Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05704, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05704
EGU General Assembly 2008

Geodetic constraints on rifting processes in East Africa

E. Calais(1), S. Stamps(1), L. Bennati (1) N. d'Oreye(2), T. Wright(3), I. Hamling(3), E. Saria(4), E. Lewi(5), C. Hartnady(6), R. Fernandes(7), C. Ebinger(8), R. Buck(9)

(1) Purdue University, USA, (2) ECGS, Luxembourg, (3) Univ. of Leeds, UK, (4) Ardhi University, Tanzania, (5) Geophysical Observatory, Ethiopia, (6) Umvoto Africa, South Africa, (7) UBI, CGUL, IDL, Portugal, (8) Univ. Rochester, USA, (9) Lamont-Doherty Observatory, USA

Most passive margins worldwide experienced magmatism prior to breakup, and many continental rifts experience magmatism coincident with rift initiation. This is the case for the East African Rift (EAR), the 5000 km-long series of seismically active structures that marks the divergent boundary between the Somalia and Nubia plates. Although the EAR is often cited as a modern archetype for rifting and continental breakup, its current kinematics is the least well-known of all major plate boundaries. We will first present a present-day kinematic model for the EAR derived from a space geodetic geodetic solution, earthquake slip vector directions, and 3.2 Myr-average spreading rates and transform-fault azimuths along the Southwest Indian Ridge. The combined data set supports a model that includes three subplates (Victoria, Rovuma, and Lwandle) between Nubia and Somalia, with total opening increasing from ˜1 mm/yr in southern Mozambique to 7 mm/yr in northern Ethiopia. This far-field plate divergence is generally thought to drive lithospheric stretching which, in turn, leads to upwelling and adiabatic decompression melting of asthenosphere. However, the role of rising melt on the plate rheology and on the force balance that governs continental extension remain poorly understood. We will use two case studies to show that far-field plate divergence in the EAR is accommodated during rifting events that involve a significant amount of strain accommodation by magma intrusion. The first one is the on-going Dabbahu rifting event in the Afar region of Ethiopia, in a quasi-oceanic rift setting. It in 2005 started with a 60 km-long dike intrusion, followed since by 6 addi-

tional (smaller) dikes. The second one is the July-August 2007 Natron seismic crisis (northern Tanzania), dominated by the first dike intrusion captured geodetically in a continental rift. The dike was triggered then accompanied by slip on normal faults. We will discuss how these events may help better understand rifting mechanisms in East Africa.