SPECTRAL CLASSES INVESTIGATION ON OXIA PLANUM, THE EXOMARS 2022 LANDING SITE, BY MEANS OF CRISM/MRO DATA. F. Altieri[1], A. Frigeri[1], M. C. De Sanctis[1], M. Ferrari[1], S. De Angelis[1], M. Formisano[1] and E. Ammannito[2], [1]Institute for Space Astrophysics and Planetology, IAPS-INAF, Rome, Italy (francesca.altieri@inaf.it); [2]Italian Space Agency, ASI, Italy.

Introduction: ESA/Roscosmos ExoMars 2022 mission is expected to land on Mars in Oxia Planum in 2023. The landing site shows several evidences of water/rocks interaction. Extensive Noachian clay-bearing units and layered outcrops [1, 2, 3, 4, 5] are accessible to the ExoMars 2022 Rover Rosalind Franklin to search for traces of present or past life and meet the goals of the ExoMars 2022 mission [6]. The clay-bearing unit of Oxia Planum is dominated by Fe/Mg-rich clays, with vermiculite or Fe-rich saponite as best candidates for the terrains showing meter to decameter-sized polygons and an orange hue on the HiRISE color images [2]. Here we use the data from the Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) instrument [7, 8] on board the NASA MRO mission to investigate the spectral variability of the hydrated terrains. In particular, we focus on the distribution of the 2.4 and 2.53 µm absorption bands.

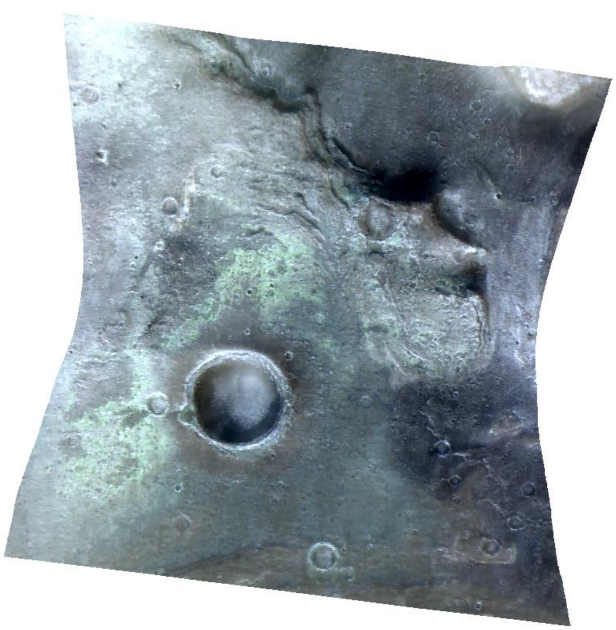

Figure 1 *- IR RGB map frt00009a16_07 from CRISM cube, Red Band: R (Reflectance) @1.15 µm, Green Band: R@1.51 µm, Blue Band: R@2.53 µm. Materials with deep Band Depth (BD) @ 1.9 and 2.3 µm appear greenish.*

Spectral Class selection: We have used the software ENVI integrated with the CRISM Analysis Tool (CAT available at https://pds-geosciences.wustl.edu/missions/mro/crism.htm#Tools) to process the CRISM data and derive reflectance factor spectra corrected for atmospheric feature, compute the summary products of spectral parameter [9] and project the maps. Then we have computed the ratio between each CRISM spectrum and a featureless one from the same column of the detector in order to remove systematic artifacts and highlight mineralogical absorptions in the rationed spectrum. Ad hoc spectral parameters have been also computed for the features around 2.4 and 2.53 µm.

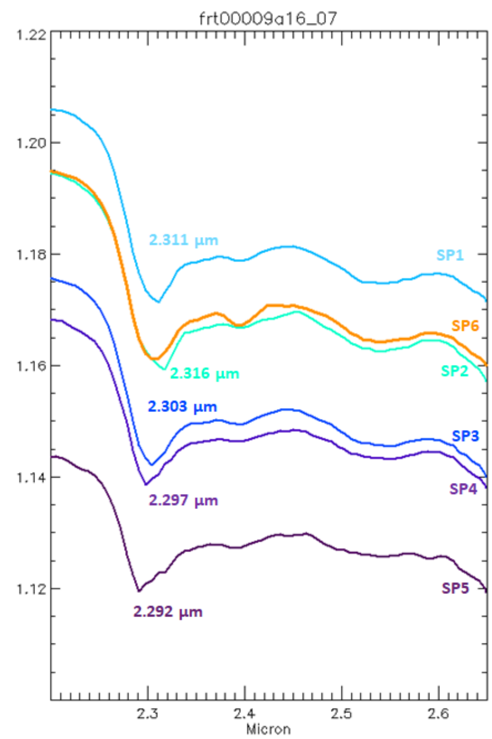

Figure 2 *– Rationed spectra, offset for clarity.*

CRISM spectral classes have been selected based on the occurrence of the band absorptions at about 2.3 and 2.4 µm (Figure 2). Spectral Classes SP1, SP2, SP3, SP4 and SP5 have been selected based on the position of the minimum of the absorption band around 2.3 µm. They show variable 2.4 BD (Band Depth) and the presence of an absorption around 2.53 µm. The orange spectral class (SP6) has been selected based on the presence of the 2.4 µm. The band depth at 2.4 µm has been computed after the removal of the continuum between 2.37 and 2.45 µm. This spectral class shows a band centered at 2.30 µm and a band centered around 2.53 µm (minimum computed after continuum removal). For all these spectral classes a weak band around 1.41 µm is also present, as reported in previous studies [e.g., 2].

Spectra with deep 1.9 and 2.4 µm band depth correlates with topographic lows (Figure 3) located at the base of the cliffs delineating the capping unit [10].

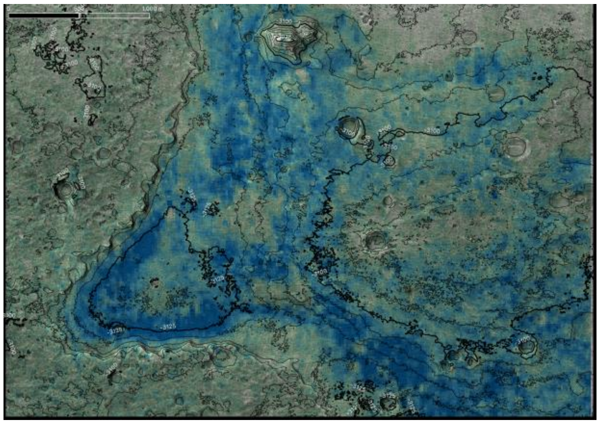

Figure 3 *– Co-registered CRISM dataset frt0000810d_0 and HiRISE image PSP_009880_1985. Scene center is located at 335.48°E,18.24°N. Elevation isolines are spaced 5 meters and are derived from the DTM generated from stereogrammetry processing of PSP_009880_1985 and PSP_009735_1985. The intensity of blue shade corresponds to the 1.9 µm band depth of CRSIM spectra .*

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