
Sedimentary evolution of the Lower Omo Valley (Turkana Depression, Ethiopia) for the past four million years: a stratigraphic modelling approach

Perrine Poirier*^{†1}, Alexis Nutz¹, Vincent Godard¹, Didier Granjeon², Mathieu Schuster³, Doris Barboni^{1,4}, Ghislain Gassier¹, and Jean-Renaud Boisserie^{5,6}

¹Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement (CEREGE) – Aix Marseille Univ, CNRS, IRD, INRAE, CEREGE, Aix-en-Provence, France – France

²IFP Energies Nouvelles – Earth Sciences and Environmental Technologies Division, IFPEN, Rueil-Malmaison, France – France

³Institut Terre et Environnement de Strasbourg (ITES) – Strasbourg University, CNRS, ENGEES, Institut Terre et Environnement de Strasbourg, UMR 7063, France – France

⁴French Institute of Pondicherry – UAR 3330, CNRS, French Ministry for Europe and Foreign Affairs, Pondicherry, India – France

⁵Centre Français des Etudes Ethiopiennes – CFEE UAR 3137, CNRS, French Ministry for Europe and Foreign Affairs, Addis Ababa, Ethiopia – France

⁶PALEVOPRIM – UMR 7262, CNRS, Poitiers University, France – France

Résumé

The past four million years are pivotal for the evolutionary history of hominids, as revealed by decades of archaeological and paleontological investigations across Africa, in the East African Rift and notably one of its key regions, the Turkana Depression (Kenya/Ethiopia). This time interval encompassed major biological and cultural milestones, including the evolution and extinction of the genus *Australopithecus*, the emergence of the genus *Homo*, early dispersals into Eurasia, and many technological innovations, characterizing the Lomekwian, Oldowan and Acheulean lithic industries; some of these discoveries were first made in the Turkana Depression. In parallel, this period is also marked by pronounced global climatic shifts, along with regional tectonic and volcanic events. However, in the Turkana Depression, the local-scale impact of these coeval global and local environmental changes is still poorly constrained. In particular, little is known about their impact on local environments in which hominids evolved.

In this contribution, we reconstruct the evolution of sedimentary environments and sedimentary landscapes in the Lower Omo Valley (Ethiopia) over the past four million years to provide a better understanding of the physical environments in which local biological and cultural evolutions took place. To this end, we use a stratigraphic forward model (Dionisos-Flow) to simulate distribution of depositional environments through time and their evolution. To assess the robustness of our model reconstructions, we compare model outputs to sedimentary architectures, volumes of eroded and deposited sediments and facies distribution derived from field observations and seismic data. We then discuss the respective influences

*Intervenant

[†]Auteur correspondant: poirier@cerege.fr

of climatic evolution and tectonics uplift in driving the evolution of the sedimentary system. A key output of this modelling approach is the generation of three-dimensional facies maps able to provide basin-scale distribution of depositional environments every 10 ka, between 4 Ma and now, with a particular effort for the period between 3.8 Ma to 1.1 Ma. These reconstructions provide insights into depositional environments and sedimentary contexts relevant for the preservation and accessibility of fossil and archaeological records, and therefore constitute a valuable tool for the paleontological and archaeological communities working in the region.

Mots-Clés: Stratigraphic modelling, paleoenvironments, Lower Omo Valley