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Solutions of barotropic trapped waves over topography

Luis Zavala Sanson
CICESE, Physical Oceanography, Mexico (lzavala@cicese.mx)

Solutions of free, barotropic waves over variable topography are derived. In particular, we examine two cases: waves around axisymmetric seamounts and waves along a sloping bottom. Even though these types of oscillations have been studied before, we revisit the problem because of two main reasons: (i) The linear, barotropic, shallow-water equations with a rigid lid are now solved with no further approximations, in contrast with previous studies. (ii) The solutions are applied to a wide family of seamounts and bottom slopes with profiles proportional to $\exp(r^s)$ and y^s, respectively, where r is the radial distance from the centre of the mountain, y is the direction perpendicular to the slope, and s is an arbitrary positive real number. Most of previous works on seamounts are restricted to the special case $s = 2$. By varying the shape parameter one can study trapped waves around flat-topped seamounts or guyots ($s > 2$) or sharp, cone-shaped topographies ($s < 2$). Similarly, most of previous studies on sloping bottoms report cases with $s = 1$ (linear slopes), whilst the present results are applied to more general bottom profiles. The resulting dispersion relation in both cases possess a remarkable simplicity that reveals a number of wave characteristics as a function of the topography shape.