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Mineralogic Context of the Circum-Chryse Planitia Candidate Landing Sites for the ExoMars Rover Mission

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The ExoMars rover mission [1] will sample ancient, aqueously altered terrains to search for traces of extinct life and characterize the water history of Early Mars. These objectives translate into site-specific constraints in order to maximize the opportunity to access morphological and/or chemical markers for past aqueous environments and possibly life [2]. Currently, four candidate landing sites are being considered, all located on the margin of Chryse Planitia and all exhibiting hydrous clays within or near the ellipse. Assessing the composition and morphologic/stratigraphic context of these clays is necessary to narrow down possible formation scenarios and help rank the sites according to their relevance to the science goals. This work investigates the aqueous mineralogy of the circum-Chyrse region -where the LS are proposed-, in order to provide a framework for future in-depth investigations.

Regional mapping of the clay mineralogy was performed using the OMEGA and CRISM NIR imaging spectrometers [3,4]. Global coverage of the circum-Chryse margin was achieved with OMEGA while detailed mapping was carried out locally with OMEGA and CRISM. Over 250 observations with pixel scales ranging 20 m - 4 km were investigated. Additionally, detailed analysis of the clay chemical composition was carried out using linear unmixing which provided the relative abundances of several Fe/Mg-rich phyllosilicate endmembers in the region.

The analysis revealed large exposures of dominantly Fe/Mg-rich phyllosilicates over most of the preserved Noachian-aged margins of Chryse Planitia. These minerals have spectral features which are generally similar to what is found elsewhere on Mars [5], consistent with either vermiculites or smectite-bearing mixed-layered clays [6,7].

A regional outlier exists at and around the Mawrth Vallis LS: the most common clay there is likely Fe-rich nontronite associated with Al-rich phyllosilicates within layered deposits [8,9], indicating a different alteration setting. This site may however have shared a common aqueous history with the other circum-Chryse clays and then diverged to form Al/Fe-rich clays; alternatively their detection may be the result of specific mantling/re-surfacing processes.

A number of similarities in composition and surface morphology have been detected between clay deposits in the Oxia Planum, Hypanis Vallis and possibly Aram Dorsum regions. These similarities and their regional distribution may hint at a common formation setting for most of the non-Mawrth-like clays found circum-Chryse, in what may be the remnant of an extensive clay-rich horizon spanning an arc of at least 2500 km. Future work will be carried out to test this hypothesis by investigating their stratigraphy and unit ages, as well as the transitional regions with the Mawrth-like deposits.

References. [1] Vago. et al., 2006, ESA Bulletin, 126, 6-23 (2006). [2] Call for ExoMars2018 Landing site Proposals, ESA SP EXM-SCI-LSS-ESA/IKI-001 (2013). [3] Bibring et al., ESA SP-1240, 37-49 (2004). [4] Murchie et al. (2007) JGR, 112, E05S03. [5] Carter et al., JGR, 118(4), 831-858 (2013). [6] Milliken et al., 42nd LPSC, No 1608, p2230 (2011). [7] Michalski et al.., 45th LPSC, No 1777, p1781 (2014). [8] Loizeau et al., JGR, 112(E8), E08S08 (2007). [9] Noe Dobrea et al., JGR, 115(E11), E00D19 (2010).