Development and application of a one-dimensional coupled physical and biogeochemical model for the South East Asia Time-series Station in South China Sea

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Abstract

A one-dimensional coupled physical and biogeochemical model is developed and applied to South East Asia Time-series Station (SEATS; 18.25^{0}N, 116^{0}E) in northern South China Sea (SCS). Mellor and Yamada's (1982) level-2.5 turbulent closure scheme is adopted for the physical component of the coupled model. Driven by heat and momentum fluxes calculated with NCEP reanalysis data, the coupled model reproduces mixed layer depth and the seasonal cycle of upper ocean temperature, even though the simulated sea surface temperature (SST) has a warm bias after six months when model initializes. The nitrogen-based biogeochemical component of the coupled model includes four compartments: dissolved inorganic nitrogen (DIN), phytoplankton, zooplankton, and detritus (Liu et al., 2002). Model results of nitrate profiles and the subsurface chlorophyll maximum are in reasonable agreement with shipboard observations. Seasonal features of surface chlorophyll-a and vertically integrated primary production derived from SeaWiFS data are also captured by the coupled model. But the modeled surface chlorophyll-a displays larger (lower) values in winter (summer) season than that derived from SeaWiFS data. Sensitivity tests for biogeochemical parameters will be needed to improve model results by modification of some parameter values.