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Focal mechanisms, stress field and crustal rheology in the North Tanzanian Divergence (East African Rift) inferred from local seismicity analysis

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We deployed a temporary local seismic network in the North Tanzanian Divergence (NTD) for 6 months in 2007 (35 stations, SEISMOTANZ'07 experiment). The region is characterized by major changes in the magmatic/tectonic nature of the rift, at the place where the eastern branch of the East African Rift enters the Tanzanian craton. More than 200 earthquakes were accurately located south of Lake Manyara (***Figure 1**, Albaric et al., in press)*.

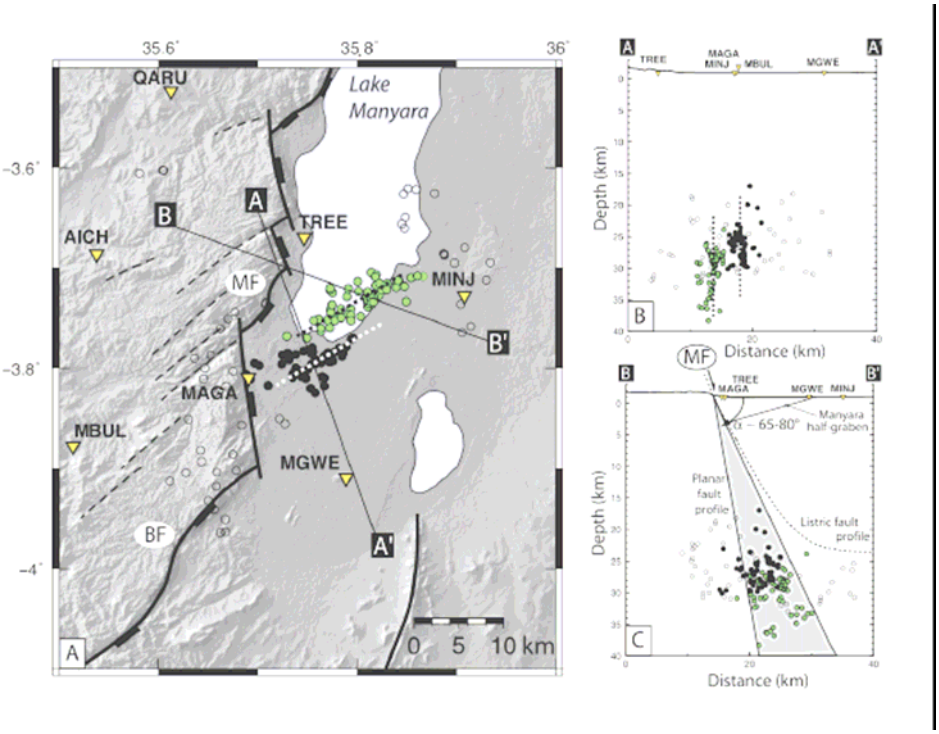


***Figure 1 :** A: Map of the seismicity in Lake Manyara. Thick lines delineate major faults and thin dashed ones the main N-E direction. Green and black circles refer to two distinguishable clusters while the rest of the seismicity is plotted with empty circles. The earthquakes are aligned along the N60°E direction (dashed line across clusters). B: Cross-section perpendicular to the direction of the clusters. arthquakes are arranged along two vertical zones (dashed lines) between 25 and 40 km for the northern one (green circles) and between 20 and 30 km for the southern one (black circles). C: Cross-section perpendicular to the mean direction of the segmented Manyara fault. The latter is projected downward into the earthquake sequence either as planar (thick line) or as listric (dashed line) profile. The "planar fault" hypothesis implies a fault surface dip in the range 65-80°, according to the location of the earthquakes. MF, Manyara fault; BF, Balangida fault. (From Albaric et al., in press).*

They form two main clusters rooted at ca. 20-35 km depth, i.e. significantly deeper than the neighbouring Natron-Gelai seismo-magmatic crisis of July-November 2007 (Calais et al., 2008). This apparently long-lasting seismic activity is surprisingly associated with significant NE-SW strike-slip faulting.

The preliminary stress field determined in Manyara is transtensive, with the minimum principal stress oriented WNW-ESE. From a non-linear inversion method using direct P, SV and SH wave

amplitudes (Simulated Annealing algorithm, Godano et al., 2009), we improve the double-couple focal mechanisms database, preliminarily determined with P wave polarities. The active structures determined depict clear links with the inherited structures of the basement, at the contact of the Tanzanian cratonwith the Proterozoic belt.

We also model the yield stress envelope of the crust from the depth frequency distribution of earthquakes. The results are consistent with the presence of a mafic lower crust and further support the overall tendency of strength increase of the rifted crust from south Kenya to the NTD (Albaric et al., 2009). It is suspected that deep fluid injections at subcrustal levels may trigger this anomalous activity in the lower crust.

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