G012-0020 - Characterizing Crustal and Upper Mantle Structure in East Antarctica with Full-Waveform Ambient Noise Tomography.

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Abstract

The thick ice coverage and harsh climatic conditions in East Antarctica hinder detailed investigations of tectonic features, leading to debates regarding the origin and evolution of the Gamburtsev Subglacial Mountains (GSM), the Wilkes Subglacial Basin (WSB), the Aurora Subglacial Basin (ASB), and the Transantarctic Mountains (TAMs). Present tomographic models lack resolution and consistency given the minimal seismic coverage in East Antarctica. To further such investigations, we are using full-waveform ambient noise tomography to model shear-wave velocities and to constrain the crustal and upper mantle structure beneath East Antarctica. This approach utilizes Empirical Green's functions (EGFs), which provides information about the Earth structure between recording stations and is an alternative approach compared to many traditional tomographic models. EGFs from ambient seismic noise between periods of 15-340 secs are extracted using a frequency-time normalization approach, and 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). Phase delays are computed by cross correlating EGFs and the synthetics, and sensitivity kernels are constructed using a scattering integral approach. Preliminary results show slow velocities beneath both the WSB and ASB, possibly reflecting old rift systems or other inherited tectonic structures. A transition from slow to fast velocities beneath the Northern Victoria Land portion of the TAMs is consistent with thermal loading beneath the mountain range. Slow velocities beneath the GSM may be due to rifting associated with the extended Lambert Rift System. These preliminary results are currently being updated using a larger EGF dataset; our final model will be used to assess East Antarctic tectonic structures and to resolve the ambiguity associated with their origin models.

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