REGIONAL MINERALOGY OF THE WESTERN ISIDIS AREA.

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Introduction: Geologic history of Isidis Planitia (or at least some of its parts) is quite complicated and many details remain unclear. There are thousands of small cones on Isidis Planitia on Mars. The cones have diameters of 300–500 m and heights of ~10- 30 m [1], [2]. Many cones form subparallel chains several kilometers in length. Our analysis of chains of cones indicates that they can be grouped in larger systems. We are examining the system of cones. In this way we divided Isidis Planitia into several characteristic regions [3], [4]. These separated regions have characteristic pattern of cones or cone chains- called a "fingerprint" (Fig.1). The cones may be: rootless cones, cinder cones, tuff cones, pingos, mud volcanoes etc. [5]. Some of chains have a characteristic furrow suggesting possibility of fissure volcanism.

In order to determine the origin of the cones, we study in this research mineralogy from infrared data.

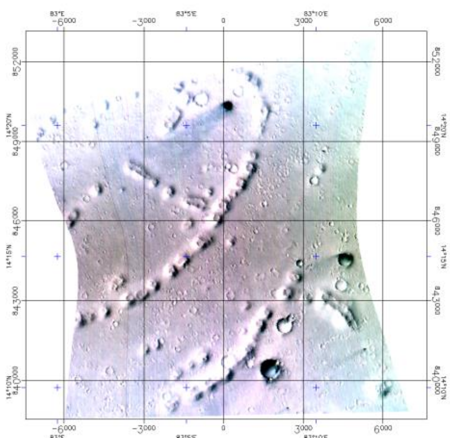

Fig.1 Scene CRISM, FRT00009260_07_IF166L_TRR3. (Central location: 14.235°N; 83.096°E)

Methodology: We selected one standout spectrum that comes from the CRISM FRT00009260 scene but is typical for the entire image area (Fig.2,3). The scene comes from the northwestern part of Isidis (Fig.1), where the characteristic chains of cones are visible. The types of cones from our division [3], [4] belong to the group of chains of separate cones and without a furrow. The spectrum shows the minima 1.49; 1.98; 2.04 μm which we assigned to individual minerals. Additionally, the ~ 2 μm range is disturbed by Martian CO_2 influences, which is caused by the imperfect separation of the atmosphere by the "volcano - scan algorithm" (through the atmosphere above Olympus Mons) (Fig.2). Gypsum appears to be the most suitable mineral for these minima, although alunites can also be considered. The clay minerals widespread on Mars do not resemble the observed minima. From the generated endmembers, it can be seen that minerals are accumulated around the cones (Fig.4).

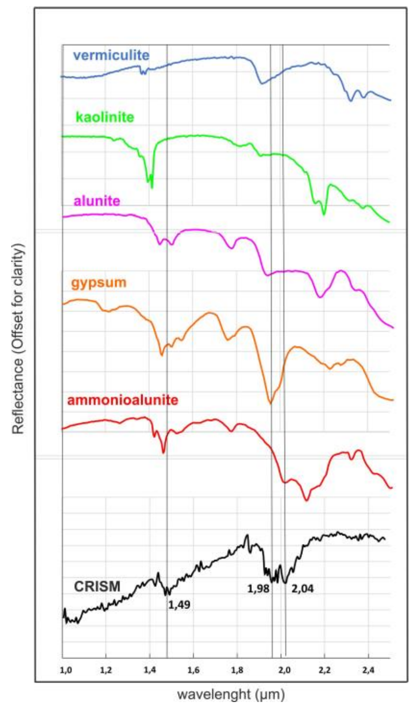

Fig.2 CRISM NIR reflectance spectrum from the FRT00009260 image from Isidis. Three characteristics 1.49; 1.98; 2.04 μm are visible and compared to laboratory spectra from the USGS library.

Discussion: Gypsum is a mineral formed in the process of evaporation and crystallizes from salty, drying water reservoirs. Because Isidis might once have been a highly saline reservoir, gypsum crystallization could occur under such conditions, especially in depressions. Alunites, on the other hand, are products of volcanic exhalation, which would explain the origin of the cones. Common alunites have been found on the La Fossa Crater Volcano, Aeolian Islands [6] as volcanic exhalations and in the vicinity of Las Vegas, Nevada, where alunites with gypsum were mapped based on aerial photos [7]. On Mars in the northeast of Hellas

Basin, gypsum and ammonioalunites were interpreted on the basis of the PFS and OMEGA (MEX) spectra [8], [9].

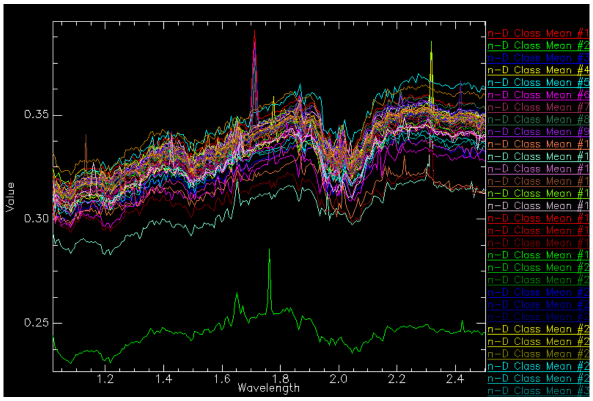

Fig.3 Generated 30 endmember in the ENVI program from the scene FRT00009260_07_IF166L_TRR3. All endmembers probably represent gypsum with an admixture of alunites.

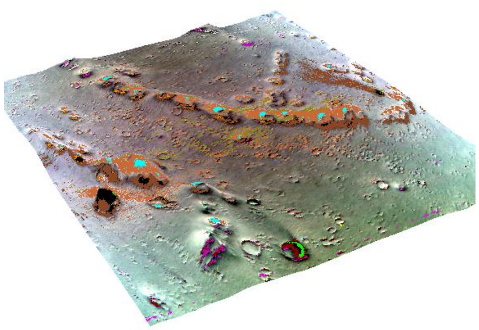

Fig.4 Spatial distribution of selected endmembers on the 3D surface of the scene FRT00009260_07_IF166L_TRR3.

Conclusion: Currently, we are working on determining the duration and age of this volcanic activity, as well as the size related magma plumbing system, which might be related to bordering to the west of Isidis the volcano Syrtis Major. Instability of water in the upper layers of the regolith could cause rapid degassing of the regolith [10], [11].

These are our preliminary comparisons that still require further evaluation.

References: [1] Guidat, T. et al. (2015) *Earth and Planet. Sci. Let* . 411, 253-267. [2] Souček, O. et al. (2015) *Earth and Planet. Sci. Let* 426, 176-190. [3] Zalewska N. et al. (2021) *LPS 52nd*, Abstract # 2710. [4] Zalewska N. et al. (2021) *EPSC* 15, 446. [5] Ghent, R. R., et al. (2012) *Icarus* 217, 1169-183. [6] Parafiniuk J. (2012) *Bulletin of the Polish Geolog. Instit.* 452, 225-236. [7] Kirkland E. et al. (2007) *LPS XXXVIII*, Abstract # 2232. [8] Zalewska N. (2014) *GeoPl. Earth and Planet. Sci.* 65-76. [9] Zalewska N. (2013) *Planet. Space Sci*. 78, 25-32. [10] Czechowski L. et al. (2021) *LPS 52nd*, Abstract # 2740. [11] Czechowski L. et al. (2021) *EPSC* 15, 434.