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Progressive Closure of the Panamanian Gateway during the Pliocene

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We present combined Mg/Ca and δ^{18}O measurements from ODP Sites 1241 from the east Pacific and ODP Sites 999 and 1000 from the Caribbean. The studied time interval covers the latest Miocene and the Pliocene between 5.5 and 2.4 Ma. Analyses were performed on the planktic foraminifer *Globigerinoides sacculifer*, representing water mass properties in the mixed layer. The divergence of the $SST_{Mg/Ca}$ and SSS records between the Caribbean and the east Pacific monitors the progressive closure of the Panamanian Gateway. The divergence of Caribbean-Pacific SSS is first recognized at central Caribbean Site 1000 (at 5.6 Ma) and $\sim$1.4 million years later at southern Caribbean Site 999 (at 4.2 Ma), implying a pronounced intra-Caribbean SSS-contrast, especially between 5.6 and 3.7 Ma. This evolution reflects the decreasing inflow of relatively fresh Pacific water masses (Site 1241) into the Caribbean that led to the gradual establishment of the modern Pacific-Caribbean SSS-contrast. By $\sim$2.4 Ma, the Pacific-Caribbean salinity difference equaled $\sim 1‰$.

The evolution of Pacific-Caribbean mixed-layer temperatures was different. The central part of the Caribbean (Site 1000) was $\sim$3˚C warmer from 5.6 to 4.4 Ma than the southern Caribbean and the adjacent Pacific (24-26˚C). After 4.4 Ma, $SST_{Mg/Ca}$ increased at Site 1000 by $\sim$2˚C, while $SST_{Mg/Ca}$ close to the gateway region (Sites 999 and 1241) remained relatively constant. The $SST_{Mg/Ca}$ increase at Site 1000 is considered to reflect the progressive development of the Western Atlantic Warm Pool (WAWP).

Although the Pliocene $SST_{Mg/Ca}$ are relatively similar between Pacific Site 1241 and Caribbean Site 999, marked differences in the phasing of temperature fluctuations

provide hints for the final phase of the closure of the Panamanian Gateway after 2.7 Ma. With the onset of Northern Hemisphere Glaciation at 2.7 Ma, sea level changes started to influence the throughflow through the Panamanian Gateway. Sea level low-stands with 50-80 m during Marine Isotope Stages (MIS) 96, 98, and 100 caused the glacial closure of the Panamanian Gateway. $SST_{Mg/Ca}$ in the east Pacific (Site 1241) followed the global cooling signal, while $SST_{Mg/Ca}$ in the Caribbean (Site 999) increased during glacials due to the cessation of the inflow of colder east Pacific watermasses.