Shallow and Deep Earthquake Sequences Captured in the North Tanzanian Divergence, East Africa: Inferences on Seismogenic Processes and Rheology

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Abstract
Using a temporary local seismic network of 35 stations deployed in North Tanzania (SEISMOTANZ'07 experiment) during 6 months in 2007, we captured two earthquake sequences (Gelai and Manyara) occurring respectively in the southern end of the Kenya rift and in the North Tanzanian Divergence (NTD). None of the sequences depicts typical swarm or mainshock-aftershock patterns. Although distant of only ~150 km, their triggering mechanisms appear to be different. They highlight a major change in the magmatic/tectonic nature of the rift where the eastern branch of the Est African Rift enters the Tanzanian craton. Both depict similar shape and long-axis, emphasizing the preferred locus of active strain release along NE-SW discontinuities which probably root at depth into steep Proterozoic shear zones. At Gelai, the deformation is dominated by aseismic processes involving slow slip on a normal fault and dyke intrusion within the upper crust, and an interaction with the eruption of the nearby Oldoinyo Lengai volcano. At Manyara, the sequence reveals a long-lasting seismic activity deeply rooted (~20-35 km depth), possibly indicative of stress loading transmitted laterally. Focal solutions demonstrate a mixture of normal and strike slip faulting on sub-vertical inherited structures striking N60°E. The yield stress envelope modelled from the depth frequency distribution of earthquakes in Manyara is consistent with the presence of a mafic lower crust and further supports the strength increase of the rifted crust from south Kenya to the NTD.

Kerywords

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