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Observed Surface Winds at Middleton Island, Gulf of Alaska and Their Influence on the Ocean Circulation

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ABSTRACT

Winds observed at an island in the Gulf of Alaska display a large annual signal with maximum easterlies in winter and weak easterlies in summer. For the northern Gulf of Alaska, the monthly mean Ekman transport is onshore in all months leading to sea surface setup and downwelling, creating westward barotropic and baroclinic longshore currents. While downwelling dominates over any month, shorter period reversals always occur, leading to rapid alternation of upwelling and downwelling situations. The cross-shelf Ekman transport is skewed onshore so that extreme transport events tend to be onshore and hence be downwelling events.

Upwelling indices calculated from synoptic pressure maps over the Gulf of Alaska exhibit a larger annual cycle than does the same parameter determined from observed winds. The observed winds do not contain the summer reversal predicted from the upwelling indices. This discrepancy between the onshore Ekman transport determined by the synoptic pressure data and that determined from observed winds is attributed to orographic effects where the pressure gradient is interrupted by a coastal mountain range. Similar effects could exist with other estimates of upwelling indices based on a large-scale grid.

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