Geophysical Research Abstracts
Vol. 20, EGU2018-7169-2, 2018
EGU General Assembly 2018

Local Earthquake Tomography using the Weak Anisotropy concept

Bohuslav Ruzek, Ivan Psencik, and Josef Horalek
Institute of Geophysics CAS, Seismology, Prague, Czech Republic (b.ruzek@ig.cas.cz)

A suitable parametrization of any anisotropic medium can be accomplished by using 21 "weak-anisotropy (WA) parameters" instead of using 21 elements of the 6x6 Voigt matrix. The WA parameters act as small perturbations of a background isotropic medium. Supposing WA parameters are small, approximate but sufficiently accurate formula for P-wave slowness, which is linear with respect to the subset of 15 P-wave WA parameters is available. This enables simple generalization of classical seismic traveltime tomography from isotropic to anisotropic media. There is no restriction regarding the symmetry of the medium (like limiting the model to hexagonal symmetry) and there is also no necessity of fixing spatial orientation of potential symmetry elements (axes, planes of symmetry). Output of the proposed approach is always 15 P-wave WA parameters per each illuminated tomographic cell, which approximate completely local P-wave velocity in any direction. The P-wave tomography behaves similarly as in the isotropic case, except the number of free parameters is 15-times higher and model resolution must be carefully selected according the data quality and quantity. As in the isotropic case, the weak-anisotropy approach can deal with both local earthquakes and/or explosions as seismic sources, the former requiring relocation anytime the velocity model has been changed.
We present briefly the mathematical background of the method. Then results of preliminary synthetic data inversion tests are used to illustrate key features of our approach. Finally, results of first attempts to invert real data from the REYKJANET local seismic network operated in Iceland, are presented, so far without geological interpretation. The main goal of the presentation is to present a new approach to a broader seismological community.