ESC2016-364, 2016
35th General Assembly of the European Seismological Commission

35th General Assembly of the European Seismological Commission
4–10 September 2016
Trieste

Mozambique earthquakes: intraplate seismicity at the tip of the East African Rift System

João Fonseca (1), Ana Domingues (2), and Januka Attanayake (3)

(1) Instituto Superior Tecnico, University of Lisbon, Portugal, (2) IST, University of Lisbon, Portugal, and UCL, UK, (3) IST, University of Lisbon, Portugal (now at Universität Münster, Germany)

Central Mozambique (SE Africa) drew the attention of the seismological community in 2006, when it was rocked by one of the largest instrumental earthquakes in Africa: the M7 Machaze earthquake. Previously, Central Mozambique had been the locus of three moderate earthquakes (M6.0 to M6.2) between 1951 and 1957, and this time cluster included two additional earthquakes of similar magnitude at distances of several hundred kilometres, in Zimbabwe (1958; M6.0) and Southern Zambia (1959; M6.1). No seismicity of comparable magnitude was recorded in SE Africa in the subsequent five decades, until 2006. Besides strong clustering in time, these observations indicate spatial correlation over large distances. In this paper we present results from a) waveform inversion for the source parameters of the Machaze earthquake (Attanayake and Fonseca, 2016), b) surface wave tomography of Central Mozambique, highlighting the main structural features of the crust and upper mantle (Domingues et al., 2016), and c) local seismicity monitoring between 2011 and 2013 (Fonseca et al., 2014). A total of 176 broadband waveforms were inverted to constrain the source parameters of the Machaze earthquake. The best-fitting point-source model is consistent with previous results (Yang and Chen, 2008; Copley et al., 2012), showing a normal mechanism with anomalous 73º dip, and a high stress drop in the range 11-15 MPa. The Rayleigh-wave group velocity model of Domingues et al. (2016) shows that the epicentral area is in a zone of structural complexity where the transition from fast cratonic crust (to the west) to slow extended crust (to the east) has a sharp change of strike. In addition, the local seismicity reveals a $\sim$300km long linear trend that connects the epicentral region to the known structures of the EARS further north, with a clear relation to the transition of crustal types. We discuss how these observations may contribute to further the understanding of the mechanisms controlling intraplate deformation.