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Aqueous Alteration at a Delta in Eastern Libya Montes

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Libya Montes hosts ancient Noachian basalt altered by hydrothermal action from the Isidis impact, olivine- and pyroxene-bearing lavas from the Syrtis volcanic outflows, multiple craters that have excavated these geologic units, and numerous Hesperian-Amazonian-aged fluvial features that carved channels across the surface and may have transported material downward towards Isidis. Mineralogical analyses of a delta region in Eastern Libya Montes using recently available MTR3 CRISM images have revealed the presence of carbonate in additional to Al-, Fe-, and Mg-bearing phyllosilicates. We are investigating the origins of these aqueous components through stratigraphical and morphological analyses. We hypothesize that the carbonate and Fe/Mg-phyllosilicates are alteration products of the ancient basalt and that the Al-smectite formed as a result of the delta and more recent lacustrine or fluvial processes. The Al-smectite spectral features are most consistent with beidellite, which forms at elevated temperatures compared to montmorillonite. We seek to determine if the beidellite likely formed in warm delta waters or if it may have formed via burial diagenesis and was then excavated by the delta.

Newly developed CRISM parameters are being utilized for analysis of the MTR3 versions of CRISM images FRT0000B0CB and FRT0001E2F2 in the fan and delta region of eastern Libya Montes. The MTR3 images feature joined short-wavelength and long-wavelength images and improved spectral signals through new atmospheric separation and noise removal techniques. This enables better detection of spectral signatures from small outcrops of aqueous components. We have placed these new CRISM mineral maps over HRSC stereo images to evaluate the stratigraphy of the aqueous components in relation to the ancient basalt and Syrtis lavas as in previous analyses of the central Libya Montes region. Coordinated CRISM-HiRISE views are expected to provide insights into the morphologies of the aqueous units as in recent studies of other sites at Libya Montes.