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Source-to-Sink (S2S) analysis of a lacustrine system across the K-T boundary: the Yacoraite Formation, Salta rift basin, Argentina

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In this contribution, we present a source-to-sink (S2S) analysis of the Late Cretaceous to Early Cenozoic Yacoraite Formation, a typical lacustrine source rock from the Salta rift Basin (NW Argentina). The Yacoraite Formation corresponds to a mixed carbonate-siliciclastic lacustrine sedimentary system, deposited during the sag phase (post-rift) and also records the K-T boundary. An integrated S2S approach was applied using sedimentary, geochronology, geochemical and isotopic datasets at basin scale (ca. 200 x 200 km), to better understand the complex interactions between production, destruction, and dilution processes that characterize the dynamic of organic-rich sediments. These data are used here to discuss the high-resolution (time step ca. 0.05-1 Myr) patterns of organic carbon enrichment in a lacustrine system across the K-T boundary.

Results show that the Yacoraite Formation recorded major climate changes that can be documented in terms of catchment dynamic, erosion processes, carbonate accumulation trends, lacustrine dynamic and source rock quality. The background organic matter corresponds to a Type I kerogen dominated by algal growth (mean HI 600-800 mgHC/gTOC, TOC_0 1-2 wt.%). The K-T boundary was the climax of a climate change initiated ca. 0.3 Myr before that induced a major change in the catchment weathering processes, which temporally corresponds to the accumulation of poor quality source rock intervals ($TOC_0 \leq 0.2$ wt.% and HI < 50 mgHC/gTOC) in these series. The location of the K-T boundary is highlighted by a main negative anomaly in $\delta^{13}C$ of the carbonate deposits in the Yacoraite Formation, as also supported by absolute U-Pb dating of inter-fingered volcanic ashes. It was followed by a major pulse in paleo-productivity, in turn followed by a major pulse in TOC_0 (10-15 wt.%) under anoxic conditions. In ca. 0.2 Myr the lacustrine dynamic and the related organic-carbon enrichment resumed to their initial setting, just prior to the prelude K-T boundary climate change. The obtained results suggest that the Yacoraite Formation can be considered as a world-class example to illustrate how the K-T boundary is recorded in lacustrine sediments. In particular, it could be used as reference to address key questions related to cross-scale interactions, feedback loops and temporal dynamics in the sedimentary record.