



Towards noise-based seismic tomography in Antarctica: data processing

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The primary goal of our research project is to improve on the current knowledge of the three dimensional structure of the Antarctic lithosphere producing a new continental-scale tomographic model. Seismic tomographic studies of Antarctica already exist, but they are generally based on earthquake data. Their resolution is limited not only by the scanty number of seismic stations on the continent — often, temporary stations installed on ice, whose quality is not on par with that of permanent seismic stations installed on rock — but also by seismicity being only present on the plate boundary.

The strategy we are using is to apply noise interferometric techniques to the continuous data recorded by seismic stations in Antarctica. This approach allows us to extract more information out of the available data, which is mostly made by seismic noise. This method may show particular value in Antarctica, considering the absence of continental seismicity. Interferometric techniques have shown unquestioned ability to map crustal structure using microseismic data, but also capacity to image mantle structure using the long-period seismic hum.

Instead of a classical cross-correlation, we are using a phase cross correlation approach, which appears to be more robust than the classical one in our use case, where input data is often not very clean. The results obtained with the two techniques will be shown and compared.

Here, we illustrate our current workflow, the present status of the analysis and the problems and challenges encountered while working with such difficult data, along with the strategies implemented to dynamically identify and discard problematic stations and data sections. A couple of noteworthy “pathological” examples will be shown.

Finally, some preliminary velocity maps for different period bands will also be shown.