

Variability of Kuroshio nitrate flux and transport in the western North Pacific: A model study

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An eddy-resolving coupled physical-biological ocean model has been employed to examine the interannual variability of nitrate flux and transport mechanism by the Kuroshio during 1995-2010. The Kuroshio provides an advective flux of nitrate carried in subsurface waters, redistributing nitrate from the tropics to the mid-latitude. Some observed data capture the nitrate flux and transport in the subsurface layers by the Kuroshio. The model reproduces the maximum nitrate flux core in the subsurface layer from the eastern side of Luzon (16N) to the Kuroshio Extension (36N) with the downstream. High phytoplankton blooms along the south of Japan (subpolar region) in the winter and spring seasons appear in the model, and the advective flux of nitrate with the downstream to the subpolar region contributes to the high blooms. Because the downstream of nitrate transport by the Kuroshio appears under the winter mixed layer in the south of Japan, the high blooms are enhanced. The model also reproduces the interannual variability of nitrate flux and transport by the Kuroshio in the North Pacific. The change of Kuroshio speed and structure are major causes for interannual variability of nitrate flux and transport. The simulated nitrate concentration in the Kuroshio shows interannual variation.

Keywords: Nitrate transport, Kuroshio, Interannual variability, High-resolution ocean physical-biological model