

**WATER-RELATED MINERALS IN AUREUM CHAOS, MARS.** M. Sowe, L. Wendt, T. Kneissl, P.C. McGuire, and G. Neukum. Institute of Geosciences, Planetary Sciences & Remote Sensing, Freie Universitaet Berlin, Germany ([maria.sowe@fu-berlin.de](mailto:maria.sowe@fu-berlin.de)).

**Introduction:** Collapsed plateau material, chaotic terrain, and Interior Layered Deposits (ILDs) characterize Aureum Chaos that is located east of Valles Marineris. As elsewhere on Mars, spectrometers on Mars Express (MEX-OMEGA), Mars Reconnaissance Orbiter (MRO-CRISM) and Mars Global Surveyor TES detected water-related minerals in association with ILDs [1-4]. We studied these minerals by utilizing MRO-CRISM data and co-aligned MEX-HRSC, MRO-HiRISE and MRO-CTX data since their extent indicates where water was present in the past (Fig. 1).

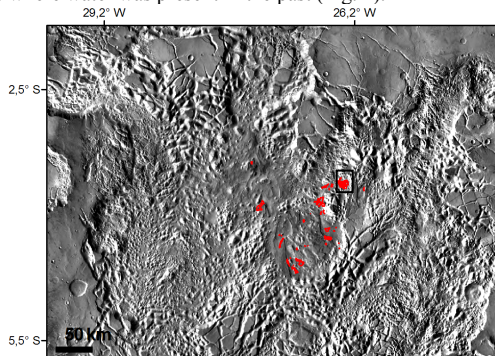


Fig. 1: THEMIS-daytime infrared shows the regions of major hydrated minerals and ferric oxides in red. Box indicates location of Fig. 2.

**Methodology:** CRISM data were analyzed with the CAT Software including atmospheric correction reflectance, removing bad bands, and artifacts [5]. Spectral indices were mainly used to identify minerals or mineral groups as described in [6]. We used the FRT Observations and HRL Targeted Observations which have the highest spatial resolutions (<36 m/px). Map-Projected MRDR were also applied. Data between 1 and 2.6  $\mu\text{m}$  were used and combined with data in the visible range on selected observations. Mainly CRISM spectral indices [7] were used for identifying minerals (Fig. 2). However, iron oxides were found by the spectral slope between 1 and 1.3  $\mu\text{m}$  as described by [8, 9]. Data of different resolutions were combined in a geographic information system but for our analyzes the best resolving data were used. **Stratigraphic relationship and extent:** The sulfates (local thickness ~50 m on average) crop out below a spectrally neutral cap rock, whereas monohydrated sulfate (MHS) underlies polyhydrated sulfate (PHS). PHS is detected at elevations below -3600 m, MHS below -4100 m, and phyllosilicate below -4000 m [10]. In some regions, weathered PHS (e.g. debris fans on scarps) to some extent covers MHS exposures. These regions have a massive, high-albedo texture which otherwise is observed in outcrops that show a MHS signature. Phyllosilicate is present below sulfates or occurs as windblown material but is not associated with ILDs. Iron oxide-rich material as found by CRISM is present in small occurrences within the hematite-rich region described by [1], but also in other spots either as erosional lack or bedrock in close spatial relationship with sulfates (mostly with MHS). The fact that ILDs are mainly buried by mantling deposits and show an abundant

cap rock, overlying most of the sulfate-rich ILDs, may explain why sulfates were not found in all CRISM observations. However, the hydrated area as shown by CRISM is ~70  $\text{km}^2$ .

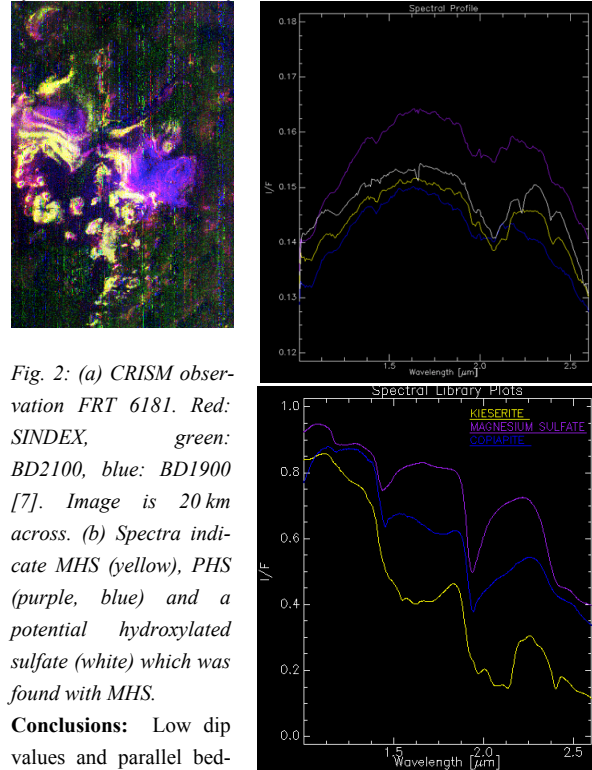


Fig. 2: (a) CRISM observation FRT 6181. Red: SINDEX, green: BD2100, blue: BD1900 [7]. Image is 20 km across. (b) Spectra indicate MHS (yellow), PHS (purple, blue) and a potential hydroxylated sulfate (white) which was found with MHS.

**Conclusions:** Low dip values and parallel bedding of ILDs indicate that they were formed by periodic, low-energy sedimentation [10]. Comparable mineralogies and morphologies were found in different regions of Valles Marineris [3] and may show that formation processes have been anyhow similar. The basin itself is dissected by subsided plateau material thus it provides multiple protected areas that might have served as sedimentary basins. Consequently, we do not consider a huge water-filled basin in which material would be deposited, but local ponds within the basin. Since Aureum Chaos is a closed basin, and a region of high hydrostatic head [11], groundwater activity could have contributed to the formation of the detected hydrated minerals. **Acknowledgement:** This research was partly supported by the Helmholtz Association through the research alliance "Planetary Evolution and Life", the German Science Foundation (DFG) through the Priority Program Mars and the Terrestrial Planets (DFG-SPP 1115, Project: Chronostratigraphy of Mars, grant: NE 212/8-3), and the German Space Agency (DLR), grant 50QM0301 (HRSC on Mars Express). **References:** [1] Glotch. and Rogers (2007), *JGR*, 112, E06001. [2] NoeDobrea et al. (2008), *Icarus*, 193, 516-534. [3] Sowe et al. (2009) *GSL subm.* [4] Wendt et al. (2010) *LPSC XLI*, #1699. [5] McGuire et al. (2009) *PSS*, 57-7, 809-815. [6] Parente (2008) *LPSC XXXIX*, #2528. [7] Pelkey et al. (2007) *JGR*, 112, E08S14. [8] Mangold et al. (2008) *Icarus*, 194, 519-543. [9] Le Deit et al. (2008) *JGR*, 113 E07001. [10] Sowe et al. (2010) *LPSC XLI*, #2499. [11] Andrews-Hanna et al. (2007) *Nature*, 446, 163-166.