A study of salt domes in the Carboniferous Wallace Sub-Basin, Nova Scotia, Canada

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Through fluid inclusion analysis the paleoenvironment that existed during evaporite formation can be determined when considering undeformed salt deposits. However, inferring the paleoenvironment of salt diapirs becomes more difficult due to recrystallization processes that occur during deformation. The Wallace No. 1 core was drilled into one such salt dome located in the Cumberland Basin in the northern Nova Scotia. The drill hole penetrated through the eastern flank of a large anticline cored with evaporites; mainly halite, anhydrite, gypsum and lesser occurrences of sylvite and carnalite. This deposit is heavily deformed, with preserved beds dipping between 40 and 60 degrees. These circumstances make it more difficult to determine seawater chemistry from conventional methods, such as fluid inclusion studies. However, preserved beds of mudstone do exist along with clear and dark grey-banded halite layers. In addition, thin sections depict preserved 'snow-on-roof' textures, with halite crystals being capped by anhydrite, exhibiting cyclic repetition. These preserved bedforms and textures indicate the possibility that not all of the deposit was reset during deformation. Through examining anhydrite grains, and looking at the trace elements incorporated into their structure, modeling techniques can be applied to examine, indirectly, ancient seawater compositions. These compositions can then be compared with existing data from nearby, undeformed samples, and modern analogs, to determine whether salt domes can preserve original seawater geochemistry despite deformation and recrystallization processes. If this is the case, salt domes may be used to help to constrain the paleoenvironments that existed during their early formation.

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