Geophysical Research Abstracts
Vol. 12, EGU2010-10780, 2010
EGU General Assembly 2010

On the role of the Drake Passage opening on the marine carbon cycle at the EO boundary

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Since more than a decade, most publications have put forward the primary role of atmospheric CO2 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 marine carbon cycle using the NEMO ocean general circulation model and the PISCES marine biogeochemical model. As already demonstrated, closure of the Drake Passage modifies the geostrophic balance that now maintains the circumpolar current in the southern ocean and results in an increase in Antarctic deep-bottom waters. This huge increase leads to a shutdown of the North Atlantic deep-water formation. The novelty of our study comes from the marine carbon cycle model that provides results in good agreement with core data for the transition. In particular, we will show how the reorganization of the deep-water formations areas changes drastically the vertical/zonal nutrient distribution and impacts on both siliceous and carbonaceous primary productivities. We also find that the opening of the Drake Passage results in a deepening of the Compensation Carbonate Depth (CCD) in the Pacific ocean in good agreement with core data.