Evidence for a Brackish to Hypersaline Paleodepositional Environment, San Elijo Lagoon, California

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Abstract

Pore-water chemistry data were obtained from continuous cores of the upper 33 m of sediment beneath the San Elmo Lagoon near San Diego, California. These cores were collected during investigations of a deep test well and pore-water samples were extracted from the bottom end of each core using a hydraulic press. The analytical protocol for the pore-water samples included major ions and stable isotopes of iodide, oxygen, and strontium. These data were combined with lithologic information collected during drilling and with 19th-century United States Coastal Survey maps of the Southern California coast to gain a better understanding of the natural environment of the San Elmo Lagoon over geologic time.

Geologic Framework

Lithologic information was compiled from descriptions of drill cuttings and from observations recorded during drilling, along with additional data collected during conventional log analyses. The cores were then divided into distinct depositional intervals.

Pore-water Chemistry

Continuous cores were collected from the upper 33 m of the core test well. A total of 4973 mg samples were analyzed for major ions and stable isotopes of iodide, oxygen, and strontium. These data were combined with lithologic information collected during drilling and with 19th-century United States Coastal Survey maps of the Southern California coast to gain a better understanding of the natural environment of the San Elmo Lagoon over geologic time.

Atlas of U.S. Coast Survey T-Sheets, 1851-1889

T-Sheets were produced in 1887-1889 and show San Elmo Lagoon and the northeastern edge of the San Diego Lagoon. The area covered by these T-Sheets is not currently mapped in detail and therefore serves as a valuable guide to the coastal geography of the region. The T-Sheets are available online at the National Archives and Records Administration website.

Significant Findings

1. Lithologic information and recent geologic logs collected during the drilling of a test well in a depth of about 340 ft. indicated the stratigraphic units in the area of San Elmo Lagoon were deposited during the Pleistocene Epoch. The stratigraphy is characterized by alternating sandy and clay-rich layers.

2. Pore-water chemistry data from continuous coring of the upper 33 m of the core test well provided evidence for the evolution of depositional conditions beneath the San Elmo Lagoon over geologic time.

3. Paleogeographic surveys of the Southern California coast show the natural environment for the San Elmo Lagoon during the 19th century consisted of a shallow tidal lagoon with some wetland areas.

References


