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Low-frequency variability of a semi-closed sea induced by the circulation in an adjacent ocean in a wind-driven, quasi-geostrophic, eddy-resolving simulation

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The wind-driven circulation in the northwestern Pacific and the South China Sea (SCS) is simplified as a 2-layer, quasi-geostrophic model in two rectangular basins connected by an idealized strait. This model is used to investigate the impact of the western boundary current (WBC) on the adjacent marginal sea. The variability of the circulation in the two basins is investigated with a high resolution and at low viscosity, which allows the numerical solution to resolve mesoscale eddy forcing. The model ocean is driven by the time-independent asymmetric wind stress acting on the idealized Pacific (large basin) only. Under the reference parameters used in this study, the WBC can intrude into the idealized SCS (small basin) in the form of a loop current, shedding eddies regularly. The rate of eddy shedding is nearly constant throughout the entire integration time of the model; however, the intensity of the eddy shedding exhibits multiple time scale variability ranging from quasi-biennial to decadal time scale. The results are proved to be comparable by a set of sensitivity experiments under different parameters and in different modeling geometry.