Geophysical Research Abstracts
Vol. 16, EGU2014-14255, 2014
EGU General Assembly 2014

Ambient Noise Tomography of the East African Rift System in Mozambique

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Project MOZART – MOZAmbique Rift Tomography (funded by FCT, Lisbon) deployed a total of 30 temporary broadband seismic stations from the SEIS-UK Pool in central and south Mozambique and in NE South Africa. The purpose of this project is the study of the East African Rift System (EARS) in Mozambique. We estimated preliminary locations with the data recorded from April 2011 to July 2012. A total of 307 earthquakes were located, with ML magnitudes ranging from 0.9 to 3.9. We observe a linear northeast-southwest distribution of the seismicity that seems associated to the Inhaminga fault. The seismicity in the northeast sector correlates well with the topography, tracing the Urema rift valley. The seismicity extends to ∼300km, reaching the M7 2006 Machaze earthquake area.

In order to obtain an initial velocity model of the region, we applied the ambient noise method to the MOZART data and two additional stations from AfricaARRAY. Cross-correlations were computed between all pairs of stations, and we obtained Rayleigh wave group velocity dispersion curves for all interstation paths, in the period range from 3 to 50 seconds. The geographical distribution of the group velocity anomalies is in good agreement with the geology map of Mozambique, having lower group velocities in sedimentary basins areas and higher velocities in cratonic regions. We also observe two main regions with different velocities that may indicate a structure not proposed in previous studies. We perform a three-dimensional inversion to obtain the S-wave velocity of the crust and upper mantle, and in order to extend the investigation to longer periods we apply a recent implementation of the surface-wave two-station method (teleseismic interferometry), while augmenting our dataset with Rayleigh wave phase velocities curves in broad period ranges. In this way we expect to be able to look into the lithosphere-asthenosphere depth range.