



Solving tidal challenges in regional and coastal ocean modeling: key guidance demonstrated via a case study of the seas surrounding Korea

In tidally dominated regional or coastal areas, such as the Yellow Sea and Korea Strait, the North Sea and the Gulf of Maine, accurate tide and tidal current information is crucial for many activities. At immediate timescales, such activities include safe navigation and operation for marine transport and fisheries industries, search and rescue (SAR), salvage, and many types of ocean recreation. At medium timescales, activities requiring tidal data include coastal development and management, while at long timescales robust tidal information can improve the accuracy of coastal ocean models investigating responses to human induced climate changes. Necessary tidal information is often obtained via tidal prediction and related forms of modeling, though a few lesser-known but relatively easily avoided errors can reduce the value of such modelling. This work provides guidance for three fundamental technical challenges associated with modeling tides at regional or coastal scales, challenges often encountered by those new to tide modeling or to ocean modelling generally: (1) how to select appropriate and generate robust tidal forcings from coarser tidal constant databases; (2) how to generate perpetual interannual tidal predictions inside a hydrodynamic model, such as in the Regional Ocean Modeling System (ROMS); and (3) ways to accurately derive tidal harmonic constants from the sea level height and current velocity data generated by models. The fundamental approaches and techniques for overcoming these challenges explained in this work, and illustrated via a case study of the seas surrounding Korea, allow researchers to avoid tide-related errors when establishing regional or coastal ocean models and operation systems or harmonically analyzing their output data.

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