

Tectonic and Neotectonic Style in the Salar de Antofalla Region of the Southern Puna (NW Argentina)

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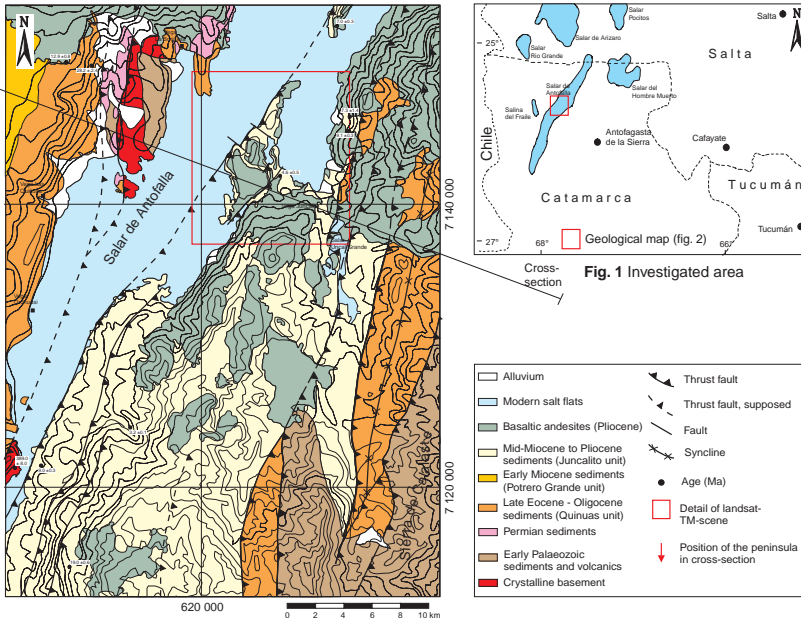


Fig. 1 Investigated area

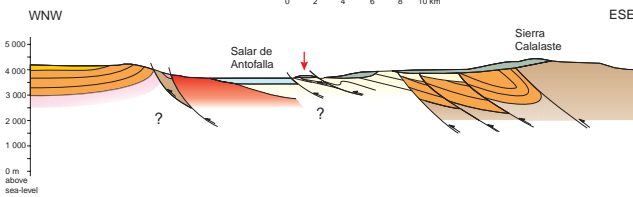


Fig. 2 Geological map and cross-section in the central part of the Salar de Antofalla area.



Fig. 3 WNW-verging thrust faults at the eastern rim of the salar. They are localized at the base of a Neogene halite-series.



Fig. 4 Tertiary fan sediments in offlap-onlap-disposition, indicating syntectonic sedimentation. They are in contact with upthrust early Palaeozoic meta-sediments.



Fig. 7 Eastern rim of the salar: In the foreground a fold-structure; in WNW-direction follows the imbricate structure.



Fig. 8 The series of reverse faults at the surface of the recent salar.



Fig. 9 Channel with a filling of fineclastic sediments, perpendicular to the striking of the imbricate structures.



Fig. 10 Gently ESE-dipping tilted block.

Tectonic style in the northern and central Salar de Antofalla

The area is characterized by NNE/SSW to N/S striking high-angle reverse faults and thrust faults. The crystalline basement and Palaeozoic sediments are involved. The style of deformation can be interpreted as "thick-skinned tectonics" (fig. 2), as observed in the adjacent Eastern Cordillera and the Subandes. The vergency in the Antofalla region is predominantly WNW to W, opposite to the direction of the tectonic transport in the Subandes and backthrusting is therefore assumed. In the Eastern Cordillera both directions of thrusting are observed.

The style of deformation depends strongly on the type of the involved rocks. Subhorizontal and flat thrusts in the Neogene continental red beds are common, whereas in the older sediments and metamorphites steep reverse faults prevail (fig. 3). Especially the Neogene limestones and gypsum beds reacted on the compressional forces with fold structures.

Large scale normal faults are missing, minor normal faults are especially frequent on both rims of the southern Salar de Antofalla and are interpreted as progressive step faults, triggered by gravitational effects.

The existence of strike slip faults has been proved at only few positions in the field, but a pattern of WNW/ESE to NW/SE striking lineaments are interpreted as sinistral lateral shifts (outside fig. 2). There is no field evidence for a pull apart origin of the Salar de Antofalla and the related Salina de Fraille basin. An interpretation as a "compressional basin" sensu COBBOLD et al. (1993), MIAL (1990) and LIU HEFU (1986) is preferred. The basin is on both sides delimited by reverse faults and overthrusts and subdivided by some WNW/ESE to NW/SE striking strike-slip-faults.

The importance of pre-Andean (oclyoc) or Cretaceous structures for the orientation of the Cainozoic tectonics is not well understood. They might be a good explanation for the NNW/SSE to N/S-striking of the reverse faults and overthrusts, which seem to be inconsistent with the stress-field induced by the convergence direction of the Nazca plate.

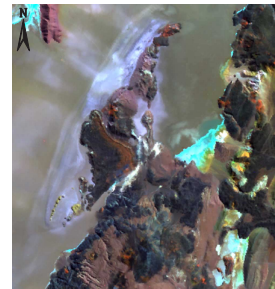


Fig. 5 Neotectonics: Detail from a landsat-TM-scene. Striae pattern and fold-structures WNW of the "peninsula".



Fig. 6 Detail from an aerial picture. The fold-structures and the striae-pattern WNW of the "peninsula" are clearly visible.

Neotectonics in the area of the recent Salar de Antofalla

Clear cut-signs of neotectonics, as alluvial fans or young volcanoes affected by faulting, are rare in this region and the seismic activity is low. But good evidence for the results of ongoing compressional forces are visible in the local deformation of the actual surface of the Salar de Antofalla:

Along the western rim of the "peninsula" (fig. 7, 8) the surface of the salar is locally uplifted and demonstrates an imbricate NNE/SSW striking structure. This structure is also well visible as a pattern of striae in aerial and satellite pictures (fig. 5, 6). Perpendicular to the strike of this structure are channels arranged, which are filled with fine-grained sediments. These channels can be interpreted as tension fractures (fig. 9).

An interpretation of this structure as a series of reversed faults result is supported by another small tilted block (fig. 10) 8 m high and gently dipping towards ESE.

In the adjacent part of the "peninsula" folded evaporates of a probable Late Tertiary age are outcropping showing an already advanced stage of compressional deformation

Further activities

- Collection of further indications of neotectonics
- Examination of the significance of pre-Andean structures for the style of Andean tectonics
- Kinematics analysis of the fault-system
- Determination of the tectonic deformation by balanced geological cross-sections
- 3D visualisation of the tectonic structures

References

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- LIU HEFU (1986): Geodynamic scenario and structural styles of Mesozoic and Cenozoic basins in China. – *AAPG Bull.*, 70 (4): 377–395.
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