Geophysical Research Abstracts,
Vol. 11, EGU2009-11366-1, 2009
EGU General Assembly 2009
© Author(s) 2009

Present-day strain rates and dynamics of the East African Rift

D. S. Stamps, L. M. Flesch, and E. Calais

Department of Earth and Atmospheric Sciences, Purdue University, West Lafayette, IN, USA (dstamps@purdue.edu)

The forces and physical processes at work during continental rifting remain to be fully understood and quantified. We investigate the balance of large-scale forces affecting present-day rifting in East Africa using a thin sheet approach to quantify strain rates and deviatoric stresses. We develop a strain rate model constrained by a combination of GPS-derived kinematic models and seismic moment tensors (CMT catalog) for our region of interest. We estimate a total deviatoric stress field by combining (1) stresses caused by gravitational potential energy (GPE) gradients within the crust and (2) a buoyancy signal present in the topography that we use to compute stresses. To estimate internal body forces, we assume crustal thicknesses and lateral density variations modeled in Crust 2.0 (G. Laske and G. Masters, http://mahi.ucsd.edu/Gabi/sediment.html, 2000). In our preferred model of deviatoric stresses, we estimate and remove the dynamic topography buoyancy signal by allowing the mantle lithosphere density to vary, compensating the lithosphere to a given reference depth. To test the reliability of our total deviatoric stress field, we compare tensor patterns of deviatoric stresses, with and without contributions from the mantle, to tensor patterns from kinematic deformation indicators. Our results to date suggest that horizontal buoyancy forces arising from variable crustal thicknesses and lateral density variations within the lithosphere contribute significantly to the diverging plate boundary forces of the EAR but do not account for the entire budget of force needed to produce present-day deformation.