Geophysical Research Abstracts
Vol. 14, EGU2012-5132, 2012
EGU General Assembly 2012

Seismic Images of the Non-Volcanic Tremor Region around Cholame, California, USA

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We reprocessed the industry seismic reflection profile "WSJ-6" which is so far the only seismic profile crossing the San Andreas fault at the non-volcanic tremor region around Cholame. The profile "WSJ-6" runs from Morro Bay eastward to the foothills of the Sierra Nevada and crosses several prominent fault systems, e.g.the Rinconada fault as well as the San Juan fault and the San Andreas fault respectively. By applying the so-called Fresnel Volume migration to the data we produced seismic images of the lower crust and the upper mantle down to depths of approximately 40 km. A 3D tomographic velocity model derived from local earthquake data analysis (Thurber et al., 2006, Lin et al., 2010) was used for slowness analyses and traveltime calculations. The imaging technique was implemented in 3D taking into account the true shot and receiver locations on the crooked profile line. The imaged subsurface volume itself was divided into three separate parts to correctly account for the significant kink in the profile line near the San Andreas fault.

The most prominent features in the resulting images are areas of high reflectivity down to 30 km depth in particular in the central western part of the profile corresponding to the Salinian Block between the Rinconada fault and the San Andreas fault. Southwest of the San Andreas fault surface trace a broad zone of high reflectivity is located at depths between 20 km to 35 km. In this region non-volcanic tremor has been located below the seismogenic zone down to 30 km depth. Tremor locations correlate with zones of high reflectivity. This correlation may be an indicator for high pore pressures and fluid content in that region as it is assumed by several authors.

The images of the eastern part of the profile show slightly west dipping sedimentary layers in the area of the San Joaquin Valley that are folded and faulted below the Kettleman Hills.

Our imaging results will be compared to existing interpretations of the same data.