Geophysical Research Abstracts
Vol. 18, EGU2016-11219, 2016
EGU General Assembly 2016

Estimates of CO_2 since the mid-Miocene

Heather Stoll
University of Oviedo, Geology, Oviedo, Spain (hstoll@geol.uniovi.es)

For past warm climates, direct CO_2 determinations are unavailable. Our inferences of Antarctic ice sheet thresholds and climate sensitivity to CO_2 are therefore strongly conditioned by the reliability of CO_2 proxy reconstructions. For the Miocene, these rely heavily on proxies using the carbon isotopic fractionation of marine phytoplankton during photosynthesis (ep). While recent records are beginning to reveal more clearly the long term CO_2 trends since the middle Miocene , the absolute CO_2 concentrations are subject to higher uncertainty. This in turn influences the ability of models to simulate dynamic Antarctic ice sheet behavior in the context of expected ice sheet hysteresis.

In this contribution, I discuss a new approach for estimating CO_2 from published and new measurements of phytoplankton carbon isotopic fractionation using the ACTI-CO cell model. This approach accounts for the physiological adaptations made by phytoplankton cells to avoid falling below optimal photosynthetic rates as CO_2 declines, the carbon concentrating mechanism. The model yields CO_2 estimates which can be significantly (up to 2-fold) higher than those estimated from classic equations. Given the large degree of cooling since the late Miocene in extratropical sea surface temperature records, such CO_2 estimates are consistent with a more conservative estimate of climate sensitivity over the last 12 Ma.