Sign in

AMERICAN METEOROLOGICAL SOCIETY
AMS Journals Online

AMS Home | Journals Home | Journal Archive | Subscribe | For Authors | Help | Advanced Search | Search | Go

Abstract View

Volume 6, Issue 6 (November 1976)

Journal of Physical Oceanography
Article: pp. 864–878 | Abstract | PDF (1.01M)

Continental Shelf Waves and Alongshore Variations in Bottom Topography and Coastline

J.S. Allen

School of Oceanography, Oregon State University, Corvallis 97331

(Manuscript received August 28, 1975, in final form June 15, 1976)

DOI: 10.1175/1520-0485(1976)006<0864:CSWAAV>2.0.CO;2

ABSTRACT

The effects of alongshore variations in bottom topography and coastline on the wind-stress-forced barotropic motion over a continental shelf and slope are studied. Perturbation methods are used to obtain solutions for forced and free continental shelf waves on an idealized continental shelf and slope with small-amplitude alongshore variations in topography. The relevant alongshore scales, set by the wind stress and by the bottom and coastline topography, are assumed to be greater than the shelf-slope width. This enables the resulting motion to be treated in the long-wave nondispersive limit. As a result, the alongshore and time-dependent behavior of the perturbation flow is governed by a forced, first order wave equation, with terms from the interaction of the basic, lowest order flow with the bottom and coastline topography acting as the forcing function. To clarify the effects of topography alone, problems are considered where a uniform wind stress forces a basic unperturbed flow which is independent of the alongshore coordinate. In one example, a steady, alongshore-independent basic flow is established impulsively by a delta function application of the wind stress. The perturbation flow adjusts to the alongshore variations in topography through the propagation of disturbances as free continental shelf waves. There is an eventual establishment in the region of variable topography of a steady-state motion which follows contours of constant depth. Other problems in which single mode free shelf wave disturbances of limited alongshore extent propagate into regions of different topography are studied also. The basic disturbance is found to travel at the local wave speed with its cross shelf modal structure described by the local eigenfunctions. As a region of varying bottom topography is crossed, disturbances in other modes are generated. General features of this scattering process are examined for limiting cases where the alongshore scale of the disturbance is greater than, or less than, the scale of the topographic feature.

Options:
- Create Reference
- Email this Article
- Add to MyArchive
- Search AMS Glossary

Search CrossRef for:
- Articles Citing This Article

Search Google Scholar for:
- J.S. Allen

top

© 2008 American Meteorological Society Privacy Policy and Disclaimer
Headquarters: 45 Beacon Street Boston, MA 02108-3693
DC Office: 1120 G Street, NW, Suite 800 Washington DC, 20005-3826
amsinfo@ametsoc.org Phone: 617-227-2425 Fax: 617-742-8718
Allen Press, Inc. assists in the online publication of *AMS* journals.