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The Mars Orbital Catalog of Hydrated Alteration Signatures (MOCHAS): keeping track of ancient Mars's blanketing aqueous alteration

John Carter
(john.carter@ias.u-psud.fr), the OMEGA and CRISM teams

The orbital and in-situ analysis of aqueous minerals on Mars is a recent research field which has given new momentum to the search for past life on Mars. These minerals, if found in preserved geologic contexts, also have the potential to decipher the past climatic conditions of Early Mars and probe its geological evolution. Despite terabytes of data and refined observations accumulated for over a decade, progress in those fields has been tedious. The highly degraded morphologic context, intrinsic limitations of orbital spectroscopy and highly localized nature of in-situ missions are major issues. Many highly detailed geological studies have been carried out at tens of locations on Mars, which have somewhat refined the global paradigm proposed in [Bibring et al., 2006], but no consensus exists as to the timing for the bulk of alteration (Pre/Noachian to LN/EH) nor the state of the water (meteoritic, climate mediated; or dominantly closed-system). In practice, the paucity of clear trends noticeable from the large datasets of near-infrared instruments (OMEGA, CRISM) has hampered efforts to test specific, global-scale alteration hypotheses. Other major fields of Mars research have tackled this issue by providing comprehensive databases with controlled biases, such as for channel networks, open-basin paleo-lakes or anhydrous chloride salts.
Here we propose to apply the same approach to the OMEGA and CRISM datasets by providing a global and detailed compositional map of aqueous minerals on Mars. This catalog (MOCHAS) has several goals: i) provide for the first time a statistically viable approach to aqueous mineral detections on Mars, ii) provide regional context to help interpret and broaden the implications of numerous local-scale studies, iii) identify previously un-observed deposits of minerals of interest coupled to a well-preserved geologic context, iv) identify new candidate landing sites for future rovers and foster complementary/higher-resolution observations with instruments on current and upcoming probes.
This new product adopts a mapping approach to all aqueous mineral detections on Mars, moving away from discrete catalogs of points available in previous attempts [Carter et al., 2013], which allows a statistical inference of their distribution, ages and other physical quantities. Classification of the deposits into major spectral classes will provide composition. The first version to be distributed in the near term will be presented, subsequent releases will provide refined characteristics for the deposits (mineralogical, physical and geological), and are foreseen to improve thanks to inputs from the community.