

Late Cretaceous changes in continental configuration : toward a better ventilated ocean?

Y. DONNADIEU¹, E. PUCÉAT², M. MOIROUD²,
F. GUILLOCHEAU³ AND J.-F. DECONINK²

¹LSCE, CNRS, Paris, France, yannick.donnadieu@lsce.ipsl.fr

²Biogéosciences, Université de Dijon, France,
emmanuelle.puceat@u-bourgogne.fr

³Géosciences, Université de Rennes, France.

Oceanic anoxic events (OAEs) are large-scale events of oxygen depletion in the deep ocean that happened during pre-Cenozoic periods of extreme warmth. They are marked by worldwide marine ecosystem crises and represent major perturbations in the carbon cycle through enhanced organic carbon burial in sediments. Last major OAE occurred at the Cenomanian-Turonian boundary prior to the Late Cretaceous long term cooling. Ever since, and despite the occurrence of warming events, Earth no more experienced such large-scale anoxic conditions. Here we explore the role of major continental configuration changes occurring during the Late Cretaceous on oceanic circulation modes through numerical simulations using the coupled ocean atmosphere model FOAM, that we confront to existing neodymium isotope data (ϵ_{Nd}). Except from a continuous deep-water production in the North Pacific, the simulations at 95 Ma and 70 Ma reveal major differences marked by a shift in the southern deep-water production sites from South Pacific at 95Ma to South Atlantic and Indian oceans at 70Ma. Our modelling results support an intensification of southern Atlantic deep-water production as well as a reversal of the deep-water fluxes through the Caribbean Seaway as the main causes of the decrease in ϵ_{Nd} values recorded in the Atlantic and Indian deep waters during the Late Cretaceous. We conclude that the change from a sluggish to a much more active circulation depicted by the model in the Atlantic from 95Ma to 70Ma may have driven the disappearance of OAEs after the Late Cretaceous.