Resolving the Timing of Mineral Growth in Searles Lake, California: A Holocene-Pleistocene Analog to Ancient Saline Alkaline Lakes

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ABSTRACT

Ancient saline, alkaline lake deposits are important economic resources of oil shale and sodium carbonate evaporites, called soda ash. Despite numerous investigations, the precise environmental and chemical conditions under which these economic deposits form remains unclear and debated. Complex mineral-brine reactions and saline mineral precipitates may obfuscate depositional indicators, thereby complicating paleoenvironmental interpretations and adding uncertainties to modeling approaches. Determining the environment of deposition, and differentiating between syndepositional and later burial diagenetic mineral growth is a crucial prerequisite to understanding the sedimentological and geochemical origin of oil shales and sodium carbonates formed in hypersaline lakes. Searles dry lake, southeastern California, is a Holocene-Pleistocene analogue to ancient saline, alkaline lakes. A new drill core, SLAPP-SRLS17, taken from Searles Lake in January 2017, extends from the surface to 76 m and records closed-basin lake deposition through the past 140 kyr. Preliminary X-ray diffraction analysis suggests a diverse assemblage of evaporite minerals, making the new Searles drill core an ideal candidate for resolving the timing and nature of the diagenetic and evaporite mineral facies found in saline, alkaline lakes. This project will incorporate multiple analytical approaches, including analysis of sedimentary structures, petrography, x-ray diffraction, scanning electron microscopy, and laser ablation ICP-MS. The goal of this project is to establish criteria for differentiating syndepositional and burial diagenetic mineral growth in relation to paleoenvironmental and geochemical conditions, thereby resolving interpretations of ancient analogues.

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