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Controls on stratigraphic variability in a semi-closed rift basin over the Late Quaternary, Gulf of Corinth, Greece

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The Corinth Gulf is a semi-closed active rift basin, which alternated between marine and isolated/semi-isolated conditions as sea level fluctuated with respect to basin sills during Quaternary glacial/interglacial cycles. Results from the recent IODP Expedition 381 reveal cyclic variations of 10s-100s of kyr in sedimentation rates and basin paleoenvironment. In this study we investigate the controls on stratigraphic development of the Corinth basin during the last eustatic cycle and the Holocene based on core data from the IODP Expedition 381 Site M0079. We perform a multi-proxy analysis of the upper ~200 mbsf of core covering Marine Isotope Stages (MIS) 1-5 (i.e. last 130 kyr). Our analyses include grain size and micropaleontological (foraminifera) analyses at regular intervals (~0.5 m), Computed Tomography (CT-scanning) of selected u-channels and specific microscopic work (smear slides, SEM) on targeted samples. Our results show pronounced variability in sedimentation patterns during the isolated/semi-isolated phases compared to the marine intervals. Low density, thinly bedded and laminated muds alternating with high density homogenous mud beds and occasionally sandy, organic rich beds prevail during isolated/semi-isolated conditions. In contrast, homogenous and/or highly bioturbated successions characterize the marine sequences. The transitions from marine to isolated/semi-isolated conditions and vice-versa are often associated with authigenic carbonate deposition. Fine grained sediments (sand < 10%) dominate both the marine and the isolated sequences. Nevertheless, sandy turbidites (sand > 10%) are also present and are more often observed in the isolated phases, likely associated with climatic-driven changes in erosional processes onshore. Our analysis reveals short-lived isolated/semi-isolated sub-phases within the lower marine interval corresponding to the MIS5b and MIS5d lowstands. Short marine spikes also interrupt the isolated/semi-isolated conditions of the last glacial period indicating temporary sea level rises within MIS3. Overall, the marine intervals display significant paleoenvironmental differences although they share similar sedimentary patterns. In particular, we observe more diverse palaeoceanographic conditions in the MIS5 marine sub-phases compared to the MIS1, especially regarding temperature and eutrophication levels of the water column.