



Evolution of the nitrogen and carbon biogeochemical cycles in association with Ocean Anoxic Events of the Cretaceous

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We explore the dynamical responses of oceanic nitrogen cycle, CO₂ and climate in association with the onset of conditions like Ocean Anoxic Events (OAEs) of the Cretaceous. We employ a global Earth System model (GENIE) which accounts for warm climate ocean biogeochemistry, ocean/atmosphere interactions for carbon and sediment deposition. We first describe typical steady state of the Cretaceous biogeochemical cycles (N, d¹³C, O₂). From this state, we carry on a series of sensitivity experiments on the role of oxygen reduction in the ocean on the marine biogeochemistry and climate. After perturbing our Cretaceous ocean by expanding the oxygen minimum zones, nitrogen fixation increases as a result of enhancement of denitrification. Following these responses, marine biological pump can become more efficient affecting oceanic d¹³C and oxygen patterns to a point which relates to the ocean circulation peculiar of the Cretaceous climate system. These experiments allow us to describe the complex interactions in the global ocean between carbon isotopes, nitrogen cycle and oxygen content in association with OAEs-like conditions.