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Origin of the Turkwel delta trajectory (Lake Turkana, Kenya): insights from numerical modeling (DIONISOS)

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Deltas simultaneously respond to modifications in parameters such as water discharge, sediment supply and base-level change. Those parameters are driven by a number of potential external forcing processes, nevertheless mainly corresponding to tectonism and climate. In this study, geomorphology and numerical modeling are coupled in order to provide analysis of the delta complex of the Turkwel River (Lake Turkana, Kenya). The Turkwel delta complex is 35 km long, forming one of the major deltaic systems that has fringed Lake Turkana during the Holocene. It developed during the lake level regression at the end of the holocene African Humid Period and correspond to a typical forced-regressive delta.

Trajectory analysis was performed on three transects cross-cutting the deltaic complex. Transects consistently display five slightly descending (slope gradient: >0° to 0.4°) plateaus separated by four abrupt steps of higher slope gradients (1° to 3.8°). Conventional interpretations presume that the deltaic trajectory results from either (1) four abrupt accelerations in lake level fall during the continuous regression, (2) four abrupt declines in sediment supply and/or water discharge during a steady lake level fall or (3) a combination of both.

We used numerical stratigraphic modeling (Dionisos) in order to test the aforementioned hypotheses as the origin of observed trajectories. We concluded that causal relationships between sediment supply, lake level change and progradation trajectory are not as straightforward as recurrently envisioned. We think that this contribution brings new lights on the relationships between deltaic architectures and controlling factors.