

DOCTOR OF PHILOSOPHY

IMPROVING WIND-BASED UPWELLING ESTIMATES OFF THE WEST COASTS OF NORTH AND SOUTH

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In this thesis, coastal upwelling was estimated off the North and South American west coasts using pressure derived winds, model derived winds from the U.S. Navy's global atmospheric model, and QuikSCAT satellite measured winds. Satellite measured winds, verified with U.S. west coast buoys, were shown to be accurate in the near-shore environment. Upwelling estimates derived from pressure derived winds using the Pacific Fisheries Environmental Laboratory technique were compared to those derived from both satellite measured winds and model derived winds. These comparisons showed that upwelling estimates based on the Navy's global model winds were accurate in more regions than those based on pressure-derived winds. A fine-scale upwelling investigation using the Navy's high-resolution atmospheric model revealed narrow near-shore bands of strong wind-stress and wind-stress-curl missed in the above upwelling estimates. Improvements in the depiction of coastal upwelling will require wind data and upwelling estimates with at least a 10 km resolution.

KEYWORDS: Upwelling, California Current, Peru/Chile Current, QuikSCAT, Wind-Stress Curl, Upwelling Index, Ekman Transport, Ekman Pumping