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Monte Carlo method to determine an initial model for seismic wave attenuation tomography: Application to the central Chile-Western Argentina (30-34˚S) region.

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Slab geometries and more generally the determination of structures are mainly obtained by arrival time analysis and so far velocity models. The information contained in the amplitude of the seismic signals are very seldom used. However, studying the distribution of attenuation coefficients is recognized as a very useful tool to complement our knowledge of structural feature, in particular about temperature and fluid contents. While in velocity tomography the initial velocity models are generally well constrained (multilayered models), in general, in attenuation tomography studies, the initial model is commonly a half-space homogeneous constant-Q model and the final attenuation models strongly depend of the selection of the constant-Q value. So, in order to have a more initial realistic medium for attenuation tomography, we determine layered attenuation models using the probabilistic Metropolis-Hastings method. Thus, 3D attenuation models of P- and S-wave have been obtained independently, by inversion of parameter t* (=t/Q) calculated by fitting the spectral displacement amplitude of these waves. In this study, tomographic analysis of attenuation models have been performed in Central Chile-Western Argentina (30˚-34˚S) where there is a transition zone between a flat (north of 32˚S) and a steep (south of 33˚S) segment of the oceanic Nazca plate which subducts to the east, underneath the South American plate; the Juan Fernandez ridge subducts on the flat segment where Quaternary volcanic edificies are absent. The data we used are from CHARGE and CHARSME temporary networks of broadband stations deployed into the region at different periods of time. We suppose that between the two experiments, the properties of the medium have not change.

Around 18000 t* were inverted to get the attenuation Qp and Qs model. These models show mainly that:

1. the subducted Nazca plate is associated with high Qp and Qs values, characterizing low attenuation (cold material?) and with high P and S velocities.
2. south to 33˚S, a clear negative anomaly for both Qp and Qs at shallow depth ($<$20km) is related to the Quaternary volcanoe belt, probably due to high temperatures.
3. in the flat slab zone, underneath the Cuyania terrane, pervasive high negative Qp and Qs anomalies extend continuously from the flat slab to the surface. This region is densly fractured, which can facilitate the circulation of the fluids.