



Karst evolution in the Cordillera de la Sal (Atacama, Chili)

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Rock salt composed of halite is at least three orders of magnitude more soluble than limestone. Because of this very high solubility rock salt rarely crops out extensively at the surface and is readily dissolved leaving insoluble residue (mainly clays and marls).

Rock salt can only survive at the surface where climate is extremely arid and normally displays a large set of typical solution morphologies similar to those developed on limestone. Solution of rock salt also leads to the formation of underground caves several km long.

Close to the village of San Pedro de Atacama, North of the Salar de Atacama basin, there is an important NNE-SSW trending elongated anticlinal ridge composed of Oligo-Miocene evaporitic rocks known under the name Cordillera de la Sal. The thick salt beds of this ridge, even in this hyperarid climate (mean annual rainfall is below 20 mm/y and there may be no rain for several years), have been karstified by occasional rains and have a well developed surface karst geomorphology with extremely sharp rillenkarrren often isolating salt pinnacles of up to 15 m in height.

During the past 10 years interesting salt caves have been discovered in these halite beds and a detailed morphological study has been carried out both at the surface and in the most important caves with the aim of understanding the mechanisms responsible for their formation and evolution. Sixteen wood and bone fragments from the ceilings of caves and from diamictons in passages have been AMS radiocarbon dated, allowing us to determine when the cave systems formed and when the major sediment units were emplaced.

In fact, cave formation appears to have been very rapid, with development of huge cave passages in salt (more than 10 m wide and 30 m high) in less than 2,000 years. Moreover, detailed surveys of cave morphology (e.g. meanders, erosion benches) and sediments (diamictons) suggest that the caves were formed by short-lived flash floods, probably produced by single extreme rainfall events. The longest cave systems in the salt have large drainage basins, while the best preserved (and older) caves occur where the recharge area is smaller.