Geophysical Research Abstracts
Vol. 16, EGU2014-6078, 2014
EGU General Assembly 2014

Objective determination of the water level in frequency-domain deconvolution for receiver function analysis

Felix Halpaap (1), Kathrin Spieker (2), and Stéphane Rondenay (2)

(1) Friedrich-Schiller-University Jena, Department of Geosciences, Jena, Germany (felix.halpaap@uni-jena.de), (2) University of Bergen, Department of Earth Science, Bergen, Norway (kathrin.spieker@gmail.com, rondenay@geo.uib.no)

Deconvolution is the central operation carried out in teleseismic receiver function (RF) analysis. It transforms the recorded teleseismic signal into the Earth's impulse response by effectively removing the source and instrument responses from this signal. The operation can be carried out either in the time domain or in the frequency domain. Time-domain deconvolution is generally more computationally intensive, but it allows for automatic convergence towards a stable solution (i.e. an RF devoid of ringing) for noisy data. Frequency-domain deconvolution is faster to compute, but it often requires user input to find the optimal regularization/water-level parameter that yields a stable solution. In this study, we investigate ways to objectively determine the optimal water level parameter for frequency-domain deconvolution of teleseismic RFs. Using synthetic and field data, we compare various optimization schemes with L-curves that provide a tradeoff between the root-mean-square error, L2-norm, signal sparseness and spectral flatness of the computed RF. We find that maximising the spectral flatness of the computed RF is the best way to find the optimum water level. Applications to field data from central and northern Norway illustrate the viability of this objective optimization scheme. The resulting RF profiles show clear signals from the Moho (with relief associated with the central Scandes) as well as from the 410 and 660 km-discontinuities below Norway.