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Late Albian-early Cenomanian planktonic foraminifera and stable isotope records from the western subtropical North Atlantic (ODP Leg 171B, Blake Nose)

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The late Albian-early Cenomanian interval from 103.3 to 99.0 Ma, which includes organic-rich deposits and a δ^{13}C increase associated with Oceanic Anoxic Event 1d (OAE 1d), is investigated using exceptionally well preserved foraminiferal samples from two closely spaced sites separated by 1000 m of depth in the western subtropical Atlantic (Ocean Drilling Program Sites 1050 and 1052). High-resolution correlation between the two sites is achieved using previously developed age models in combination with detailed δ^{13}C stratigraphies obtained from benthic and planktonic foraminifera. Carbon and oxygen isotopic records are also used to infer planktonic foraminifera depth habitats and to compare spatial and stratigraphic changes in vertical δ^{13}C and δ^{18}O gradients. Paleotemperature estimates from benthic foraminiferal δ^{18}O values suggest that middle bathyal bottom water averaged $\sim$14ºC at Site 1050 and upper bathyal bottom water averaged $\sim$17ºC at Site 1052 during the late Albian, whereas surface temperatures are estimated to have ranged from 26˚ to 31˚C at both sites. Species diversity and abundance indices reveal a steady balance of speciation and extinction throughout the late Albian, with no time of significant faunal turnover.

OAE 1d is recognized based on a 1.2 per mil δ^{13}C increase during the latest Albian through earliest Cenomanian ($\sim$100.0 Ma - 99.6 Ma), which is similar in age

and magnitude to δ^{13}C excursions documented at multiple sites in the North Atlantic and western Tethys. Organic-rich "black shales" are present throughout the studied interval at both sites. However, deposition of individual black shale beds was not synchronous between sites, and most of the black shale was deposited before the OAE 1d δ^{13}C increase. A similar pattern is observed at the other sites where OAE 1d has been recognized indicating that the site(s) of excess organic carbon burial that could have caused the δ^{13}C increase have yet to be found. For the black shales observed on Blake Nose, we propose that warm deep waters and generally developed vertical stratification were responsible for the preservation of redeposited terrestrial and/or highly degraded marine organic carbon that was occasionally concentrated in beds of black shale.