



Structure of the Antarctic plate by analysis of surface-wave group speed and a global Haar-wavelet model representation

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The unique tectonic setting of the Antarctic plate — all surrounded by active ocean ridges, geodynamically stationary, and crossed by the largest asymmetric continental rift — make it a very interesting subject, that recently has received increased attention because of the International Polar Year (IPY). We present a seismic tomographic study targeted at improving the resolution of previous models, by virtue of an extended dataset and a multiresolution spherical-wavelet based model representation. We limit the present study to modeling laterally-varying fundamental-mode Rayleigh wave group speed, that is mainly related to the structure of crust and uppermost mantle. We use single-station dispersion analysis on the surface wave train to measure group arrival times of the Rayleigh-wave fundamental mode in the period range between 30 and 150 s. On each seismogram we iteratively apply a multiple filter — to identify group arrival times with frequency — and a phase-matched filter, to isolate the fundamental mode within the wave train. We then use dispersion measurements to compute two-dimensional maps of wave group speed in the region. We parameterize the Earth using nearly-orthogonal spherical Haar wavelets based on iterative subdivisions of the icosahedron. This representation is particularly suited to implement multi-resolution, as needed for a regional model embedded into a global one. The model shows with increased detail important features such as the narrow transition between cratonic structure in East Antarctica and accreted West Antarctica, separated by the Transantarctic Mountains bordering the rift. Inclusion of data from temporary experiments carried on within the IPY, as they become available, will locally further improve resolution.