Seismic reflection images of the central California coast ranges and the tremor region of the San-Andreas-Fault system near Cholame

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The SJ-6 seismic reflection profile was acquired in 1981 over a distance of about 180 km from Morro Bay to the Sierra Nevada foothills in South Central California. The profile runs across several prominent fault systems, e.g. the Riconada Fault (RF) in the western part as well as the San Andreas Fault (SAF) in its central part. The latter includes the region of increased tremor activity near Cholame, as reported recently by several authors.

We have recorrelated the original field data to 26 seconds two-way traveltime which allows us to image the crust and uppermost mantle down to approximately 40 km depth. A 3D tomographic velocity model derived from local earthquake data (Thurber et al., 2006) was used and Kirchhoff prestack depth migration as well as Fresnel-Volume-Migration were applied to the data set. Both imaging techniques were implemented in 3D by taking into account the true shot and receiver locations. The imaged subsurface volume itself was divided into three separate parts to correctly account for the significant kink in the profile line near the SAF.

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 RF and the SAF. In the southwestern part strong reflectors can be identified that are dipping slightly to the northeast at depths of around 15-25 km. The eastern part consists of west dipping sediments at depths of 2-10 km that form a syncline structure in the west of the eastern part.

The resulting images are compared to existing interpretations (Trehu and Wheeler, 1987; Wentworth and Zoback, 1989; Bloch et al., 1993) and discussed in the frame of the suggested tremor locations in that area.