

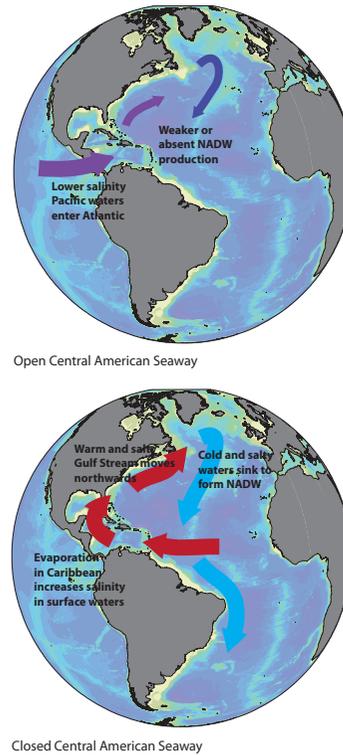
# The closure of the Central American Seaway Reconstructing intermediate- and deep-water connections

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**Introduction** The tectonic closure of the Central American Seaway (CAS), between 14 and 2 million years ago, caused a major reorganisation of deep-ocean circulation (Figure 1). Different studies have reached conflicting conclusions about whether the closure caused a warming or cooling of global climate, mainly through its influence on the Gulf Stream and Atlantic Meridional Overturning Circulation (AMOC). It has also been proposed that closure was a necessary precursor to Northern Hemisphere Glaciation. Of critical importance to all these hypotheses is the timing of closure relative to other global changes.

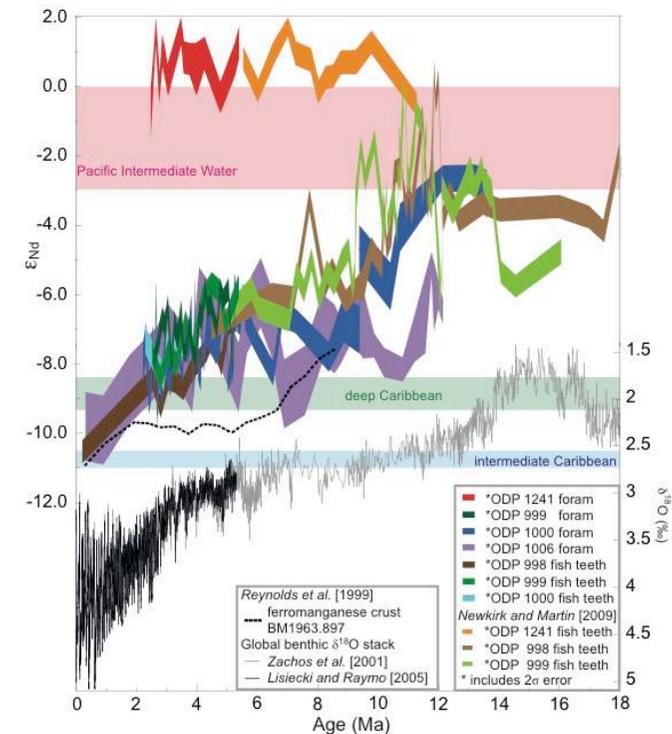
**Method** We use radiogenic isotopes of Nd and Pb in various ocean sediments to reconstruct in detail the history of intermediate and deep-water connections between the Caribbean Sea and the eastern Equatorial Pacific Ocean from 5.0 to 2.0 million years ago.

**On-going investigation** Ocean circulation models indicate that the last few hundred meters of CAS shoaling would have produced a significant increase in the strength of AMOC. We test this hypothesis by producing highly time-resolved  $\epsilon_{Nd}$  records for episodes of short term CAS closure and opening.



**Figure 1.** Closure of the CAS caused major changes in ocean circulation

**Results** The major shift in Caribbean intermediate and deep water  $\epsilon_{Nd}$  away from Pacific compositions occurred before  $\sim 7$  Ma (Newkirk and Martin, 2009) but a continued trend towards less radiogenic  $\epsilon_{Nd}$  compositions during the Pliocene indicate increasing strength of AMOC (Figure 2).



**Figure 2.** Compilation of  $\epsilon_{Nd}$  data for Pacific ODP Site 1241 and Caribbean ODP Sites 998, 999, 1000 and 1006.