Geophysical Research Abstracts,
Vol. 10, EGU2008-A-04847, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-04847
EGU General Assembly 2008

Seismic anisotropy in the area of the German Regional Seismic Network (GRSN) using P-to-S converted phases.

C. Eckhardt, W. Rabbel
Institute of Geoscience, University of Kiel, ([ceckhardt,rabbel]@geophysik.uni-kiel.de)

Several studies based on SKS and Pn-residual analysis have shown evidence that the crust and/or the upper mantle are seismically anisotropic beneath the area of the German Regional Seismic Network (GRSN). The aim of our study is to estimate the crustal and mantle shares of seismic anisotropy by analyzing the polarization of P-to-S converted waves – receiver functions RF, generated at the Moho Pms and at the upper mantle discontinuities P410s, P660s. Since about 16 years the GRSN provides continuous seismological data records for most of its stations. Because of the long observation time the azimuth coverage of incidence angles is sufficient for the major part of stations $(18/25)$. For the analysis of P-to-S converted waves we selected 2455 events of magnitude $mb > 5.5$ in an epicentral distances of $0^{\circ} - 100^{\circ}$. To compute the receiver functions, of this data volume we set up an automatic process including the computation of various quality criteria. The processing steps included in the procedure are: (1) RF calculation in the ray coordinate system and back rotation in the radial system, (2) RF weighting based on the quality of polarization. Seismic anisotropy finds its expression in a directional dependence of seismic velocities and in the travel time delay between orthogonally polarized S-waves (S-wave splitting). For the estimation of S-wave splitting we used the energy minimization technique and an azimuthal stacking approach. The P-to-SV converted wave fields generated at the Moho show a frequency variation with azimuth, broading of amplitude peaks and an azimuth periodicity in amplitude strength. These are indications of both a thickness variation of a transition zone and existence of anisotropy. On the SH-component converted energy is observed, too. Its amplitude and polarity periodicity is 2 lobed for

most of the GRSN stations. Some stations show less than 360° or unclear periodicity. More than a half of the stations show equal directions for the crust Pms compared to SKS/SKKS studies. High delay times δt$> 0.5s$ are observed for crustal structures. To understand seismic anisotropy we computed back azimuth dependend reflectivity synthetic waveforms for two alternate models for station MOXa with mantle and crustal anisotropy each for 45° and 90° tilted symmetry axes. The main features of the seismograms are the periodicity of Pms Amplitude, energy to near zero time, the delay of travel time on radial, transverse component and the more complex multiple field of only crustal anisotropy. A first step forward simulation of the complete event geometry of station MOXa with $N30^\circ W$ oriented and 45° tilt of symmetry axis with 12% ”negative” crustal anisotropy express a more coherent image of observed RF. The symmetry axis based on Null detection coincides with the orientation of the regional stress system and with fast direction results of SKS/SKKS studies.