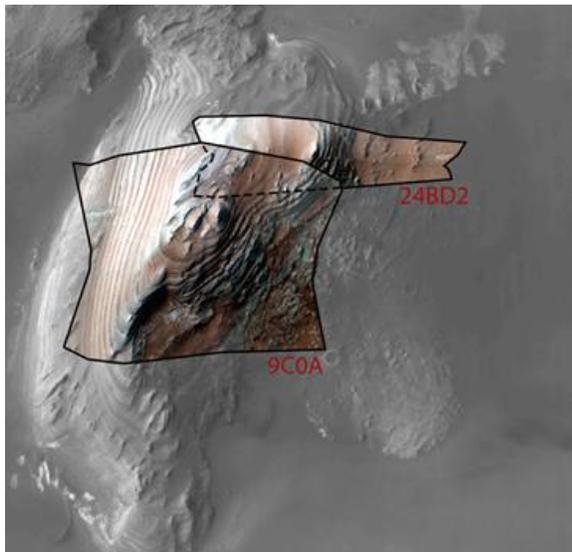


**CRISM ANALYSES OF JUVENTAE CHASMA: MINERALOGY AND MORPHOLOGY OF INTERIOR LAYERED DEPOSITS AT MOUND B.** A. J. Noel<sup>1,2</sup> and J. L. Bishop<sup>1</sup> <sup>1</sup>SETI Institute (Mountain View, CA), <sup>2</sup>Univ. of Calif. Davis (Davis, CA, ajnoel9@gmail.com).

**Introduction:** Juventae Chasma is a 3 km deep depression located approximately 500 km northeast of Valles Marineris. The chasma contains four light-toned layered sulfate-rich mounds, or interior layered deposits (ILDs), informally named A-D from west to east. These mounds are composed of both monohydrated and polyhydrated (PHS) sulfates [1, 2]. This work focuses on the mineralogy and morphology of Mound B, located at 297.7 E, -4.4 N (Figure 1). Mound B is approximately 25 km in length and 10 km in width, rising from -2800 m to -266 m in elevation [3].

We are building on previous analyses using additional CRISM images that have been acquired of Mound B. Our investigation takes advantage of improved CRISM calibration and an expanded spectral library of sulfate minerals [e.g. 4]. This should allow us to narrow down the possibilities of PHS, distinguish between the monohydrated sulfates kieserite and szomolnokite, and look for new minerals in the region.



**Fig. 1** CTX image of Mound B with CRISM images FRT00009C0A and FRT00024BD2 overlain.

**Methods:** CRISM targeted hyperspectral (FRT) images collect data at 544 channels from 0.36-3.9  $\mu\text{m}$  at 18 m per pixel. Data are processed for instrumental effects using the latest radiometric calibration (TRR3) [5], converted to I/F, and corrected for atmospheric effects using a ratio to Olympus Mons [6].

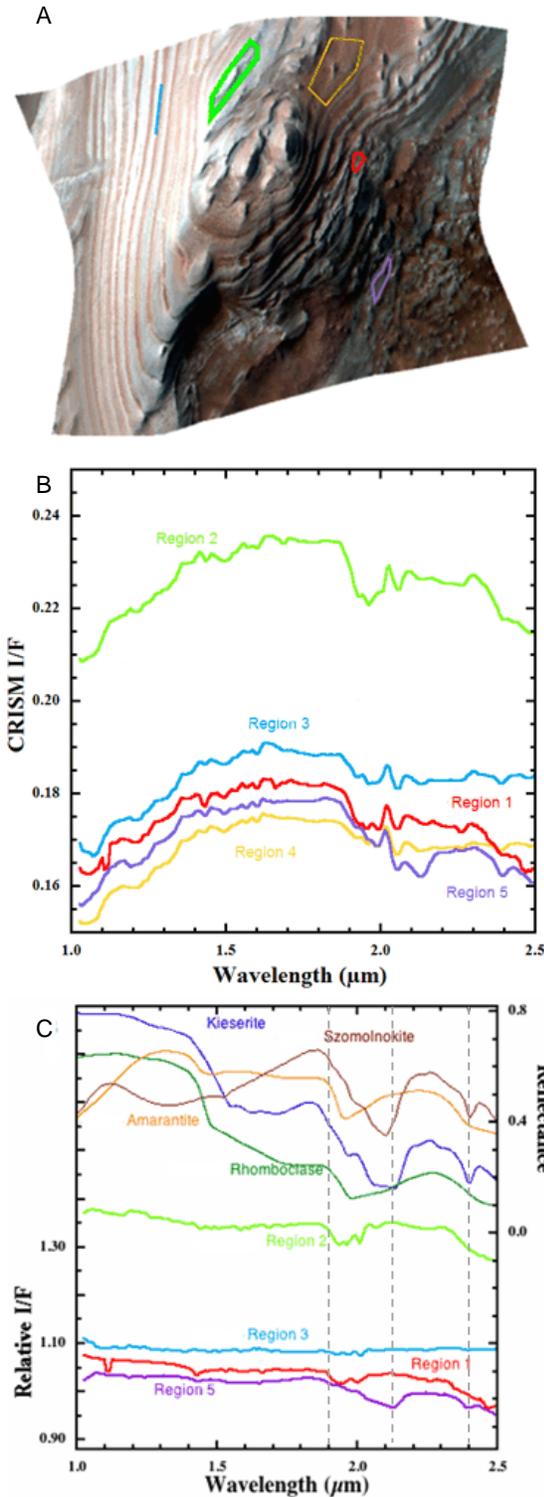
Band math calculations are used to create parameters that highlight spectral features specific to certain minerals in order to map trends in mineralogy. To reduce noise, spectra are collected from regions of interest (ROIs) or averaged from 5x5 pixel regions. Spectra

are ratioed to regions that are spectrally unremarkable when possible; however, this poses challenges for the Mound B region of Juventae Chasma as there are signatures of sulfates throughout most of the images.

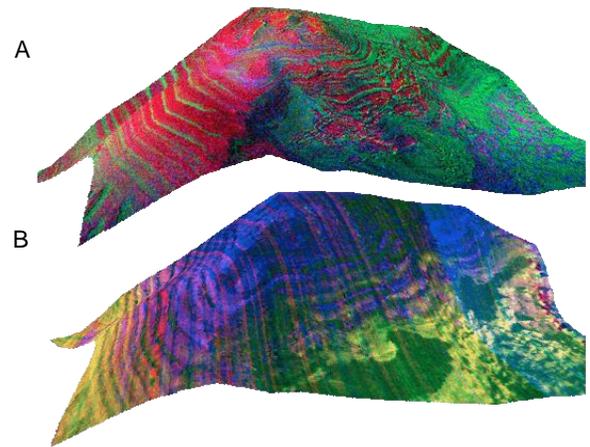
**Results:** Analyses of multiple CRISM images indicate that both monohydrated and polyhydrated sulfate minerals are present in Mound B. We performed detailed analyses on CRISM images FRT00009C0A and FRT00024BD2. In-column ratioing was not possible for these images as sulfate signatures were ubiquitous even in the reddish-colored regions containing dust/sand.

Several ROIs were identified for FRT00009C0A that represent different units in Mound B (Figure 2). Region 3 collected along the dust-covered horizontal between slopes of the sulfate mound exhibited the least sulfate signature and was used as the denominator for spectral ratios. Spectra of regions 1 and 2 both exhibit a broad band near 1.96  $\mu\text{m}$  due to  $\text{H}_2\text{O}$  that is consistent with hydrated sulfate spectra. Differences in brightness between regions 1 and 2 could be due to lighting as well as dust cover. The region 2 spectrum has a band near 2.4-2.5  $\mu\text{m}$  that is also consistent with many hydrated sulfates. The region 1 spectrum also has a drop in reflectance near 2.5  $\mu\text{m}$ , but has a different spectral shape that may indicate a change in mineralogy. The region 5 spectrum has a broad band from 2.0-2.19  $\mu\text{m}$  with a band minimum at 2.14  $\mu\text{m}$  and an additional band centered at 2.39  $\mu\text{m}$ . This is similar to the spectra of both kieserite ( $\text{MgSO}_4$ ) and szomolnokite ( $\text{FeSO}_4$ ), but is a better match for kieserite.

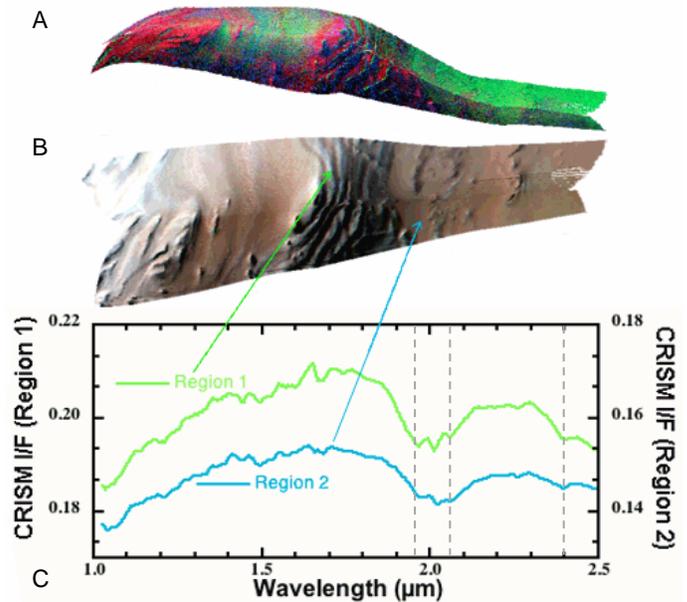
Two regions were identified for FRT00024BD2 that occur as brighter and darker units (Figure 4a,b). CRISM I/F spectra are dominated by atmospheric features near 1.9-2.1  $\mu\text{m}$ ; however, some qualitative differences can be discerned. The region 2 spectrum collected from the red sand region at the base of the mound has a broad band from 1.96-2.08  $\mu\text{m}$  with a minimum at 2.08  $\mu\text{m}$  and an additional band at 2.4  $\mu\text{m}$  consistent with monohydrated sulfate. Region 1, collected from a light toned layer, has a spectrum that also has a broad band from 1.96-2.08  $\mu\text{m}$ , but with a minimum near 1.96  $\mu\text{m}$  and a drop in reflectance near 2.4  $\mu\text{m}$ . This is consistent with PHS or a mixture of PHS and monohydrated sulfate. Results from 24BD2 are consistent with 9C0A, with PHS primarily at the top of the mound, a mixture of PHS and monohydrated sulfates along the slopes, and monohydrated sulfates at the bottom.



**Fig. 2** FRT00009C0A a) CRISM image with ROI locations, b) raw spectra, and c) spectra ratioed to yellow ROI (region 4), with lab spectra of sulfates for comparison.



**Fig. 3** Views of Mound B from CRISM image FRT00009C0A draped over MOLA elevations with 2X vertical exaggeration. a) highlights differences in Fe mineralogy with Fe<sup>2+</sup> regions mapped in green: BD530 G: BD1000VIS B: BD920 b) R: SINDEXT G: BD2100 B: BD1900.



**Fig. 4** Views of Mound B from CRISM image FRT00024BD2: a) mineralogy map draped over MOLA elevations with the same parameters as Fig. 3a, b) ROI locations and c) spectra.

**References:** [1] Bishop J. L. et al. (2009) *JGR*, 114, E00D09, doi:10.1029/2009JE003352. [2] Catling D. C. et al. (2006) *Icarus*, 181, 26-51. [3] Wendt L. et al. (2009) *LPSC 40*, abstract #1531. [4] Bishop J. L. et al. (2012) *AGU Fall Meet.*, Abstract P11E-1872. [5] Seelos, F. et al. (2011) *LPSC 42*, abstract #1438. [6] Murchie S. L. et al. (2009) *JGR*, 114, doi: 10.1029/2009JE003344 .