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Ambient noise waveform imaging of Yellowstone's magmatic system

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Understanding important characteristics of Yellowstone's magmatic system such as the melt fraction, composition, and geometric organization of melt are critical for improving our knowledge of volcanic processes and assessing the potential for future eruptions. While previous tomographic images have provided much insight into the magmatic system, imaging results are complicated by an incomplete understanding of how large crustal magmatic systems affect seismic waveforms. In particular, tomographic studies based on asymptotic methods may underestimate the seismic wave speed anomaly of the magma reservoir because first arriving energy may be diffracted around strong low wave speed anomalies. Here, we present a high-resolution shear wave speed model of Yellowstone's crust and uppermost mantle structure, based on the most up to date dataset of ambient noise correlation functions from broadband stations deployed in the Yellowstone region over the past two decades. This model serves as the starting point for an adjoint inversion, which has potential to improve resolution by incorporating more accurate sensitivity kernels based on realistic wave propagation physics. We discuss our adjoint tomography methodology and present the first model iterations. Continued iterations promise to sharpen features in the model which can provide new inferences into the present state of Yellowstone's magmatic system.