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Dissecting hearts of the continent in southern Africa using first P-wave tomography based on local, regional, and mining-induced earthquakes

In the present study, the anatomy of the uppermost subcontinental lithosphere (USCL) under southern Africa is explored through the application of seismic tomography. The Kaapvaal and Zimbabwe cratons, which constitute the Precambrian hearts of the continent around which southern Africa was formed, are sliced using P-wave tomography to improve our understanding of the seismological structure of the USCL beneath the subcontinent. The tomograms of the USCL beneath the study area were determined from first P-wave arrival times generated by local, regional and mining-induced earthquakes recorded by 82 stations of the 1997–1999 Southern Africa Seismic Experiment that were supplemented by 3 International Monitoring System (IMS) stations located in the study area. The geotomograms provide a key constraint for understanding better the thermal, density and compositional variations in the region, and in advancing our knowledge of the assembly and modification history of continents through time. The present tomograms can be correlated with results from previous seismic studies in the area to detail the already known structural features and to find new structures. The results indicate that the P-wave structure in the study area is heterogeneous, and bring insight into the P-wave velocity anomalies associated with the USCL in southern Africa.

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