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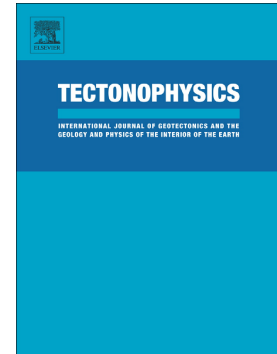
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Samuel C. Boone, Barry P. Kohn, Andrew J.W. Gleadow, Christopher K. Morley, Christian Seiler, David A. Foster, Ling Chung

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# Tectono-thermal evolution of a long-lived segment of the East African Rift System: Thermochronological insights from the North Lokichar Basin, Turkana, Kenya

Samuel C. Boone<sup>1</sup>, Barry P. Kohn<sup>1</sup>, Andrew J. W. Gleadow<sup>1</sup>, Christopher K. Morley<sup>2</sup>, Christian Seiler<sup>1,3</sup>, David A. Foster<sup>4</sup> and Ling Chung<sup>1</sup>

<sup>1</sup>School of Earth Sciences, University of Melbourne, VIC 3010, Australia

<sup>2</sup>Department of Geological Science, Chiang Mai University, Chiang Mai, Thailand

<sup>3</sup>Geoscience Australia, GPO Box 378, Canberra, ACT 2601, Australia

<sup>4</sup>Department of Geological Sciences, University of Florida, Gainesville, FL, 32611, U.S.A.

Corresponding author: Samuel C. Boone ([sboone@student.unimelb.edu.au](mailto:sboone@student.unimelb.edu.au))

## Highlights:

- Marked Late Cretaceous-Paleogene denudation of southern Turkana
- Inconsistent with linkage of Cretaceous Anza-South Sudan Rifts in Turkana
- ~30-10 Ma reheating related to burial during formation of Lothidok Basin
- Late Miocene-Pliocene cooling marks formation of North Lokichar Basin

## Abstract

The Turkana Depression is a structurally complex and long-lived segment of the East African Rift System (EARS), with associated magmatism and strain nucleating there in the late Paleogene. The anomalously wide, ~N-S rift zone defines the topographic lowlands separating the Ethiopian and East African Domes. The atypical architecture and morphology of the Turkana Depression has often been attributed to the influence of an oblique, pre-existing lithospheric heterogeneity speculated to result from earlier Cretaceous-early Paleogene Anza-South Sudan rifting. However, this hypothesized period of earlier rifting is poorly constrained due to the obscuring effects of extensive Cenozoic rifting and volcanism. Similarly, the extent and timing of basin formation during the initial stages of EARS extension in Turkana is not well understood. Seismic reflection studies in Turkana have revealed the presence of older, possibly late Paleogene sub-basins, predating the Neogene onset of major faulting elsewhere in the EARS. One example, the Lothidok Basin, has previously been imaged beneath the late Miocene-Pliocene North Lokichar Basin. Its age, however, is unconstrained due to a lack of well controls, geochronological constraints and outcrop of its basal unit. Here, we present a multiple low-temperature thermochronometer [apatite fission track, apatite (U-Th-Sm)/He and zircon (U-Th)/He] study performed on

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