Geophysical Research Abstracts
Vol. 17, EGU2015-11056, 2015
EGU General Assembly 2015

Coupled paleogeographic and carbon dioxide controls on the existence of high-latitudes ice sheets during the Middle-Late Cretaceous

Jean-Baptiste Ladant and Yannick Donnadieu
LSCE, Paris, France (jean-baptiste.ladant@lsce.ipsl.fr)

The Cretaceous is historically known as an ice-free world with several degrees warmer surface temperature both on land and in the oceans and a higher mean ocean sea level. This view however has started to be challenged as numerous studies have argued that some of the recorded variations of δ18O and sea level could only be explained by the glacioeustatic hypothesis, therefore implying potentially large ice sheets in the high-latitudes. Besides, although it is now well known that CO_2 levels were higher than today, huge uncertainties remain on the absolute values and variations of carbon dioxide during the Cretaceous. In this contribution, we use a set of models including the mixed-resolution ocean-atmosphere coupled model FOAM, the high-resolution atmospheric model LDMZ and the 3D ice sheet model GRISLI to investigate the CO_2 threshold required to initiate ice sheets in the high-latitudes of the Cretaceous world. We focus on three time slices from the Middle-Late Cretaceous: the Aptian (115 Ma), the Maastrichtian (70 Ma) and the Cenomanian (95 Ma) during which the existence of ice sheets is the most vividly debated as this latter represents the climatic optimum of the Cretaceous. We will notably investigate the role of paleogeography versus atmospheric CO_2 levels and test our results versus existing hypotheses to help constraining the poorly known atmospheric CO_2 levels variations.