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Tomograms of the Uppermost Subcontinetal Lithosphere in Southern Africa Based on P Wave Arrival Times from Local, Regional, and Mining-Induced Earthquakes Recorded by SASE and International Monitoring System Stations

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Seismic tomograms of the uppermost subcontinental lithosphere (USCL) beneath southern Africa are key to improving knowledge of the correlation between the surface geology and velocity anomalies in the region. The regional distribution of seismic wavespeed anomalies (SWAs) provides a means to delineate known structural features and to find new regions of SWAs within the model space. Delineated SWAs enable a better understanding of the relationship between SWAs and the USCL density and thermal variations. The present study investigates the anatomy of the USCL beneath southern Africa by tomographic inversion of absolute P wave arrival times from local, regional, and mining-induced earthquakes recorded by 82 broadband stations of the 1997–1999 Southern Africa Seismic Experiment (SASE) and three seismic stations of the International Monitoring System (IMS) located in the study area. The P wave geotomograms were determined through the application of a hybrid iterative tomographic inversion method in which travel times and ray paths are calculated rapidly and accurately using a 3-D ray tracer, and the linearized iterative inversion utilizes the conjugate gradient-type LSQR algorithm. The reliability of the SWAs was assessed through checkerboard resolution test. The geotomograms determined in the present study indicate that the P wave speed structure of the USCL is heterogeneous across southern Africa.

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Promotional text

This work contributes to regional frontier seismological research by investigating the tomographic structure of the uppermost subcontinental lithosphere in southern Africa based on data from a transportable regional network and IMS stations.

Oral preference format

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