

## Comments on "Coastal Jets in the Lower Atmosphere"\*

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Chao (1985) is to be commended on a thorough discussion of topographically forced coastal wind fields, an important topic that has lacked suitable theory (Zimmerman and Burton, 1979). Of particular note is the Kelvin wave nature of the solution which is neither resolved by the quasi-geostrophic approximation nor by numerical weather prediction models with grid lengths greater than half the Rossby radius (Hsieh and Gill, 1984). The Rossby wave mode should be important to the modification of atmospheric systems by the coastal wall.

A difficulty with the analysis, however, is the assertion that the offshore length scale is determined by horizontal viscosity (section 3c). Horizontal momentum diffusion often represents a relatively unimportant smoothing term in general circulation models. In boundary layer problems, however, the highest order term dominates the physical balance, as in this case. While it is understood that a large scale, seasonal approach is taken in this paper, it is misleading without further justification to consider that a coastal influence of order 200 km for topographically forced coastal winds is established based upon an inappropriately large constant eddy viscosity instead of geostrophic adjustment length scales (Greenspan, 1968, p. 97; Mofjeld, 1980, Appendix).

An additional formulation for the internal Rossby radius is also possible. Atmospheric soundings (Walter

and Overland, 1982) for midlatitude, Pacific Ocean, onshore air masses show that the internal Rossby radius based upon continuous stratification,  $R_c = ND/f$ , where  $N$  is the Brunt-Väisälä frequency,  $D$  is topography height and  $f$  is the Coriolis parameter, is to be preferred to that based upon equivalent inversion height,  $R_i = \sqrt{g'h}/f$ , where  $g'$  is reduced gravity and  $h$  is the equilibrium depth of the lower atmosphere. An important difference is that the former has the geostrophic adjustment scale proportional to the height of the coastal topography. For the central coast of the United States,  $N \sim 0.01 \text{ s}^{-1}$ ,  $D \sim 1000 \text{ m}$ , so  $R_c$  is of order 120 km, about half  $R_i$ .

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