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The Valle de Barrancas Blancas: landscape evolution of a hyper arid, high-altitude basin in the Atacama Andes

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The Valle de Barrancas Blancas represents a remote closed basin situated at elevations above 4850 m asl., west of the Ojos del Salado Massif (6893 m) and east of the Nevados Tres Cruces Massif (6748 m), in the High Atacama Andes of Chile (68°39' W, 27°02' S). Based on several mapping and field work campaigns through the last ten years we present initial results of landscape evolution research in this extreme environment.

The study area contains a series of well preserved landforms resulting from a unique combination of slope, aeolian, lacustrine/ litoral, fluvial, glacial and periglacial regimes. They permit reconstruction of the full range of geomorphological processes within this isolated catchment of approximately 160 km^2. Environmental evolution deduced from such archive combinations have not yet been described at all. Further, these preliminary studies reveal modern subsurface features, which were not documented before and are presumably crucial for e.g. water management within the area and beyond.

Particular features are intercalations of volcanoclastic material with some firn and ice layers. These formations provide insight into modern environmental processes. Prominent shore line features with distinctive pedological properties suggest a palaeolake succession with up to 12 stages. They may yield information about landscape evolution of the wider Andean Region which no other archive can provide. Stone pavement-covered, loess-like deposits indicate several periods of aeolian activity. Presumably the entire catchment exhibits permanently frozen ground at an average depth of 37.5 cm, covered by mostly dry, partially water-saturated sediment. This finding may lead to a better understanding of water sources, flow paths and, hence, water management strategies in High Atacama regions outside the Valle de Barrancas Blancas catchment.