Geophysical Research Abstracts
Vol. 15, EGU2013-7837, 2013
EGU General Assembly 2013

Role of the Antarctic Circumpolar Current (ACC) on the Antarctica ice-sheet

Jean-Baptiste Ladant, Yannick Donnadieu, Vincent Lefebvre, and Christophe Dumas
LSCE, CNRS/CEA, Orme des Merisiers, 91190 Gif sur Yvette France (jean-baptiste.ladant@lsce.ipsl.fr)

Since more than a decade, most publications have put forward the primary role of atmospheric CO_2 for explaining the Eocene Oligocene transition while diminishing the potential for the gateways to play a major role. Here we investigate the role of the Drake Passage opening on the Antarctica ice-sheet using a new modelling system including the Fast Ocean Atmosphere Model (FOAM), the high resolution atmospheric model LMDz and the ice-sheet model GRISLI. Using a set of boundary conditions, i.e. atmospheric CO_2 level, orbital parameters and continental configuration, FOAM provides SSTs required to run LMDz, which is then used to simulate ice-sheet over Antarctica with GRISLI. As demonstrated by Lefebvre et al. (2012), the opening of southern oceanic gateways does not trigger the onset of the ACC for CO_2 typical of the late Eocene (>840 ppm). A cooler background climatic state such as the one prevalent at the end of the Oligocene is required to simulate a well-developed ACC. Here, we show that the formation of the East Antarctica ice-sheet triggers the onset of the ACC in FOAM. Changes in oceanographic conditions have a significative impact on the atmospheric circulation simulated by LMDz, which in turn influence the ice-sheet geometry. In particular, we show that the ACC may have triggered the onset of West Antarctica ice-sheet through a feedback loop including multiple interactions between the atmosphere, the ocean and the Antarctica ice-sheet. The sensitivity of our results to unconstrained parameters such as those fixing the ablation / freezing below the ice-shelves but also to the topography of the Antarctica (Wilson et al., 2012) will be presented.

Ref.: Deciphering the role of southern gateways and carbon dioxide on the onset of the ACC, Lefebvre V. et al., vol. 27, Paleoceanography, 2012
Antarctic topography at the Eocene – Oligocene boundary, Wilson D.S. et al., vol. 335, P-cubed, 2012.