



The Occurrence of Internal Tides along the Italian Coast of the Adriatic Sea

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The occurrence of internal tides along the Italian coast of the Adriatic Sea during stratification season is revealed by a high-resolution, state-of-the-art, three-dimensional primitive-equation baroclinic tidal ocean model of the Adriatic Sea. The NEMO (Nucleus for European Modelling of the Ocean) model is implemented in the Adriatic Sea with a horizontal resolution of $1^{\circ}/48$ and 120 vertical layers. Tidal components important for the Adriatic, including four major semi-diurnal and three major diurnal tides, are simulated by imposing tidal elevations and velocities along the model domain's southern boundary, which is in the northern Ionian Sea. Effects of atmospheric pressure and wind stress are simulated as well. The co-tidal charts of both semi-diurnal and diurnal tides are well reproduced by the model, suggesting that the hydrodynamics key to tidal processes in the Adriatic (Kelvin, Poincare, and topographic waves) are correctly represented. Compared against tide gauge observations, tidal harmonic analysis shows that the averaged error of modelled amplitudes and phases at eight stations along the Italian coast are 15% and 5%, respectively. Vertical oscillations of isotherms near diurnal frequencies are evident at sites along the Italian coast during stratification season. Such oscillations are absent when the tidal forcings are removed from the model. The occurrence of internal tides is readily explained by the supercritical slope theory.