

AfricaArray studies of the lithosphere in sub-Saharan Africa

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The AfricaArray programme was launched in 2005 with a 20-year vision to establish research infrastructure, build capacity and conduct research in support of the mineral resources, geohazards, groundwater and environmental sectors in sub-Saharan Africa (Nyblade et al. 2008, 2011). The African continent provides many opportunities to investigate first-order questions related to the structure and dynamics of the Earth. In association with many African and international partners, AfricaArray has developed a 'backbone' network of 51 permanent geophysical observatories (a mixture of broadband seismometers, GPS stations and weather stations) in 19 countries and deployed more than 100 broadband seismometers in temporary arrays in Botswana, Cameroon, Madagascar, Malawi, Mozambique, Namibia, South Africa, Tanzania, Uganda and Zambia. We will provide a high-level review of the progress that has been made since 2005 by AfricaArray and its associates in expanding knowledge of the evolution of the African continent

Many investigations of the structure of the crust and mantle have been conducted using techniques such as body wave tomography and joint inversion of receiver functions and surface waves. The scale ranges from the continental (Julià & Nyblade 2013; Pasyanos & Nyblade 2007; Hansen et al. 2009a, 2012; Tedla et al. 2011) to the regional, for example the Kaapvaal craton (Kgaswane et al. 2009, 2012; 2013; Hansen et al. 2009b), the plateaus of East Africa (Adams et al. 2012) and Ethiopia (Brazier et al. 2008; Dugda et al. 2007, 2009), the basins of East and Central Africa (El Tahir et al. 2015; Raveloson et al. 2015; Inguane 2017) and the island of Madagascar (Andriampenanana et al. 2017; Pratt et al. 2017). Regions of active volcanism and rifting have been studied intensely, such as the Cameroon Volcanic Line (Adams et al. 2015; Reusch et al. 2010, 2011; Tokam et al. 2010) and the rift systems of East Africa (Accardo et al. 2017; Kim et al. 2009, 2012; O'Donnell et al. 2013, 2015; Park & Nyblade 2006; Shillington et al. 2016; Tuluka 2010) and the Red Sea (Hosny & Nyblade 2014). Geodynamic questions that have been addressed include the cause of the region of elevated topography (the African Superswell) and the connection (if any) to the Superplume (e.g. Adams & Nyblade 2011; Brandt et al. 2012; Hansen & Nyblade 2013; Huerta et al. 2009; Mulibo & Nyblade 2013a,b; Nyblade 2011), the origin of mantle anisotropy (Bagley & Nyblade 2013; Koch et al. 2012), and evidence for secular variations in crust-forming processes (Kachingwe et al. 2013; Tugume et al. 2012, 2013). The hazard posed by earthquakes has been addressed through seismotectonic studies in East and southern Africa (Mulibo & Nyblade 2009, 2016; Singh et al. 2009, 2011; Tugume & Nyblade 2009) and seismic hazard assessments in the DR Congo (Mavonga & Durrheim 2009; Mavonga et al. 2010) and along the East African Rift (Poggi et al. 2017).

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