Heat Flow and Geothermal Potential Across the Central Andean Subduction Zone

M. Springer[1], and A. Förster[2], [1]GeoForschungsZentrum Potsdam, [2]Now at STATOIL, Stavanger, Norway

Terrestrial heat flow and lithospheric thermal regimes in the western part of South America are influenced by various geodynamic processes caused by the subduction of oceanic lithosphere along the continental margin. Recently measured and revised heat-flow values across the Central Andean subduction zone (between 60-75°W and 15-30°S) show a variability corresponding to different ongoing tectonic processes. It was of interest (1) to investigate the effect of the different processes on the lithospheric thermal situation and (2) to quantify the temperature conditions at depths greater than those penetrated by boreholes. This is not only of academic importance but also essential for elucidating the potential for geothermal energy use in these regions. Several scenarios of processes and parameters affecting the thermal conditions were investigated at regional scale and constrained by surface heat flow from the Nazca Plate in the west towards the Chaco Basin in the east. Low heat flow of 20 mW/m^2 in the Coastal Cordillera can be explained by low shear stresses along the plate contact between the Nazca Plate and the South American Plate; high values ranging between 50 and 180 mW/m^2 in the active magmatic arc and the Altiplano can be achieved by assuming locally ascending magma and/or near-surface fluid circulation. In the Andean foreland, heat flow of 40 mW/m^2 is slightly lower than the heat flow of about 50 mW/m^2 in the adjacent Brazilian Shield farther east. Comparison of the active margins of the North American continent and the Central Andean subduction zone shows a similar heat-flow pattern, but there are differences in the subduction parameters and consequently in lithospheric thermal conditions.