Abstract View

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Energy Flux and Generation of Diurnal Shelf Waves along Vancouver Island

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ABSTRACT

Recent observations along the west coast of Vancouver Island reveal among diurnal-period currents due to a tidally driven continental shelf wave superimposed upon a Kelvin wave. The energy flux of this system is investigated here. It is shown that both the Kelvin wave and the first-mode continental shelf wave transport energy toward the northwest in the direction of phase propagation, but when the two waves are superimposed the combined energy flux vectors form meanders and gyres over the continental shelf; the pattern repeats in the alongshore direction every wavelength of the shelf wave. Near Southern Vancouver Island these waves combine to form a gyre in which the nearshore side carries energy to the southeast toward Juan de Fuca Strait. Kinetic energy flows up-Strait until it is dissipated in narrow tidal channels.

The total alongshore energy flux in the shelf wave alone can be determined from a fit of a model baroclinic shelf wave to current meter observations along Vancouver Island. Energy flux in the K_1-period shelf wave decreases as the wave propagates away from Juan de Fuca Strait, probably because of wave dispersion rather than friction. The decrease in energy flux together with the convergence toward Juan de Fuca Strait of flux vectors of the combined waves suggests the shelf wave originates at the entrance to Juan de Fuca Strait.