

Fluid/Rock Interactions in the Central Andean Subduction Zone Imaged by Geophysical Observations

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The lithosphere of the Central Andes (21°-24°S) has been investigated by the interdisciplinary collaborative research center program "Deformation Processes in the Andes" carried out by geoscientists of the Freie Universität Berlin, Technische Universität Berlin, the GeoForschungsZentrum Potsdam and the Universität Potsdam in close co-operation with geoscientific institutions in South America. Here geophysical studies are presented which monitor fluid/rock interactions in the downgoing slab and the overlying wedge. Extensive active (refraction and reflection studies) and passive seismic measurements give information of numerous petrophysical details of this young and extreme orogene. The pattern of intermediate depth seismicity as double seismic zone, which is caused by phase transformations, portrays the shape of the isotherms in the temperature range of 500°-700°C. Seismological tomographic 3-D studies of vp/vs and Qp in combination with magnetotelluric investigations reveal regions of hydration (serpentinization) and melting in the upper plate. Extreme low velocity regions show the distribution of partly molten rocks in the uppermost crust of the recent magmatic arc. Sections derived from receiver functions reveal the transition from basalt to eclogite in the downgoing slab. In addition geothermal studies along a trans-Andean section shows the distribution of the heat flow. There are well expressed changes in the petrophysical structure of the lithosphere in the upper plate in N-S direction, which may be correlated with the recent volcanic activities in the magmatic arc.