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The electrical resistivity structure across the San Andreas Fault zone near the SAFOD site - a regional magnetotelluric study

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New magnetotelluric data, acquired across the San Andreas Fault zone (SAF) near the SAFOD site, reveal the electrical conductivity structure of the crustal lithosphere. These models - in conjunction with local seismicity, seismic velocity tomography, seismic reflection profiles and surface magnetic anomaly maps - image the heterogeneous upper crust with the sedimentary sequences, the Franciscan subduction complex and terranes of Salinian granite. In particular, the seismicity along the SAF zone appears to be bent around the north-eastern edge of a large granitic body in a depth range from 2 to 8 kilometers. A lithological contrast in the vicinity or directly in the zone defined by the locations of seismicity is evident from the resistivity model. However, modeled conductivities in this depth range are not high enough for a significantly increased fluid volume and, associated with that, enhanced porosity of fractured rocks. This means that either there is no significant increase in the bulk porosity or there is only a narrow zone of increased porosity - too narrow to be resolved with magnetotelluric measurements. However, we do find a broad zone of enhanced conductivities, located two to five kilometers east of the active SAF. This zone can provid a link between the shallow fault zone conductor, topping the seismic region, and the lower crust. It also suggests a connection of the Coast Range Fault and the SAF at depth. The middle and lower crust below the SAF zone is generally conductive in a 20 km wide zone. A clear transition zone from brittle to ductile deformation which may be expected at a depth of app. 15 km cannot be deduced from our conductivity model. There are, however, indications for a localized conducting anomaly in the lower crust, which seems to coincide with a lower bound of the observed seismicity.