Abstract View

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Large-Scale Response of the Pacific Ocean Subarctic Front to Momentum Transfer: A Numerical Study

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ABSTRACT

A numerical four-layer hydrodynamical model is implemented to investigate the role the atmosphere exerts on the dynamics of the subarctic front. While the effect of the westerly winds causes a southward shift of the front, the effect of a negative curl shows convergence at the front. This convergence strongly favors frontogenesis.

The salient features at the wake of a strong cyclone can be summarized as follows: (i) upwelling of 20 m of the four interfaces occurs; (ii) the water remains upwelled for several weeks; (iii) the *e*-folding time scale of the vertical oscillations induced by the storm's passage is of the order of 10 days; (iv) a region of relative maximum convergence is observed in the lower layers below a region of relative maximum upwelling in the upper layer, and (v) the along- and cross-front velocity fields are in quadrature in time, with the cross-front velocity lagging the along-front velocity.

With the exception of the cyclone case, it is established that the effects of the atmospheric wind forcing are confined to the upper layer. These results are supported by oceanic observations. Finally, it is also proved that the response of the front to the atmospheric momentum transfer is not sensitive to the initial form of the subarctic front.