

Sedimentology and Facies Analysis of the Jurassic Summerville Formation, Utah – A Potential Analog for Martian Mudstones

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ABSTRACT

Subtle features in mudstones can reveal a great deal about the sedimentological history of those sediments. Mudstones on Earth commonly have some degree of bioturbation that has destroyed portions of the primary sedimentary structures and influenced the chemistry of that system. These added complications makes using terrestrial mudstones as Mars analogs a more complicated process.

The Jurassic Summerville Formation of the Colorado Plateau was deposited in a hypersaline, marginal marine environment that was likely only capable of supporting life in the form of microbes, algae and organisms of similar hardiness. The abundance of calcium sulfate, lack of macro organisms, and the presence of sedimentary features that have already been observed in Mars rover investigations, make the Summerville a valuable Earth analog for the study of Martian mudstones.

The chemically harsh but low-energy physical environment of the Summerville is comparable to Martian environments, even though there are fundamental differences to Earth in terms of physical boundary conditions. Summerville evaporites, particularly calcium sulfate filled syneresis and desiccation cracks, have potential to help us better understand Martian sedimentary processes. Though rare in the sedimentary rock record, syneresis cracks, subaqueous mudcracks formed due to a salinity induced collapse in clay structure, are well-preserved in the Summerville. Because syneresis depends on water chemistry, studying these features on Earth has the potential to find thresholds of water salinity that might be applicable to Mars.