Session: C32 Poster: W128A

Sensitivity of atmospheric pCO2 to changes in ocean circulation: role of the surface chemistry

Marc d'Orgeville[†]; Matthew England; Willem Sijp
[†] Climate Change Research Center - UNSW Sydney, Australia
Leading author: marcdo@unsw.edu.au

The University of Victoria Earth System Climate Model is used to investigate the changes in the ocean carbon budget for different classical circulation changes (e.g. due to a shutdown of the North Atlantic Deep Water production, or a change in the Southern Hemisphere Westerlies). For all the circulation changes considered here, the sign of the atmospheric CO2 change is found to be driven by variations in the efficiency of the oceanic carbon pumps (i.e. "soft-tissue", carbonate or solubility). However, the concomitant changes of the mean surface chemistry independent of the pumps can either greatly enhance or almost inhibit the atmospheric response. A new definition of the global Revelle factor is developed to obtain this result. The complete buffered ocean carbon budget which ensues allows one to separate the changes of the oceanic carbon pumps from the change of the surface mean solubility due to alkalinity, temperature and salinity. This buffered budget can be used for cases of addition of carbon from an external source or of changes in the non-buffered ocean carbon inventory (i.e. the oceanic carbon pumps storage capacity).