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

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The mid-Cretaceous was a time of intensive greenhouse conditions with surface- and deep-water temperatures much higher than today, low latitudinal temperature gradients, missing permanent ice-sheets, and high sea-level. These greenhouse climate conditions and the mid-Cretaceous paleogeography led to the assumption that, in contrast to the today's icehouse world, intermediate to deep-water sources were mainly located in the low-latitudinal epicontinental shelf seas and formed by hypersaline waters. Based on general circulation models, however, the southern and northern high latitudes of the Pacific Ocean were also suggested as the main sources of bottom-water formation. Yet the possibility to test these assumptions is limited based on the need of reliable mid-Cretaceous paleotemperature data. Here we present a bottom-water δ^{18}O long-term record of glassy benthic foraminifera from two sediment cores drilled off Suriname (ODP Leg 207) that provides the first tropical long-term paleotemperature record for middle Cenomanian to early Turonian bottom waters.Our data suggest that bottom-water temperatures were between 20-25˚C and therefore extremely warm throughout the Cenomanian and Turonian. During the Late Cenomanian benthic foraminifera document an unexpected and significant increase of the δ^{18}O values, that is not paralleled by benthic foraminiferal Mg/Ca ratios as well as planktic foraminiferal oxygen isotopes. This increase is therefore proposed to reflect a change of the bottom-water salinity. An according saline bottom-water mass is interpreted to derive from tropical to subtropical epicontinental seas around the proto-North Atlantic Basin and is believed to contribute to intermediate and/or deep waters in the entire Central Atlantic.