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# Looking through the Earth's crust: the troubles of crustal correction

Lapo Boschi, Eduard Kissling, and Men-Andrin Meier
Institute of Geophysics, ETH Zurich, Switzerland

The purpose of this study is to estimate the resolution at which we currently know the structure of the Earth's crust under Europe, and to determine whether or not finer models of the crust are needed to derive more detailed and reliable images of shallow mantle structure. From the point of view of global- and regional-scale seismologists, interested in the information that seismic data provide on far seismic events and deep Earth structure, the crust is a thin but very complicated lens, distorting their perception of the planet. Algorithms designed for lithosphere and mantle tomography typically do not treat the crust as a free parameter, because mantle-sensitive data generally lack the resolution of crustal structure needed to adequately map it; algorithms have been designed to account for crustal effects by the application of a linear correction to seismic observations. In global tomography, this approach has been found to result in a nonnegligible gain in model quality. "Crustal corrections" can be calculated in different ways. The relatively simple procedure of "station correction", based on averaging the travel times associated with all recordings made at a given station, is limited by the usually insufficient uniformity of azimuthal seismic coverage at stations. In recent years, authors have thus preferred to work towards the identification of a consensus, global model of crustal properties. Defining such a model is also problematic, because of the lack of direct, local seismic observations of crustal structure. Models like Crust5.1 and the more recent Crust2.0 are based on the idea that seismic analyses made at a particular location be valid at other locations characterized by an analogous tectonic setting: a global model can then be defined by extrapolation. These models have been verified to improve tomography resolution and the accuracy of earthquake location at the global scale, but, because of the very way in which they have been constructed, their resolution is bound to be limited. To quantify the improvement in data quality that such correction achieves for regional upper mantle tomography we apply a simple crustal correction based on model Crust2.0 to global and European databases of body-wave travel times, and we review a number of available, higher resolution crustal models for the region of Europe. This comparison leads us to conclude that the growth in tomography resolution of corrections based on Crust2.0 is negligible while for higher resolution crustal models it is significant.