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Influence of bottom topography on vortex stability[1] BOWEN ZHAO, Yale University, EMMA CHIEUSSE-GERARD, ENSTA ParisTech, GLENN FLIERL, MIT — The effects of topography on the linear stability of both barotropic vortices and two-layer, baroclinic vortices are examined by considering cylindrical topography and vortices with stepwise relative vorticity profiles in the quasi-geostrophic approximation. Four vortex configurations are considered, classified by the number of relative vorticity steps in the horizontal and the number of layers in the vertical. In the barotropic calculation, the vortex is destabilized by topography having an oppositely signed potential vorticity jump while stabilized by topography of same-signed jump, i.e. anticyclones are destabilized by seamounts while stabilized by depressions. Further, topography of appropriate sign and magnitude can excite a mode-1 instability for a two-step vortex, especially relevant for topographic encounters of an otherwise stable vortex. The baroclinic calculation is in general consistent with the barotropic calculation except that the growth rate weakens and, for a two-step vortex, becomes less sensitive to topography (sign and magnitude) as baroclinicity increases. The smaller growth rate for a baroclinic vortex is consistent with previous findings that vortices with sufficient baroclinic structure could cross the topography relatively easily.

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