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Nutrient sources in the Bohai Sea and Yellow Sea: results from seasonal sampling in 2018

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The Bohai Sea and Yellow Sea are semi-enclosed basins strongly affected by human activities due to climate change and growing industries in China. Changes of hydrology, nutrient concentrations and sources and resulting ecosystem responses are therefore progressively intensifying during the last decades. In order to characterize nutrient sources and dynamics and to estimate the anthropogenic impact, we investigated nutrient concentrations and dual isotopes of nitrate in spring and summer 2018 in Bohai Sea and Yellow Sea. Furthermore, we sampled suspended matter and surface sediments and determined organic carbon, nitrogen and stable nitrogen isotopic ratios.

In spring, the water column was well mixed and the study area was mainly affected by the Yellow River diluted water and the Yellow Sea Warm Current water, which were the main nitrate sources. In summer, the water was stratified, and the Yellow River and Changjiang River diluted water supplied nutrients to an even larger region than in spring. During this season, the Yellow Sea Cold Water mass formed the bottom water of the Yellow Sea where nutrients became enriched. In contrast to other polluted marginal seas, the stable isotopic ratios of dissolved and particulate nitrogen are relatively low in the study area, which could be due to nutrient supply from the atmosphere or the open ocean. Using nitrogen isotopes, we developed a box model of reactive nitrogen for the Bohai Sea and quantified the input of atmospheric and riverine reactive nitrogen, submarine groundwater and water exchange with the Yellow Sea, constraining the budgets of reactive nitrogen combining mass fluxes with an isotopic balance. Including the isotopic balance improved the mass balance based only on nutrient concentrations.

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