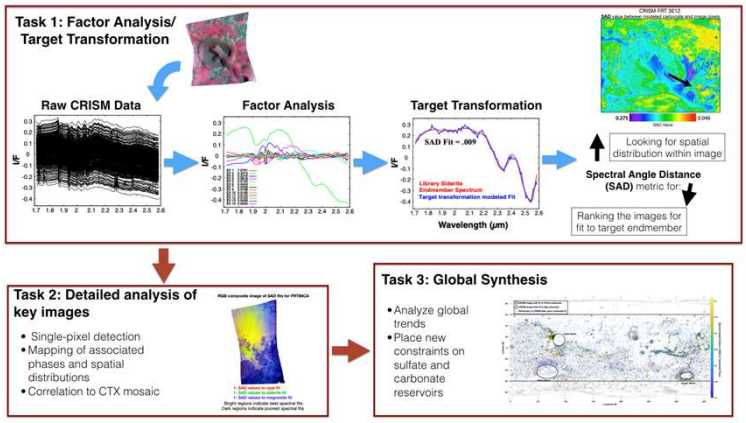
Development of science analysis tools and software for orbital + *in-situ* spectroscopic datasets

Principal Investigator: Elena Amador (397D), Bethany Ehlmann (3200), Luther Beegle (3200)
Collaborator: David Thompson (382B)
Program: Topic Area

Project Objectives:

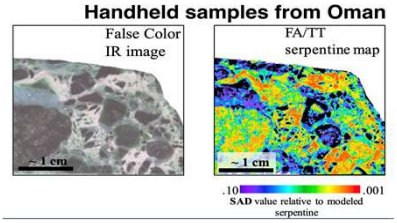
- **Technical objective:** To develop semiautomatic tools that enable the full utilization of large spectral datasets (terabytes) for the retrieval of important spectral signatures present only in small exposures that may be missed by traditional techniques
- **Scientific Objective**: To evaluate and advance existing paradigms for the control on martian water chemistry as inferred by the observation and contextualization of key water-formed minerals
- This work has focused on using factor analysis and target transformation of the full Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) dataset in search of carbonates and sulfates. However, these developed methods could be applied to other spectral datasets and in search of other mineral phase.

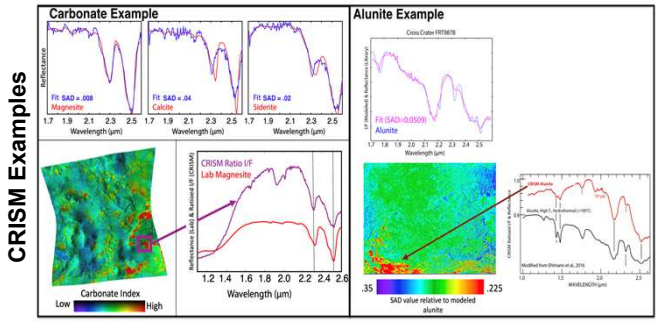
Approach



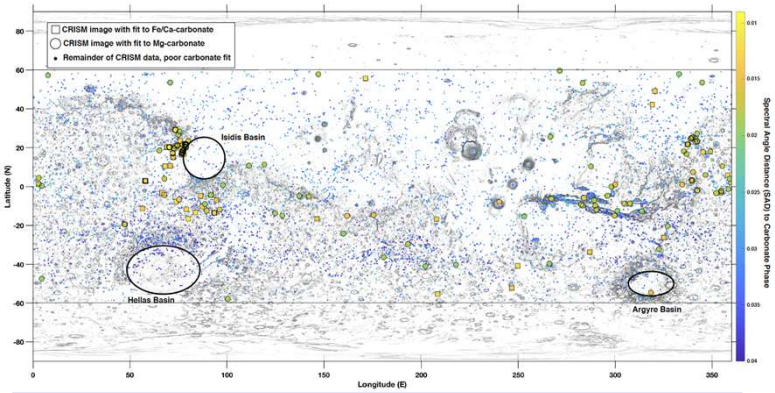
Validation

- FA/TT output has been validated with both laboratory spectra taken from hand-samples with known mineralogy and hyperspectral CRISM data in regions with well studied and understood mineral phases.





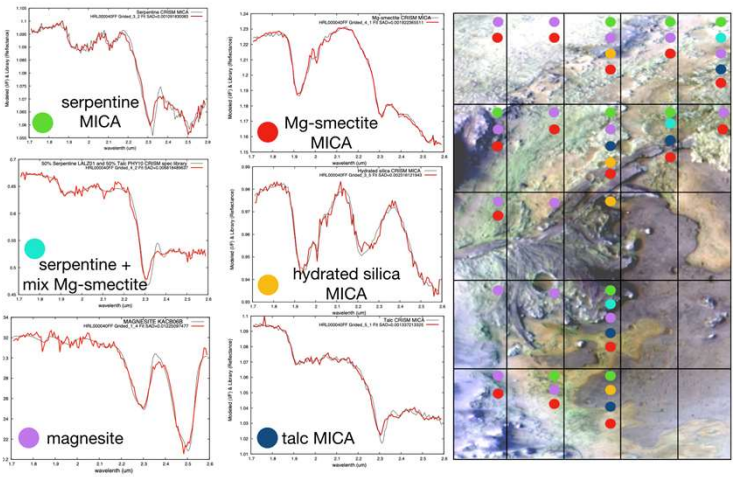
Global Carbonate Map using FA/TT pipeline



Benefits to NASA and JPL

- This technique allows for the full utilization of large datasets and provides mineralogical information that would otherwise be difficult or impossible to discern
- Initial science results show that carbonate is present in ancient Noachian terrains, perhaps at low concentrations – such as in Mawrth Vallis
- Preliminary results are also being used to better characterize the expected mineralogy in Jezero crater in preparation for Mars 2020

Mars 2020 Landing Site: Jezero Crater



- FA/TT of CRISM images in Jezero crater have been used to confirm phases that we know are present (e.g., carbonate and Mg-smectite) and point to low concentrations of other phases of interest (e.g., serpentine and hydrated silica)

National Aeronautics and Space Administration
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

www.nasa.gov

Poster No. RPC-188