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Strong changes in depositional conditions during the Late Glacial and the Holocene along the northern Argentina Continental Margin: a multiproxy approach.

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We investigated sediments from three different depositional environments along the northern Argentine continental margin to assess the main processes controlling sediment deposition since the last glacial period. Further, we evaluated how different depositional conditions affect (bio)geochemical processes within sediments. Sediment cores were collected during expedition SO260 in 2018[1]. Two sites are located at ~1100 m water depth north and south of the Mar del Plata Canyon (N- and S-Middle Slope Site). Another site is situated at the lower continental slope at 3600 m water depth (Lower Slope Site). Reliable age constraints of sediments deposited during the last glaciation at the Argentine margin are difficult to obtain due limited amounts of carbonate. We overcame this issue by combining radio-isotope analyses (^{14}C,$^{230}Th_{ex}$) with sedimentological, geochemical and magnetic data demonstrating that all sites experienced distinct changes over time.

Both, N- and S-Middle Slope Sites, record at least the last 30 ka. The S-Middle Slope Site is dominated by continuously organic carbon-starved and winnowed sandy deposits, which according to geochemical and magnetic data leads to insignificant sulfate reduction and sulfidation of iron (oxyhydr)oxides. Glacial sedimentation rates at the Middle Slope increase northwards suggesting a decrease in bottom-current strength. The N-Middle Slope Site records a transition from the last glacial period, dominated by organic carbon-starved sands, to the early deglacial period when mainly silty and organic carbon-rich sediments were deposited between 14-15 ka BP. Concurrently, glacial sedimentation rates of ~50 cm/ka significantly increased to 120 cm/ka. We propose that this high sedimentation rate relates to lateral sediment re-deposition by current-driven focusing as response to sea level rise. Towards the Holocene, sedimentation rates

strongly decreased to 8 cm/ka. We propose that the distinct decrease in sedimentation rates and change in organic carbon contents observed at the N-Middle Slope Site caused the nonsteady-state pore-water conditions and deep sulfate-methane-transition (SMT) at 750 cm core depth. The Lower Slope Site records the last 19 ka. Continuously high terrigenous sediment input (~100 cm/ka) prevailed during the Deglacial, while sedimentation rates distinctly decreased to ~13 cm/ka in the Holocene. Here, pore-water data suggest current steady-state conditions with a pronounced SMT at 510 cm core depth. Our study confirms previous geochemical-modelling studies at the lower slope, which implied that the observed SMT fixation for ~9 ka at specific depth relates to a strong decrease in sedimentation rates at the Pleistocene/Holocene transition[2].

During the Holocene, total organic and inorganic carbon contents, inorganic carbon mass accumulation rates and XRF Si/Al ratios (preserved diatom flux) increase at our sites. We relate this to increased primary production in surface waters and less terrigenous input along the continental margin. Our multidisciplinary approach presents improved age constraints at the northern Argentine Margin and demonstrates that lateral/vertical sediment transport and deposition was strongly linked to Glacial/Interglacial variations in bottom currents, seafloor morphology, sea level and sediment supply. The dynamic depositional histories at the three sites still exert a significant control on modern sedimentary (bio)geochemical processes.

[1]Kasten et al. (2019).Cruise No. SO260. Sonne-Berichte.

[2]Riedinger et al. (2005).Geochim. Cosmochim. Acta. 69.