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C21F-1514 - Crustal and Upper Mantle Structure beneath the Wilkes and Aurora Subglacial Basins, East Antarctica from Full-Waveform Ambient Noise Tomography.

Tuesday, 10 December 2019
08:00 - 12:20
Moscone South - Poster Hall

Swirl Topics

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Abstract

East Antarctica is covered by thick sheets of ice and is underlain by stable cratonic lithosphere, extensive mountain ranges, and subglacial basins. The sparse seismic coverage in this region makes it difficult to assess the crustal and mantle structure, which are important to understanding the tectonic evolution of the continent as well as the behavior of the overlying ice sheets. Present tomographic models lack resolution and are often inconsistent with one another; therefore, delineating sub-surface characteristics associated with old rift systems or structures that would allow us to assess the origins of the Wilkes and Aurora subglacial basins, for instance, becomes challenging. To overcome these limitations, we are using a full-waveform tomography method to model the crustal and upper mantle structure in East Antarctica. We have used a frequency-time normalization approach to extract empirical Green's functions (EGFs) from ambient seismic noise, between periods of 15-340 seconds. The ray path coverage of the EGFs is dense throughout East Antarctica, indicating that our study will provide new, high resolution imaging of this area. Synthetic waveforms are simulated through a three-dimensional heterogeneous Earth model using a finite-difference wave propagation method with a grid spacing of 0.025° (~ 2.25 km), which accurately reproduce Rayleigh waves at 15+ seconds. Following this, phase delays are measured between the synthetics and the data, sensitivity kernels are constructed using a scattering integral approach, and we invert using a sparse, least-squares method. The resulting shear-wave velocity model will be used to assess crustal and upper mantle features, ultimately aimed at resolving whether old rift systems exist within East Antarctica in relation to prominent subglacial basins. Preliminary results will be shared.

Authors

Ashish Kumar
University of Alabama

Erica Emry
Pennsylvania State University Main Campus

Samantha Hansen
University of Alabama