

Impact of the deviation of phytoplankton stoichiometry from Redfield ratio on global oceanic net primary production

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The deviation of the carbon to nitrogen ratio (C:N) of oceanic phytoplankton from Redfield ratio is well known in field observations; however almost all marine ecosystem models are based on Redfield ratio. Incubation experiments show that C:N increases with an increase in the chlorophyll a to carbon ratio (chl:C) of phytoplankton. Recently developed FlexPFT (Flexible phytoplankton Functional Type) model proposed in Smith et al. (2016) can naturally represent the observed relation between chl:C and C:N. We introduced the FlexPFT model into a 3D ecosystem model combined with an OGCM (Oceanic General Circulation Model). We found that the global oceanic net primary production in a variable C:N case is 1.5 times larger than that in the fixed Redfield C:N case. Higher C:N in equatorial regions mainly contributes to the increase in global primary production.

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