

HALITE, EXTANT LIFE, PERMIAN SALADO FORMATION, AND MARS. R. M. Holt¹ and D. W. Powers¹,
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Introduction: Bacteria recovered from 250 Ma halite of the Permian Salado Formation¹ and discovery of chloride salts on Mars^{2,3} converge as a point of interest in the search for life on Mars. Other positive findings of viable bacteria in more recent⁴ to ancient salt⁵ buttress the initial controversial claim, although the entire subject was overshadowed for years by controversy over the initial claims of viable bacteria in ancient salt^{6,7}. Cellulose has been recovered from Salado halite⁸, and DNA⁹ and other organic material¹⁰ have been recovered from ancient halite.

Examples of biological materials preserved in halite of varying age are now becoming numerous. The Salado exhibits features that can be confidently assigned as synsedimentary or Permian in age¹¹. Recognizing these features in small samples is more difficult, and the samples examined during this conference illustrate the scale relationships.

Cyclical Halite Features and Processes: Depositional cycles are well established as a feature of the Salado¹². Continuous vertical sequences mapped in large diameter shafts through Salado halite (Fig. 1) are summarized (Fig. 2) in an idealized depositional cycle¹¹. Upward desiccation was common. Subaerial exposure resulted in solution pits and pipes and concentration of insoluble minerals, mainly clay. Dissolution pipes were cemented with halite before the overlying beds were deposited. These cements were often called “recrystallized” salt in earlier descriptions.

As desiccation continued (often multiple episodes of exposure) and the brine table (phreatic zone) dropped, pipes of various sizes and depths formed, desiccation cracks and saucers developed, and the uppermost zone likely was reorganized and possibly compacted, similar to pedogenesis.

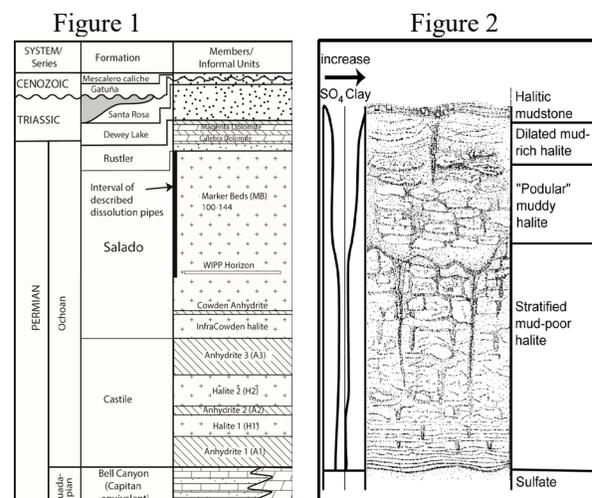
Scaling and Details: We focus on the macroscopic features of Salado halite; dissolution pipes and the repeating elements of the depositional cycle were observable in large-diameter shafts and underground at the Waste Isolation Pilot Plant (WIPP). Other studies have focused more on finer details¹².

Continuous core (10 cm diameter) through ~400 m of the upper Salado was obtained in borehole C3977 early January 2017. C3977 is located ~365 m west of the air intake shaft where the Salado was mapped in most detail¹¹. Core recovery was essentially 100%. A report can be accessed through ResearchGate: https://www.researchgate.net/publication/324597439_C3977GeologyReportFeb2018_4-18-18.

Nearly all map units from the air intake shaft can be correlated directly with core. Lateral variations within the mapped shaft area can account for virtually all differences. In particular, some exposure intervals internal to a cycle may be disrupted in the core by a dissolution pipe. Conversely, dissolution pipes clearly exposed in the shaft interval may be missed in a smaller diameter core or partially exposed. In addition, boundaries of dissolution pipes discernable in the shaft may be inferred in core only through the disparity in crystal size and clarity.

The core will be compared to shaft mapping details. Interpreted large features only partially represented in core can be discussed and examined carefully.

A new, large-diameter (~9 m) shaft to be constructed at the location of the corehole may offer research opportunities that can be discussed.



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