



Transient electromagnetic investigations of sedimentary deposits for paleoclimate research in the Atacama Desert, Chile

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Claypans in endorheic basins along the Coastal Cordillera of the Atacama Desert (Chile) host unique records of the precipitation history of one of the major hyperarid deserts in the world. Most of these endorheic basins were formed due to the blocking of drainage related to tectonic movements. In order to provide detailed information about the sedimentary architecture and bedrock topography of selected claypans, a geophysical survey using the Transient Electromagnetic (TEM) was performed.

TEM method is an active electromagnetic method, where the decay of induced electromagnetic fields is measured using a Transmitter-Receiver separation shorter than the deepness of the investigated structure. With this method, it is possible to determine the depth of the bedrock down to a few hundred meters and the thickness of sedimentary sequences at a rather high survey speed. The method is sensitive to electrical resistivity changes in the subsurface, particularly to electrical conductors.

Extensive fieldwork was carried out in November 2018 taking measurements in three different claypans. For each site central, separated, and fixed loop measurements were performed with a transmitter size of 40x40 m using two different receivers with a different effective area. In total, more than 50 soundings were measured per claypan distributed along parallel profiles covering all three sites with rather dense soundings. The study was conducted within the collaborative research center CRC 1211 (EARTH - Evolution at the dry limit). The major focus of the presented geophysical survey was to derive suitable drilling locations for paleoclimatic research and to better understand the deposition regime.

Preliminary results indicate that in two of the sites a clear contrast between the conductive sediments and the bedrock was observed. First preliminary inversion of the TEM data using Occam and Marquardt Methods indicate a thickness of sediments about 90-120 m depending on the investigated claypan. The findings of this study provide the first indications of the geometry of the bedrock topography and of the sedimentary infill in the basin. The results correlate well with H/V seismic profile and borehole data available at the PAG main site. Eventually, our study can also provide valuable information on the spatial extent of lake deposits related to a paleo-lake.