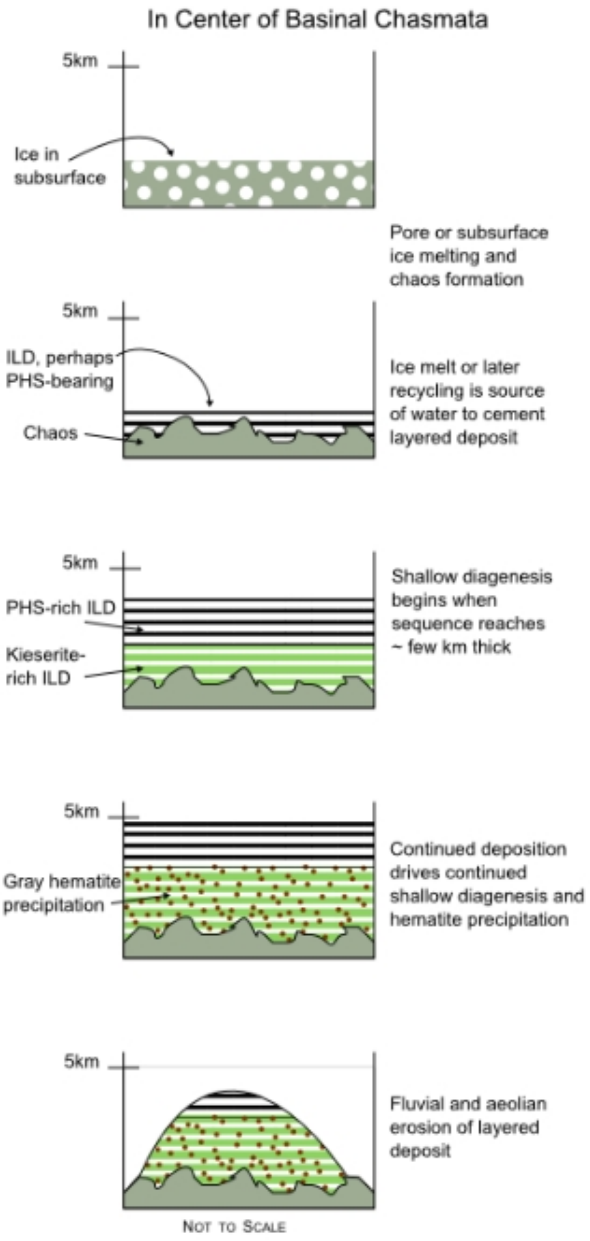
SULFATES IN VALLES MARINERIS AND IMPLICATIONS FOR MARS' AQUEOUS HISTORY. L.H. Roach[1], J.F. Mustard[1], S.L. Murchie[2], and J.L. Bishop[3], [1]Brown University, Box 1846, Providence, RI 02912. Leah_Roach@brown.edu, [2]Johns Hopkins/APL, Laurel, MD 20723, [3]SETI Institute/NASA-ARC, Mountain View, CA 94043.

Introduction: Mapping the type and distribution of hydrated mineralogy is one way to track the aqueous history of Mars. Sulfates are a potentially good tracer of past climate because they form by aqueous processes, so their presence, volume, and process of formation can characterize how much water was available. The sulfates in Valles Marineris (monohydrated Mg or Fe sulfate and polyhydrated sulfates (PHS) of undetermined cation(s)) occur in regionally consistent stratigraphy with red hematite. Together, the alteration mineral assemblage may represent earlier shallow diagenetic alteration.

Datasets: Mapping of sulfate distribution was extrapolated from spectral interpretation of near infrared CRISM (Compact Reconnaissance Imaging Spectrometer for Mars) data at targeted (~20 m) and mapping (~200 m) resolution [1]. HiRISE (High Resolution Imaging Science Experiment) [2] and CTX (Context Imager) [3] data were used to extend sulfate mapping beyond CRISM coverage. Red hematite and other iron phases were identified through spectral analysis of visible CRISM wavelengths (0.4-1.0 μm).

Spectral results: We identified kieserite ($MgSO_4 \cdot H_2O$), PHS of unknown cation(s), red hematite, and other, undetermined ferric phases in light toned layered deposits within many of the Valles Marineris basinal chasmata (Capri, Candor, Melas, Ophir, and Ganges) [4]. Gray hematite had previously been mapped in many of the same locations [5, 6].

Stratigraphic results: The stratigraphy of sulfates and iron oxides in the light toned layered deposits across the basinal chasmata had several key elements in common: (1) PHS on top of kieserite in a horizontal contact; (2) crystalline red hematite associated with kieserite bedrock but not with PHS; (3) other ferric oxides sometimes present at the base of the sulfate-bearing layered deposits. Fig 1 is a schematic for how the alteration materials could collect in layered deposits within basinal chasmata. One plausible formation process is that the kieserite and crystalline red and gray hematite could have formed by diagenesis of sulfate-bearing sediments as a consequence of burial and/or a higher heat flow early in the chasma's history. This diagenetic process would be active in the lower parts of any deposit > few km; upper units would remain unaltered. Shallow diagenesis of sulfate-rich sediments may be responsible for the sulfate and iron oxide stratigraphy expressed today throughout Valles Marineris.



References:

[1] Murchie S.L. et al. (2007) *JGR,* 112. [2] McEwen, A.S. et al. (2007) *JGR*, 112. [3] Malin, M.C. et al. (2007) *JGR*, 112. [4] Roach et al. (submitted) *Icarus*. [5] Christensen, P.R. et al. (2001) *JGR*, 106. [6] Weitz, C.M. et al. (2008) *JGR*, 113.