Geophysical Research Abstracts
Vol. 19, EGU2017-14707-1, 2017
EGU General Assembly 2017

Mechanisms of crustal shortening in the foreland of the central Andes, Argentina: insights from data-driven three-dimensional gravity, thermal and rheological modelling

Christian Meeßen (1,2), Magdalena Scheck-Wenderoth (2,3), Judith Sippel (2), and Manfred Strecker (1)

(1) Institute of Earth and Environmental Science, University of Potsdam, Potsdam, Germany, (2) GFZ German Research Centre for Geosciences, Section 6.1 Basin Modelling, Potsdam, Germany, (3) Institute of Petroleum and Coal, Structural Geology, RWTH Aachen University, Germany

Thin- and thick-skinned deformation styles in the foreland of the central Andes are the result of ongoing crustal shortening since the early Neogene. The mechanisms proposed for these different styles range from variations in subduction angle of the Nazca plate, lithospheric thickening to variations in temperature and strength of the crystalline crust. The latter hypothesis states a cold and strong lithosphere in the foreland of the Altiplano Plateau, facilitating thin-skinned shortening. In contrast, the foreland of the Puna plateau is proposed to be characterized by a warm lithosphere and strong upper crust, resulting in thick-skinned deformation. Whilst this hypothesis has been confirmed in numerical thermomechanical experiments, there is no evidence for this mechanism from data integrative modelling. We test this hypothesis by means of three-dimensional data integrative gravity, thermal and rheological modelling. Therefore, we constructed a lithospheric-scale density model of the foreland of northern Argentina and southern Bolivia using gravity forward modelling and inversion techniques. Into this density model we implemented sediment isopachs, data from receiver functions and densities from shear-wave velocities of the upper mantle. The model was verified using the observed Bouguer gravity anomaly. By assigning thermal and rheological properties to the modelled units we are able to quantify the strength of the lithosphere and test the predictions by the thermomechanical models.