Upper mantle structure of Africa from full waveform tomography and long-period ambient noise

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To understand the tectonic development of the African continent and the interplay between its geological provinces, it is important to have good characterization of the lithosphere and upper mantle. However, our ability to obtain important constraints on the upper mantle structure is hindered by uneven and sparse instrumentation. In order to better understand the continent, we used long-period ambient noise full waveform tomography on data collected from 186 broadband seismic stations throughout Africa and surrounding regions to better image the upper mantle structure. We extracted empirical Green's functions from ambient seismic noise using a frequency-time normalization method, which allowed us to retrieve coherent signal at periods of 7-340 seconds. We simulated wave propagation through a heterogeneous Earth using a spherical finite-difference approach to obtain synthetic waveforms. We measured the misfit as phase delay between the data and synthetics, calculated numerical sensitivity kernels using the scattering integral approach, and iteratively inverted for structure. We will present results showing isotropic, shear wavespeed for the upper mantle beneath Africa. Some key observations include segmented, low upper mantle wavespeeds beneath the highly magmatic northern and eastern sections of the East African Rift System that shift towards the southwest at deeper depths, several low-wavespeed anomalies scattered through the shallow upper mantle beneath Angola and North Africa that may be connected to a deeper structure, and distinct high-wavespeed upper mantle anomalies, likely associated with cratonic roots.