

## **Warming drove the expansion of marine anoxia in the equatorial Atlantic during the Cenomanian leading up to Oceanic Anoxic Event 2**

### **ABSTRACT**

Oceanic Anoxic Event 2 (OAE 2) (~ 93.5 Ma) is characterized by widespread marine anoxia and elevated burial rates of organic matter. However, the factors that led to this widespread marine deoxygenation and the possible link with climatic change remain debated. Here, we report long-term biomarker records of water-column anoxia, water column and photic zone euxinia (PZE), and sea surface temperature (SST) from Demerara Rise in the equatorial Atlantic that span 3.8 Myr of the late Cenomanian to Turonian, including OAE 2. We find that total organic carbon (TOC) content is high but variable (0.41 wt %–17 wt %) across the Cenomanian and increases with time. This long-term TOC increase coincides with a TEX86-derived SST increase from ~ 35 to 40 °C as well as the episodic occurrence of 28,30-dinorhopane (DNH) and lycopane, indicating warming and expansion of the oxygen minimum zone (OMZ) predating OAE 2. Water-column euxinia persisted through much of the late Cenomanian, as indicated by the presence of C35 hopanoid thiophene but only reached the photic zone during OAE 2, as indicated by the presence of isorenieratane. Using these biomarker records, we suggest that water-column anoxia and euxinia in the equatorial Atlantic preceded OAE 2 and this deoxygenation was driven by global warming.