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Middle Miocene oxygen minimum zone expansion offshore West Africa: Evidence for global cooling precursor events

Sev Kender (1), Victoria L. Peck (2), Robert W. Jones (3), and Michael A. Kaminski (4)

(1) British Geological Survey, Nottingham, UK (sev.kender@bgs.ac.uk), (2) British Antarctic Survey, Cambridge, UK, (3) BG Group, UK, (4) University College London, UK

Three dissolution events ca. 16 Ma, 15.5 Ma, and 14.3 Ma ago have been identified in sediments from the Congo Fan. Multiproxy benthic foraminiferal and sedimentary records suggest an expanded oxygen minimum zone consistent with enhanced upwelling at these times. Low oxygen species Bulimina elongata, Brizalina alazanensis, Bulimina marginata and Valvulineria pseudotumeyensis begin to dominate from ca. 16 Ma, replacing more oxic indicators such as Oridorsalis umbonatus and Cibicidoides crebbsi. The low oxygen faunas are show reduced diversity and exhibit erratic abundance values from 100 to 2000 specimens per gram. Agglutinated foraminifera Glomospira spp. are also associated with these low oxygen faunas. Benthic isotope records from Cibicidoides spp. show shifts similar to those of the global composite, with marked bottom water cooling from ca. 16 Ma. Total organic carbon values show a general increase over the low oxygen intervals. Marine carbonate records from adjacent North Africa indicate coincident episodes of increased continental weathering (John et al., 2003, Geological Society of America Bulletin), suggesting that an intermittently stronger polar front strengthened west African offshore winds, increasing surface water productivity, and enhanced North African weathering during these events. We propose that Columbia River Flood Basalt volcanism, estimated to have released 106 Tg CO2 and 106 Tg SO2 between 16 and 15.6 Ma ago, may have influenced these climatic changes.