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Spectral classification and mineralogical characterization of Nili Fossae for a better understanding of hydrated mineralogies.

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The presence of hydrated minerals on Mars provides a record of water-related processes and, in particular, the identification of phyllosilicates puts constraints on the evolution of Mars (Poulet et al., 2005). Even if data from the Observatoire pour la Minèralogie, l'Eau, les Glaces, et l'Activitè (OMEGA) and from the Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) show the presence of different hydrated minerals, on Mars the spectral regions where hydrated minerals absorb are also affected by atmospheric features due to gaseous components, mostly CO_2 and H_2O. Among the different methods that have been proposed to separate the atmospheric signatures from the hydrated absorptions, we use the Surface Atmosphere Separation (SAS) method proposed by Geminale et al. (2015) to analyze the Nili Fossae region (in particular, four MEX orbit have been selected and a mosaic have been created).
In this work, we spectrally classify the Nili Fossae region using the Spectral Angle Mapping (SAM, Kruse et al., 1993) classification and using a spectral library iteratively built from the image though the Pixel Purity Index (PPI, Boardman, 1995). Mainly, we recognized five spectral regions dominated by: iron-hydroxides, pyroxenes (both orthopyroxene and clinopyroxene), olivine and phyllosilicates, in accordance with the literature. Then, we focused on the hydrated regions: absorptions in the 1.9-2.3 μm are fundamental to recognize a hydrated mineralogy, and to discriminate between phyllosilicates characterized by different cations in the octahedral environment. Comparing our results with maps from Mangold et al. (2007) and Poulet et al (2007), we demonstrated that the SAS+SAM technique permits to identify hydrated regions that cannot be easily recognized using the spectral mapping applied to images corrected with Mons Olympus method (Langevin et al., 2005). Furthermore, applying the MGM algorithm to a set of spectra selected from hydrated regions, we recognized the presence of two main hydrated mineralogies belonging to smectite (both montmorillonite and nontronite) and chlorite families (chamosite). These minerals are also spatially distributed in Nili Fossae region.

References:
Boardman, 1995, 5th JPL Airborne Earth Sciences Workshop, JPL 95-1, 23-26; Geminale et al., 2015, Icarus, 253, 51-65; Kruse et al., 1993, Remote Sensing of Environment, v. 44, p. 145 – 163; Langevin et al., 2005, Science 307 (5715), 1584–1586; Mangold et al., 2007, J. Geophys. Res. 112 (E8); Poulet et al., 2007, JGR, 112; Poulet et al., 2005, Nature 438 (7068), 623–627