Abstract View

Volume 15, Issue 4 (April 1985)

Journal of Physical Oceanography
Article: pp. 361–371 | Abstract | PDF (825K)

Coastal Jets in the Lower Atmosphere

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(Manuscript received April 3, 1984, in final form January 7, 1985)

DOI: 10.1175/1520-0485(1985)015<0361:CJITLA>2.0.CO;2

ABSTRACT

Low-level winds over land-ocean boundaries are generally alongshore. Two types of forcing that generate alongshore jets in the lower atmosphere are considered here, using as simple a model as possible. The first type of forcing is the blocking of the low-level zonal winds by topographies. Winter alongshore wind off the west coast of North America is topography-forced. Our simple model produces wind fields that have horizontal structure similar to the observed. Based on the distribution of zonal wind stress with latitudes, the model suggests that the alongshore wind over the west coast of the United States reveres its direction near 40°N, in fair agreement with observations. However, the linear model underestimates the alongshore wind off the California coast by a factor of about 1.7–2. Consequently, linear prediction of nearshore wind stress is about 3–4 times smaller than the observed. The discrepancy is attributed to nonlinear effects. A nonlinear analysis is presented to show how nonlinearity increases the speed of the coastal jet. The second type of forcing is the temperature difference between the land and the ocean. The dynamic similarities and differences between a thermally driven coastal jet and a topography-forced alongshore jet are discussed.