Improvement of Port Phillip Bay coupled hydrodynamic hindcast model

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This paper is devoted to the hydrodynamic climate of Port Phillip Bay (PPB), the largest coastal lagoon in Victoria, Australia and home to the Port of Melbourne and the Port of Geelong. Long-term simulations were carried out to hindcast sea state conditions from 1990 to 2016 (26 years) in this fetch-limited area. All simulations were derived from a coupled high resolution unstructured grid modelling system that merges the 2D circulation model - SCHISM with the spectral wind wave model - WWMIII. The model was calibrated against all available field observations at the time of setting up the model before running the model for the entire hindcast duration. Results of the model included long-term statistical analysis in terms of seasonal variations and extreme conditions for waves, currents, and water elevations. Recently, the Department of Environment Land Water and Planning (DELWP) expanded its Victorian buoy network system into PPB. Six directional wave buoys were installed at PPB and started data logging in January 2023. They measure the wave parameters including significant wave height, wave period and wave direction every 30 minutes in deep and shallow areas of PPB. These datasets were compared with those of the hindcast model result for the duration of their overlap to verify the results of the hindcast model in several locations with different depths at PPB. Good correlation between the numerical results and the measurements, motivated us to upgrade the long term hindcast forcing ERA5 wind field with resolution of 0.25 degree and extend the duration of long term hindcast till the present (32 years) with hourly wave parameter outputs. The improved PPB hindcast model is a base for future PPB hindcast/forecast models and can be used as boundary conditions for local hydrodynamic models in PPB.