A MARS ORBITAL CATALOG OF HYDRATED ALTERATION SIGNATURES (MOCHAS). J. Carter\textsuperscript{1} and the CRISM\textsuperscript{2} and OMEGA\textsuperscript{3} teams. \textsuperscript{1}Institut d’Astrophysique Spatiale, CNRS/Université Paris-Saclay, France (john.carter@ias.u-psud.fr). \textsuperscript{2}JHU/APL, Laurel, MD.

Introduction: Aqueous minerals, when found in preserved geologic contexts, have the potential to decipher the past climatic conditions and probe the geological evolution of Mars. Recent landed and orbital instruments have permitted their study, which in turn has spawned a burgeoning, highly active research field.

Over the past decade, terabytes of orbital data have been acquired, covering an ever increasing fraction of the planet’ surface, but progress in this field has been tedious. The highly degraded morphologic context of ancient Mars terrains, intrinsic limitations of orbital spectroscopy and the local scope of rover measurements constitute major limitations. Stemming from this are lingering unresolved puzzles such as the timing of the bulk of aqueous alteration (ranging from the Early Noachian to the Late Noachian/Early-Hesperian), and its water setting (meteoritic and climate-mediated or dominantly closed-system).

Several limitations in the available global-scale orbital catalogs of Mars mineralogy [1-4] must be overcome to address these major questions. This is the goal of the “MOCHAS” project, which will attempt to provide a global, detailed survey of the aqueous mineralogy of Mars. It is based on 10 years of data from the OMEGA and CRISM imaging spectrometers.

Goals: The MOCHAS project will attempt to achieve the following goals:

1. Provide a statistically viable approach to aqueous mineral deposits on Mars. The catalogue provides a large number of mineral detections (\textasciitilde10\textsuperscript{4}-10\textsuperscript{5}, see figure) with controlled biases which will be used to test mineral formation/transformation processes that took place on an extended scale (both geographic and in time).

2. Provide regional-scale context to help interpret and broaden the implication of the numerous in-depth local-scale studies which are carried out at many locations of Mars.

3. Identify previously un-catalogued mineral deposits with high scientific potential, especially those occurring in seemingly well-preserved geological contexts. These sites would be subjected to in-depth follow-up investigations.

4. Identify suitable science-driven landing site candidates for future roving and sample return missions.

5. Provide targets for other instruments, especially high resolution contextual and mineralogical instruments (e.g. CRISM, HiRISE, CASSIS).

6. Provide a comparative basis or “test bench” for advanced methods of mineral detection and characterization, which are increasingly implemented on orbital datasets. It is expected that follow-up studies using abundance estimation methods (e.g. [5,6]) will refine the context of a number of mineral deposits.

Database properties: MOCHAS uses all types of (near-) nadir observation modes from the OMEGA and CRISM imaging spectrometers [7,8] covering non-polar latitudes. The major improvement of this catalog is that it will provide a detailed global map of the location of aqueous minerals, moving away from the catalogs of points that were used previously. Previously, point catalogues were used because most of the data originated from high resolution but localized (<400km\textsuperscript{2}) “targeted” CRISM observations. The mapping is provided at a \textasciitilde300 m/pixel resolution, covers most of Mars, and exhibits high detection sensitivity. Each deposit identified is analyzed spectrally and classified into broad aqueous mineral families. Because most observations do not possess a signal-to-noise and spectral resolution equal to that of the CRISM targeted observation modes, the spectral characterization cannot be as refined as that from detailed investigations based on the latter modes. However, over 6000 targeted CRISM observations have also been analyzed and corresponding mineral detections incorporated into this catalog so as to provide higher-level mineralogical and contextual ‘anchor points’ to the global maps.

Distribution: The MOCHAS project would benefit from a collaborative approach, through which the database would be refined, amended and expanded thanks to contributions from the community. It will be openly distributed in a GIS-friendly format. To facilitate this participative approach, a web interface similar to the successful HiWish page is foreseen. Simple visualization of the database will initially be made available on the PSUP portal [9].

Enhancements: The metadata available initially is basically the spatial distribution and broad mineralogical composition. More characteristics are being collected and will be made available in subsequent releases, pending a proper system of internal review. These include: the geological unit age, morphological context, thickness, surface abundance and detailed spectral interpretation. Only the largest or most scientifically
compelling deposits are foreseen to benefit from the full range of analyses.


Figure. Example global map of aqueous mineral deposits on Mars extracted from the MOCHAS database.