Accepted Manuscript

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J.D. Muirhead, S.A. Kattenhorn

PII: S0191-8141(17)30244-4

DOI: 10.1016/j.jsg.2017.11.004

Reference: SG 3551

To appear in: *Journal of Structural Geology*

Received Date: 17 September 2017

Revised Date: 30 October 2017

Accepted Date: 6 November 2017

Please cite this article as: Muirhead, J.D., Kattenhorn, S.A., Activation of preexisting transverse structures in an evolving magmatic rift in East Africa, *Journal of Structural Geology* (2017), doi: 10.1016/j.jsg.2017.11.004.

Activation of preexisting transverse structures in an evolving magmatic rift in East Africa

Muirhead, J. D.[a,b,*], Kattenhorn, S. A.[c,b]

[a]Department of Earth Sciences, Syracuse University, 204 Heroy Geology Laboratory, Syracuse, New York 13244, USA

[b]Department of Geological Sciences, University of Idaho, 875 Perimeter Drive, Moscow, Idaho 83844, USA

[c]Department of Geological Sciences, University of Alaska Anchorage, Anchorage, AK 99508, USA

*corresponding author email: james.muirhead@fulbrightmail.org

Abstract

Inherited crustal weaknesses have long been recognized as important factors in strain localization and basin development in the East African Rift System (EARS). However, the timing and kinematics (e.g., sense of slip) of transverse (rift-oblique) faults that exploit these weaknesses are debated, and thus the roles of inherited weaknesses at different stages of rift basin evolution are often overlooked. The mechanics of transverse faulting were addressed through an analysis of the Kordjya fault of the Magadi basin (Kenya Rift). Fault kinematics were investigated from field and remote-sensing data collected on fault and joint systems. Our analysis indicates that the Kordjya fault consists of a complex system of predominantly NNE-striking, rift-parallel fault segments that collectively form a NNW-trending array of en echelon faults. The transverse Kordjya fault therefore reactivated existing rift-parallel faults in ~1 Ma lavas as oblique-normal faults with a component of sinistral shear. In all, these fault motions accommodate dip-slip on an underlying transverse structure that exploits the Aswa basement