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Lake Donggi Cona is located in the north-eastern part of the Tibetan Plateau at the boundary between monsoon and westerly climate influence. The main objective of limnogeological resaerch is to infer late glacial to Holocene lake development in response to monsoon dynamics. Donggi Cona is an oligotrophic freshwater lake with a recent open-basin system. The 30 km long, 8 km wide, and up to 90 m deep open lake basin is a tectonic pull-apart structure, situated along the Kunlun suture. Sub-bottom profiling of the lake basin revealed the presence of graben structures, conjugate faults, subaquatic terraces, and ancient fan systems, draped by 4 to 5 m thick postglacial lacustrine muds.
After analysis of the seismic pre-survey, five sediment cores were retrieved at between 40 m and 2 m water depths. The cores are partly laminated and composed of calcareous muds with variable amounts of carbonate micrite, organic matter, detrital silt and clay, and are rich in ostracods and plant remains. Dating results from the top of the cores reveal radiocarbon ages around 2000 yr BP. These too old ages of recent sediments suggest a marked reservoir offset by hard-water effects. Nineteen reservoir-corrected and calibrated 14C AMS dates in combination with sedimentological proxy data document palaeoenvironmental change of the lake system during the last 20000 calendar years after the last glacial maximum.
With a multi-proxy approach using grain size, XRF, XRD, CNS, TOC and statistical modelling (EMMA) we reconstruct the lake development and the forcing factors of the last 19 ka in relation to the palaeo-climatic development. Prior to 18 ka terrestrial loess and sand suggest a very low lake level. From 18 to 13 ka B.P the lake level rise during a period of climate-driven glacier melt. For the same time period the detrital supply is at its maximum and seems to control the high sedimentation rate. Grain-size coarsening and hiatuses in some sediment cores, document a repeated lake-level fall after 13 ka BP, possibly associated with the late-glacial Younger Dryas stadial. From 12.3 to 4.3 ka the biological productivity was high, the lake level rose to above its present level as evidenced by the different terrace levels in the littoral of Lake Donggi Cona and by the increase of the fine fraction of the sediment. For the same time interval we assume a rise in salinity (and possibly temperature) because of increased accumulation of aragonite. The lake changes in that time from a full ventilated to a stratified system in response to warm and moist conditions during the Holocene climate optimum. The values of aragonite and calcite show for all cores an inverse distribution pattern. At 4.3 ka B.P the system shifts from an aragonite dominated to a calcite dominated system. This can be explained by a shift from a closed brackish to an open fresh water system. This sudden change can be attributed to a threshold response during prolonged lake-level rise and overspill at the western end of the lake. Lake-level rise, possibly progressed in the course of continuous climate deterioration in response to a decline in summer insolation and evaporation, leading to a positive hydrological budget.