Diagnosing PMOC activity with global Pliocene-modern CCD reconstructions

Daniel E. Gaskell (University of California Santa Cruz), Raina Lakhamraju (Singapore American School), Serena Manildi (Harbor High School), Shreya Malhotra (Nueva School), James C. Zachos (University of California Santa Cruz)

Present-day ocean circulation is dominated by the Atlantic meridional overturning circulation (AMOC), which lacks a corresponding analogue in the Pacific and may be slowing as the oceans warm. Conversely, a robust Pacific meridional overturning circulation (PMOC) has been hypothesized to have occurred during the warm mid-Pliocene, where *p*CO2 approached modern values of ~420 ppm. If present, such a PMOC would ventilate the presently corrosive intermediate waters in the North Pacific and be visible as a deepening of the North Pacific carbonate compensation depth (CCD). We construct a global compilation of carbonate accumulation using XRF core scans, supplemented by published %CaCO3 estimates, and calculate global basin-specific CCDs over the past 5 million years. Contrary to theoretical predictions that, in the absence of circulation changes, high-CO2 conditions should lead to a shallower North Pacific CCD, we instead find deeper CCDs in the North Pacific during the mid-Pliocene, consistent with the development of an active PMOC. Consistent with prior work, we find that Atlantic CCDs remain relatively stable through the Pliocene, implying the maintenance of AMOC.