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# The geochemical and sedimentary imprint on the continental margin of the NW Gulf of Mexico during the last 20 cal ka: glacial melt-water floods and geochemical proxies

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The sedimentary stratigraphy of the last 21 cal ka of the NW continental slope of the Gulf of Mexico (GOM) is recorded in detail in six cores; it is characterized by the widespread occurrence of discrete sedimentary beds (turbidites, nepheloid-layer deposits). They are interpreted as the depositional effect of six melt-water floods (MWFs) that were routed during the last deglaciation through the Mississippi River to the GOM. Geochemical, oxygen isotope analyses, and radiocarbon datings have been performed in core JPC-26 from to identify the geochemical signature of these MWFs. The history of JPC-26 may be portrayed in three distinct sedimentary units. Unit 3: Early deglaciation episode (16–21 cal ka). It is characterized by two series of red and green mud turbidites, with the red turbidites being the product MWF-1/a. Both mud turbidites display major peaks in the distributions of the terrigenous elements Si, Zr, Fe, Mg, as well as in P, and Mn ratios to Al. Exclusive occurrence of peaks of Ti, K, and Mg ratios to Al characterize the red turbidites. Subunits 2b, 2c, and subunit 2e: Melt-water floods during 10–16 cal ka. They are characterized by two successive, negative $\delta$18O excursions indicating that they represent MWFs 2–4 of the Mississippi R. Distinct peaks in the ratios to Al profiles of the terrigenous elements Si, K, Ti, Cr, Fe, and Ni in subunits 2e and 2b indicate that enormous amounts of river-sourced sediment was delivered and dispersed throughout the NW continental slope of the GOM. Barium ratio to Al shows marked peaks in subunits 2e (15.3–15.9 cal ka), 2c (13.7–14.6 cal ka) and marginally in 2b, suggesting increasing flux of Ba during the MWFs (palaeoproductivity proxy). A sudden increase is observed from the uppermost section of subunit 2b in the Mn to Al ratio (125x10-4 at 13.26 cal ka to 254x10-4 at 11.46 cal ka). Calcium to Al ratio exhibits similar behavior, thus the Mn enrichment is probably related to the formation of manganese carbonates. The Younger Dryas climatic event ($\sim$11.6-12.8 cal ka) presents identifiable geochemical imprints in subunit 2a to unit 1, showing minimum values of terrigenous elements ratios to Al (Si/Al, Fe/Al, Ti/Al) and Corg. Unit 1: Early Holocene to present day. At the base of unit 1 (9.8-11.6 cal ka), Ba and Sr ratios to Al exhibit local maxima related to increased primary productivity during MWF-5 (10-11.4 cal ka) and mwp-1B. Unit 1 is characterized by an almost continuous decrease in Al content in reverse to Ca/Al which increases upcore. This trend is attributed to the rise of the sea-level, and the consequent formation of a widespread continental shelf. However, between 5.4 and 7.3 cal ka there is a prominent increase of Al, and Fe, indicating an interval of increased river discharge, corresponding to the Holocene “Thermal Maximum”. During the late Holocene, Mn-rich mud beds occur in the upper 0.6 m of the core (last 4.6 cal ka), attributed to the intensification of the bottom currents in the NW GOM.