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Interaction between an incipient rift and a cratonic lithosphere : The North Tanzania Rift seen from some seismic tools

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The North Tanzania part of the East African Rift is the place of an incipient break up of the lithosphere. This continental rifting happens on the edge of the Tanzanian craton, and their interaction leads to major changes in the surface deformation. The evolution of the rift and its morphology is strongly linked to the inherited structures, particularly the Proterozoic belts and the craton itself. It is thus of prime interest to image the structure of the craton edges to fully understand its impact on the localisation of the current deformation at the surface. Since 2007 different multidisciplinary projects have taken place in this area to address this question. We present here a work based on a collaborative work between French, American and Tanzanian institutes that started in 2013. About 35 seismological stations were installed for 2 years in the Natron lake region, and 10 short period instruments were added for 9 months in the Manyara area to record local and telesismic events. We have analysed more than a hundred teleseismic events to compute the receiver function, and we finally obtain a Moho map of the region as well as azimuthal distribution of converted phases.
The stations located on the edge of the rift and near the craton present a continuous evolution of their crustal pattern in the RF signal. Especially, we identify a clear phase at about 7s for those stations that corresponds to an interface separating a normal upper mantle from a very slow mantle at about 70 km depth. We first model those receiver functions to perfectly fit the signal, and more precisely the transverse component, which shows a strong and coherent pattern.
Second, the local seismic network we have installed for 9 months in Manyara region advantageously completed the 2007 SEISMOTANZ network. In this part of the rift the seismicity is deep (20-30 km) and clustered without any magmatism record at the surface, opposite to Natron area. We could then relocalize the deep seismicity observed in 2007 and 2014 within a new 3D velocity model based on the previous 1D velocity model obtained from the 2007 dataset. We discuss the new location of the seismicity in terms of rift-craton interaction and debate its origin: tectonic or magmatic?