Abstract View

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Coastal-Trapped Waves on the East Australian Continental Shelf Part II: Model Verification

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ABSTRACT

The Australian Coastal Experiment (ACE) was designed to test coastal-trapped wave (CTW) theory and the generation of coastal-trapped waves by the wind. For the ACE dataset, we use CTW theory to attempt to hindcast the observed alongshelf currents and coastal sea levels at locations remote from the upstream (in the CTW sense) boundary of the ACE region. Local (in the ACE region) wind forcing is responsible for only about a quarter of the CTW energy flux at Stanwell Park (the center of the ACE region), and the remainder enters the ACE region from the south and propagates northward through the ACE region. Including the second-mode CTW improves the correlation between the hindcast and the observed near-bottom currents on the upper slope at Stanwell Park, but the use of the third-mode CTW cannot be justified. A linear bottom drag coefficient of $r = 2.5 \times 10^{-4}$ m s^{-1} works better than a larger drag coefficient, and simplifying the CTW equations by assuming the modes are uncoupled does not detract from the quality of the hindcasts. The hindcast and observed coastal sea levels are correlated at greater 2 than the 99% significance level. For the nearshore locations at Stanwell Park, the hindcast and observed alongshelf currents are correlated at greater than the 99% significance level, and the CTW model can account for about 40% of the observed variance. On the shelf at Stanwell Park, we find the hindcasts agree with the observations only if direct wind forcing within the ACE region and the correct (nonzero) upstream boundary conditions are included. However, even after attempting to remove the effects of the eddies and the East Australian Current, the CTW model is not useful for predicting the currents on the slope at Stanwell Park and on the shelf and slope at Newcastle (the northern boundary of the ACE region). The currents at these locations are dominated by the effect of the East Australian Current and its eddies.

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