



Acidic Alteration Environments at Valles Marineris, Noctis Labyrinthus and Mawrth Vallis

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Unique surface materials have been discovered at Valles Marineris, Noctis Labyrinthus, Mawrth Vallis, and elsewhere that have CRISM features distinct from those of any known minerals. Typically these unusual sites are found in light-toned outcrops or interior layered deposits associated with phyllosilicates and/or sulfates. We term these units “doublet” materials because they exhibit a doublet absorption in CRISM spectra between 2.2 and 2.3 μm . We are investigating the spectral signatures of these outcrops compared to lab spectra of minerals, mixtures and alteration products. We’re also evaluating the stratigraphy of these unique alteration phases compared with neighboring phyllosilicate and sulfate units.

A similar 2.2-2.3 μm doublet has been observed in spectra taken of acid altered clays produced in the laboratory. The band centers and relative intensities of these Martian doublet features vary greatly suggesting that a process such as acid weathering could be acting on OH-bearing minerals to produce altered phases that differ depending on the type of substrate, water/rock ratio, solution chemistry, and duration of aqueous processes.

Because these unique materials occur in many regions across a range of times on Mars, acidic alteration may have been a key process at local and regional scales throughout Martian geologic history. Constraining the types of acidic alteration that have taken place on Mars will assist in defining the aqueous geochemistry at these sites.