Geophysical Research Abstracts
Vol. 12, EGU2010-2554, 2010
EGU General Assembly 2010

High latitude climate change and ocean gateways.

Willem Sijp
UNSW, CCRC, Sydney, Australia (w.sijp@unsw.edu.au)

We examine the effect of tectonic gateway changes in driving high latitude climate change in both hemispheres during the Eocene and at the Eocene/ Oligocene boundary. We find a significantly greater sensitivity of Antarctic temperatures to Southern Ocean gateway changes when atmospheric CO2 concentrations are high. In particular, the closure of the Drake Passage (DP) gap is a necessary condition for the existence of ice-free Antarctic conditions at high CO2 concentrations in our coupled climate model. The absence of the Antarctic Circumpolar Current (ACC) is particularly conducive to warm Antarctic conditions at higher CO2 concentrations, markedly different to previous simulations conducted under present-day CO2 conditions. Furthermore, we will examine the effect of a range of ocean gateways under realistic late Eocene boundary conditions and find that the opening of the Tasman Gateway leads to a more modest yet significant cooling of Antarctica. The effect of a higher-latitude Antarctic seaway through the interior is also examined. Finally, we find a 13 degrees C warming and significantly more saline conditions in the Arctic ocean under northern polar gateway changes. We will also examine the effect of shallow seas and the strength of the hydrological cycle on climate and watermass properties in a Cretaceous (Turonian) setting.