

Compound-specific nitrogen isotopic record for reconstructing biogeochemical processes in the paleocean

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Although there are various aspects of biogeochemical processes in the (paleo)ocean, here I focus on nitrogen cycle, since nitrogen is a major limiting element for biological production. In the ocean, nitrogen exists as nitrate, nitrite, nitrous oxide, dinitrogen, and ammonia as well as large pools of DON and PON. Nitrogen isotopic composition is a useful tool for delineating the nitrogen cycle dominating in the ocean. In the modern surface ocean, isotopic composition of nitrate as a major nutrient form of nitrogen is recorded as nitrogen isotopic composition of chlorophylls, major antenna pigments for photosynthesis. The chlorophylls are long preserved as tetrapyrrole (chemical structure of chlorophyll nucleus) molecules in the sediments. Therefore, the nitrogen isotopic composition of these chlorophyll derivatives provides a clue to understand the nitrogen cycle in the geological past. In this presentation, I overview the oceanic nitrogen processes and show some case studies for reconstructing nitrogen processes in the paleocean with this molecular tool.