

The Neogene Central American Seaway

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Two of the world's largest oceans, the Pacific and Atlantic, has been connected through a sea passage called the Central American Seaway (CAS). The closure of this passage and separation of the two oceans have been impacted by the ongoing interaction of the Caribbean and South American Plates, readjusting oceanic currents and creating the only land bridge between South and North America. The modalities and timing of the closure during the Neogene have been the objectives of many studies, resulting in two main proposals, one for late closure of the shallow seaway and the other for early closure of deep-sea connection. A Late Pliocene cessation of the flow of shallow oceanic waters between the Atlantic and Pacific Oceans has been the classic interpretation. A Middle Miocene closure of the deep-oceanic seaway along the tectonic boundary between the Panamá Arc and oceanic rocks from the Western Cordillera of Colombia is a more recent and controversial interpretation. However, until now there has not been any direct geologic evidence from the tectonic boundary to support either interpretation. This new study, which involves field work along the Panamá Arc and Western South America tectonic boundary, reveals a stratigraphic record of Miocene marine sediments that were deposited in the Central American Seaway along the suture zone (CASsz). Although highly deformed and fractured, these sediments constitute the only known direct evidence of the geologic history along the CASsz. Micropaleontological, including calcareous nannofossils, U-Pb detrital geochronologic, and ichnological data from these deposits attest to a progressive shallowing during latest Early to earliest Middle Miocene (16.4-15.1 Ma). Our data indicate that marine conditions were already shoaled (<120 m depth) in some sectors of the CASsz, possibly implying that water depth exchanges between the Atlantic and Pacific oceans were already affected by closure during the Early to Middle Miocene. When we combine our results with previous studies from Central America and western Colombia, our research supports that several parts of the Panamá Arc had shoaled to neritic paleodepths by Middle Miocene, resulting in a perturbed flow of deep-water across the arc and implying that the CAS should not be restricted to the suture zone (CASsz). Our findings agree with the view that the onset of the Atlantic overturning circulation preceded the Pliocene intensified cooling (2.5 Ma) of the Northwestern Hemisphere by several million years (ca. 13 Myr). The CAS was represented by different straits that close at different times, probably vanishing in the suture zone

(CASsz) by Middle Miocene (between 15 and 12 Ma) as previously proposed. Nevertheless, well-calibrated stratigraphic sections older than Late Miocene from Central America and western Colombia are still needed in order to better understand the geologic evolution of the CAS prior to the well-known shallow oceanic disruption of the Pliocene.