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Evidence for warm saline bottom waters in the Cretaceous tropical Atlantic Ocean

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A new bottom-water δ^{18}O long-term record of glassy benthic foraminifera of Ocean Drilling Program (ODP) Leg 207 at Demerara Rise (tropical Atlantic Ocean) provides the first tropical long-term paleotemperature record for middle Cenomanian to Turonian bottom-waters. The extremely well-preserved benthic foraminiferal tests and continuous sedimentation at Demerara Rise serve the unique opportunity to decipher paleoceanographic variations before and during the most prominent Oceanic Anoxic Event (OAE) of the Cretaceous. Our data suggest that bottom water temperatures at Demerara Rise were between 20-25˚C and therefore extremely warm throughout the Cenomanian and Turonian. Maximum bottom-water temperatures are recorded below the Mid-Cenomanian Event and during Oceanic Anoxic Event 2 (OAE 2) with temperatures up to 29˚C. During the Late Cenomanian benthic foraminifera document an unexpected and significant increase of the δ^{18}O values, which is not paralleled by planktic foraminiferal oxygen isotopes. This increase is proposed to reflect a change of the bottom water salinity. An according saline bottom-water mass is interpreted to derive from tropical epicontinental seas of the northern South American continent and is believed to even contribute to intermediate and/or deep waters in the Central Atlantic. At the base of OAE 2, benthic foraminiferal oxygen isotopes decrease, reflecting either a dramatic warming and/or a reduce of the salinity of bottom water, which is paralleled by a moderate increase of sea-surface temperatures. The resulting decreased δ^{18}O gradients point to a weakening of the thermohaline stratification during the OAE 2 probably contributing to the formation of black shales extremely rich in organic carbon (up to 29%).