



The Mekong River plume fuels nitrogen fixation and determines phytoplankton species distribution in the South China Sea during low and high discharge season

Grosse, Julia, Deniz Bombar, Hai Nhu Doan, Lam Ngoc Nguyen, and Maren Voss

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ABSTRACT: The influence of the Mekong River (South China Sea) on N_2 fixation and phytoplankton distribution was investigated during the lowest- and highest-discharge seasons (April 2007 and September 2008, respectively). The river plays an essential role in providing nutrients (nitrate, phosphate, silicate) for the adjacent sea and creates different salinity and nutrient gradients over different seasons. River water (salinity 0), mesohaline waters (salinity 14-32), a transition zone with salinities between 32 and 33.5, and marine waters (salinity above 33.5) were sampled at different spatial resolutions in both cruises. High N_2 fixation rates were measured during both seasons, with rates of up to $5.05 \text{ nmol N L}^{-1} \text{ h}^{-1}$ in surface waters under nitrogen-replete conditions, increasing to $22.77 \text{ nmol N L}^{-1} \text{ h}^{-1}$ in nitrogen-limited waters. Asymbiotic diatoms were found only close to the river mouth, and symbiotic diatoms, which potentially hosted diazotrophs, were most abundant in waters where N_2 fixation rates were highest, nitrate concentrations were at the detection limit, and phosphate and silicate were still available. Filamentous cyanobacteria like *Trichodesmium* were present only in marine waters with salinities above 33.5. Overall, N_2 fixation accounts for 1-47% of the nitrogen demand of primary production.

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