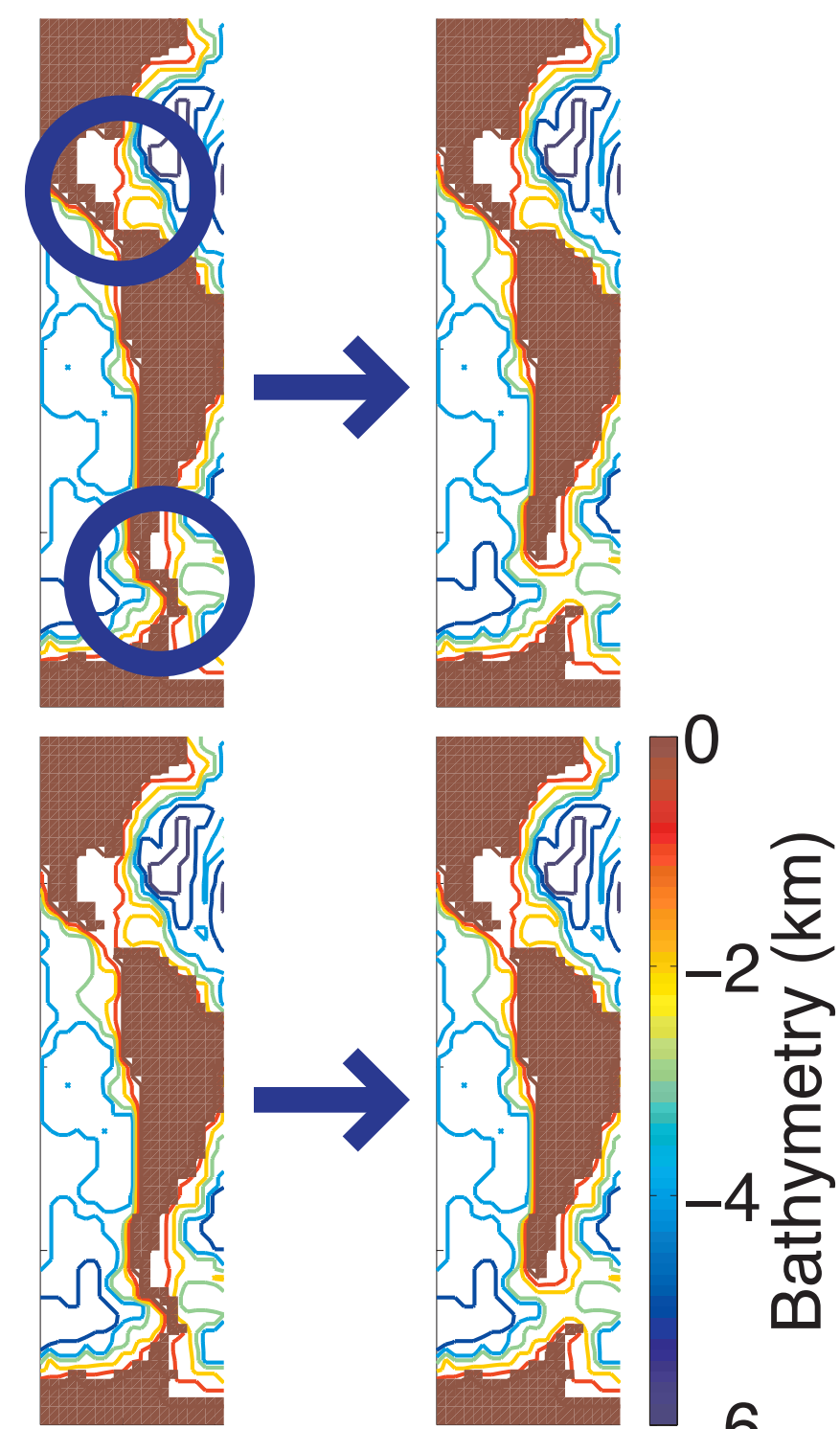


Carbon cycle reorganization due to opening of the Drake Passage

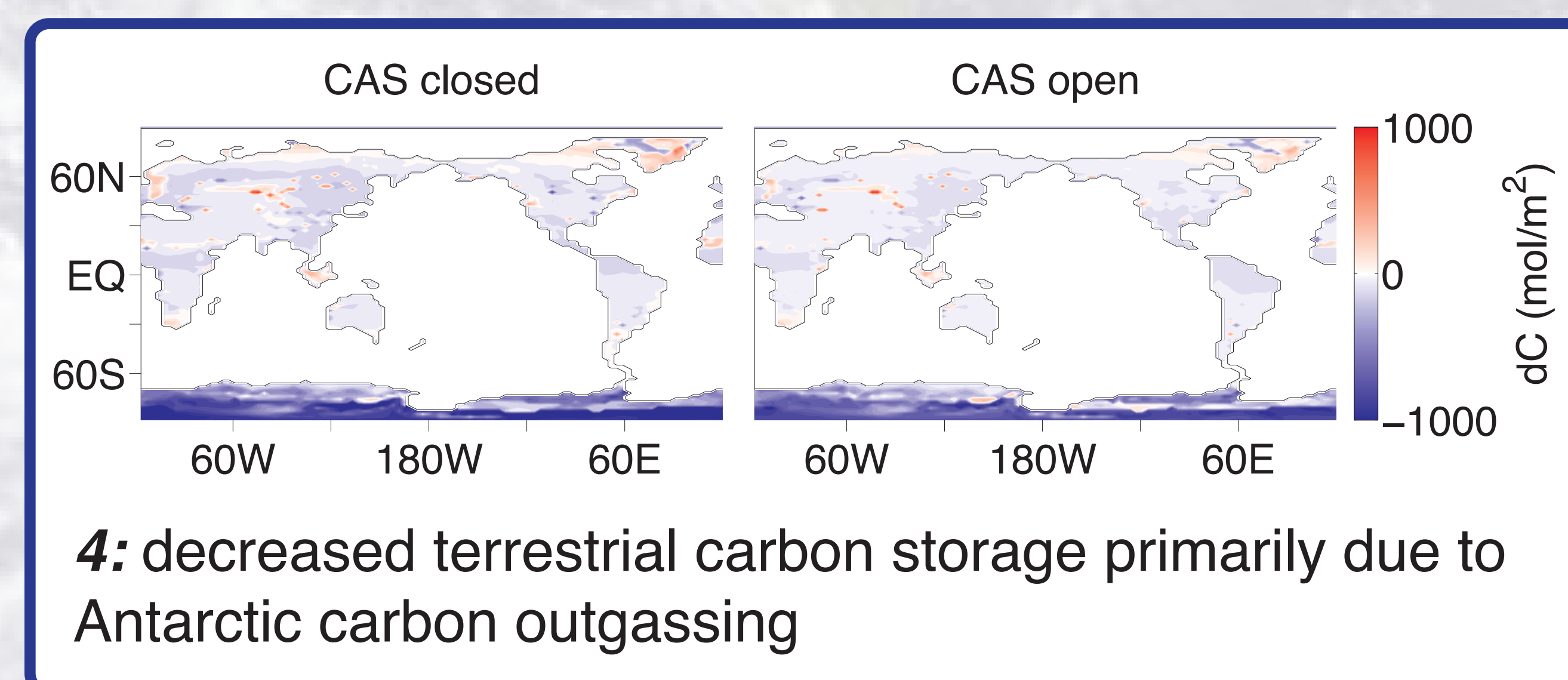
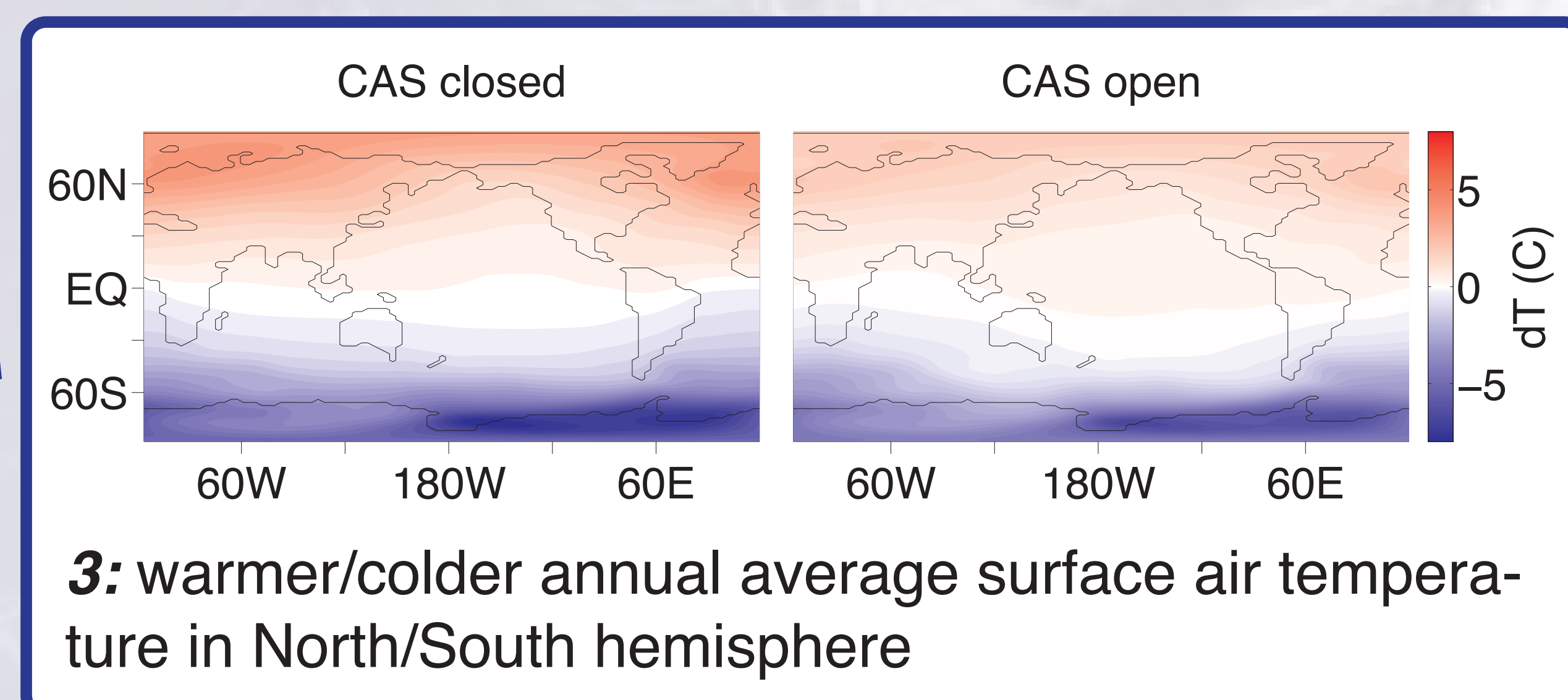
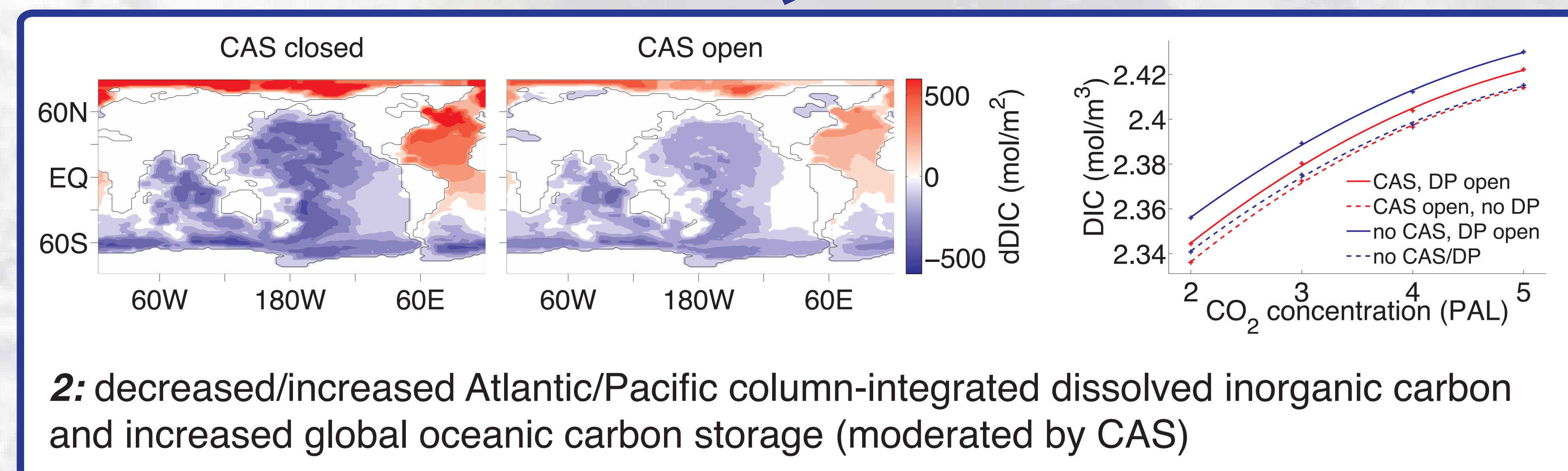
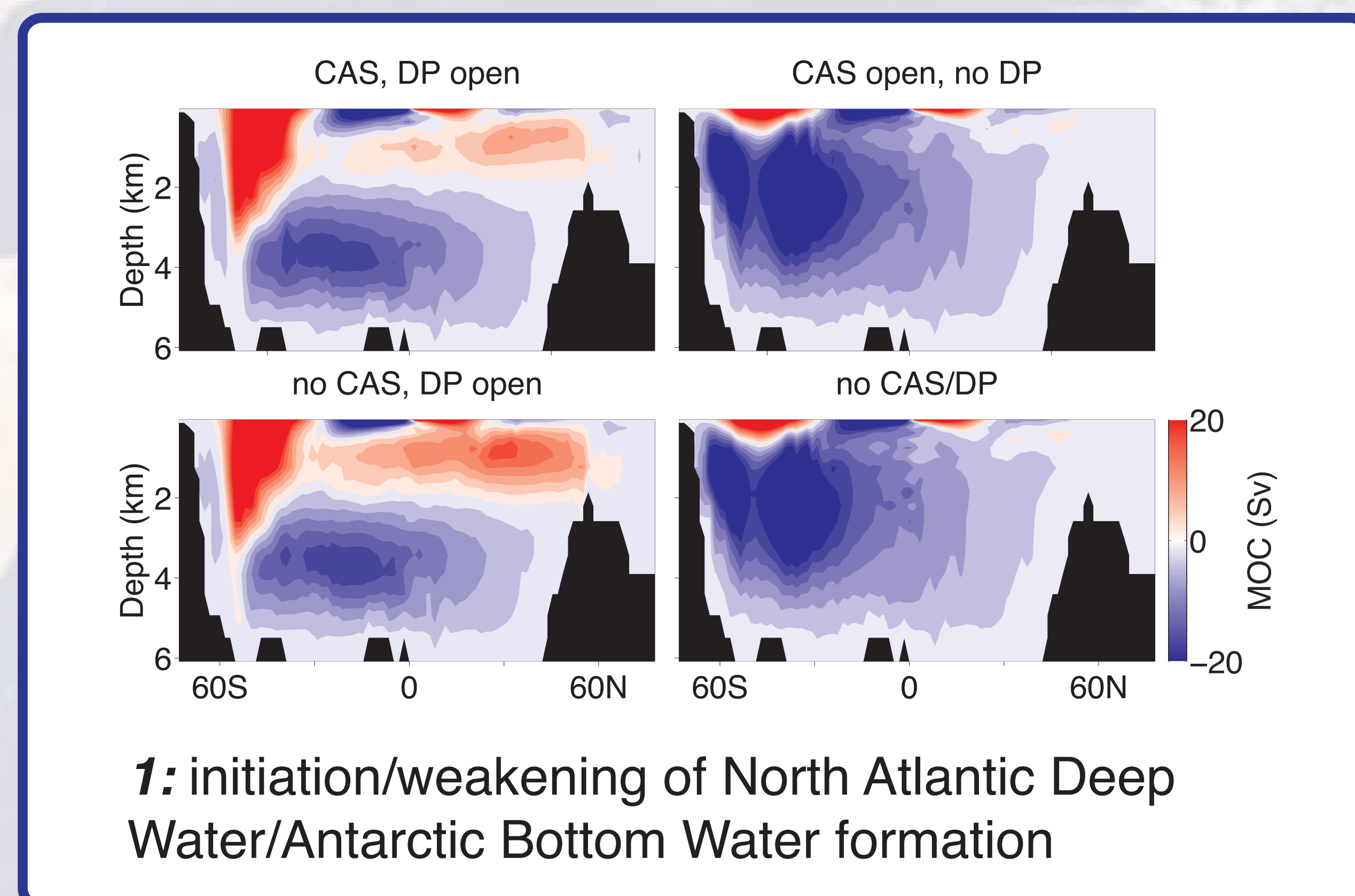
Jeremy Fyke*

Opening the Drake Passage (in the presence/absence of a Central American Seaway) leads to...



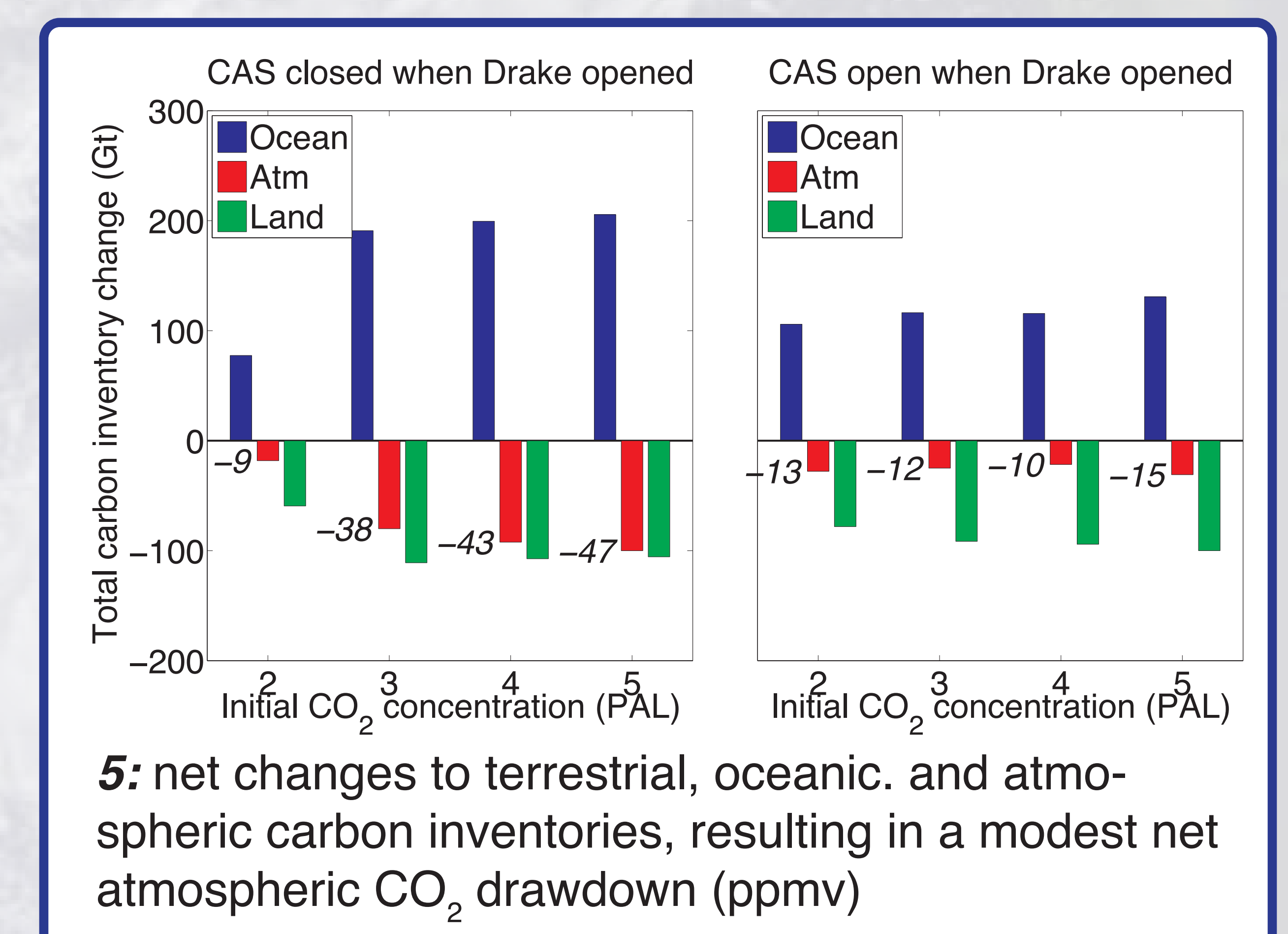
Context Cenozoic opening of the circumpolar Southern Ocean drove changes in ocean transport and surface air temperature (Scher et al., 2006; Sijp et al., 2009). However, the effect of these changes on the global exogenic carbon cycle, including atmospheric CO₂, are not well understood despite the the broad co-occurrence of important gateway events with permanent atmospheric carbon dioxide concentration changes.

Methods To explore the impact of Southern Ocean opening on the global carbon cycle, opening of the Drake Passage (DP) was simulated with the coupled carbon/climate model UVic ESCM. Simulations were initialized over a range of CO₂ concentrations and with the Central American Seaway (CAS) both open and closed.



Results Opening of the Drake Passage caused an internal reorganization of the oceanic carbon reservoir and loss of terrestrial carbon from the ice-free Antarctic continent. The sum of these effects was a consistent decrease atmospheric CO₂. The magnitude of this decrease was moderated by the presence of an open Central American Seaway, and in all cases was modest compared to the total Cenozoic CO₂ decline (e.g. Pagani et al., 2005).

References: Scher et al., Science, 2006; Sijp et al., Journal of Climate, 2009; Pagani et al., Science, 2005



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