

The Pliocene closure of the Central American Seaway: reconstructing surface-, intermediate- and deep-water connections.

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Timing of Gateway Closure

The shoaling of the Isthmus of Panama and the associated reorganisation of deep-ocean circulation have been controversially reported as contributing to both a warming and a cooling of global climate. A resulting increase in moisture supply to the northern hemisphere, through the initiation or strengthening of the Gulf Stream, may have been an important precondition for Northern Hemisphere Glaciation. A robust timeframe for the closure of this major ocean gateway is essential for understanding its direct and indirect effects on global climate.

Method

We use radiogenic isotopes of Nd and Pb to reconstruct the history of shallow, intermediate and deep water connections between the Caribbean Sea and the eastern Equatorial Pacific Ocean from 5.0 to 2.0 million years ago. Surface water exchange is characterised using the Nd isotope composition of planktonic foraminiferal calcite. The Nd and Pb isotope compositions of early diagenetic ferromanganese coatings of the same sediment samples are employed to reconstruct intermediate and deep water exchange.

Results and Conclusion

Our results indicate that Caribbean Intermediate Water continued to diverge from a relatively constant Pacific deepwater Nd composition from 5.0 to 2.0 Ma. Comparison with published stable isotope and Mg/Ca records from the same ODP Sites 999, 1000 and 1241 suggest that Caribbean Intermediate Water composition continued to change even after a decrease in surface water exchange with the Pacific (4.5 Ma onwards [1]). A more rapid restriction of mixing between the Pacific and Caribbean at intermediate depths from 4 to 3.5 Ma clearly preceeded the major increase in ice-rafted-debris north of Iceland [2].

[1] Groeneveld *et al.* (2008) *G³* **9**, Q01P23. [2] Jansen *et al.* (2000) *Paleoceanography* **15**, 709-721.