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Albertine Rift, Uganda: Deformation-Sedimentation-Erosion relationships

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The Albertine Rift is the northern part of the western branch of the East African Rift that runs over a distance of around 2000 km from Lake Albert in the north to Lake Malawi in the south. Lake Albert Basin is assumed to be a classical half-graben initiated around 12 Ma and oriented NNW-SSW, with a major northwesterly bounding fault - the Bunia fault - located along the western Congolese shoreline (Ebinger, 1989; Pickford & al., 1993).

The aim of this study is to understand the relationships between deformation, erosion, and sedimentation of the rift through time by restoring (1) the timing and amplitude of vertical movements (subsidence, uplift), (2) the geometry and paleo-environmental evolution (including climate) of the sedimentary infilling and (3) the geomorphological evolution of the surrounding area and associated erosion budget.

Seismic data and outcrops studies suggest a much more complex history than previously described. (1) The age model, mainly based on mammal fossils (Pickford et al., 1993; Van Damme and Pickford, 2003), is debated, but the early stage of the rift is probably Middle Miocene. (2) No half-graben geometry has been characterized: the infilling consists of juxtaposed tabular compartments with sharp thicknesses variations along bounding faults, in response of either low rate extensional or combined strike-slip/extensional movements.

The following onshore-offshore evolution is proposed:

- Middle Miocene ($\sim$ 13 Ma) to Late Miocene (?): rifting 1 – differential subsidence along N60° faults – major deepening from fluvio-deltaic to deep lacustrine environments (maximum flooding at 8 Ma) – uplift, erosion and reworking of weathered profiles – first generation of pediments.

- Late Miocene (?) to Late Pliocene ($\sim$ 3 Ma): quiescence phase – homogenous subsidence – lacustrine clays interbedded with sandy flood-lobes – uplift, erosion and reworking of ferruginous laterite (iron duricrusts) – second generation of pediments.

- Late Pliocene ($\sim$ 3Ma) to Early Pleistocene ($\sim$ 2 Ma): rifting 2 – major uplift and growth of the Ruwenzori Mountains (5000 m of elevation) – differential subsidence – deltaic to wave-dominated coast (shoreface) sandy deposits – pediments degradation by fluvial erosion.

- Middle-Late Pleistocene: late regional uplift and tilting - drainage inversion and present-day scarp formation.