is a turning of the group velocity vector and of wave rays towards the southwest.

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