

Temporal variations of nutrient concentration east of Taiwan and its influence on downstream area

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Kuroshio transports a amount of materials (e.g., nutrient) in the ocean from the tropics to mid-latitudes. As an upstream area, the Kuroshio east of Taiwan has significant effects on the environments in the downstream area such as the East China Sea, the seas southeast of Japan, and even the Tsushima Strait. This study uses in-situ data, satellite data and model results to understand seasonal and interannual variations of nitrate concentration along a transect across the Kuroshio east of Taiwan (KTV1 transect) and its influence to downstream area.

In summer, a clear increasing of nitrate concentration can be found at onshore side of KTV1 transect. This increasing is maximum at depth around 50 m. It forms a band from the east coast of Taiwan to the East China Sea up to near 29°N at 45 m depth while at surface, this increasing of nitrate concentration has both small magnitude and area limited to south of 24°N. Both satellite and model results show a corresponding increase of surface chlorophyll-a/phytoplankton. The increasing of phytoplankton reaches to ~26°N in the model results.

Using EOF analysis, the interannual variation is extracted as the second mode. The increasing of nitrate concentration in onshore area due to interannual variation affects nitrate distribution further downstream to more than 30°N northward and affects a larger magnitude and area of phytoplankton increasing than the seasonal variation does. The mechanism of the interannual variation is arrival of mesoscale eddies generated along North Pacific subtropical countercurrent. As the eddies arrive east of Taiwan, they can dramatically change the axis position, width and surface velocity of Kuroshio east of Taiwan.

Keywords: Kuroshio, Nutrient, East of Taiwan, Seasonal Variation, Interannual Variation