**ORBITAL IDENTIFICATION OF POTENTIAL REACTION FRONTS IN JEZERO CRATER RIM.**  E. V. Rivera¹, E. M. Hausrath¹, and C. T. Adcock¹, ¹University of Nevada, Las Vegas (evrivera@unlv.nevada.edu)

Introduction: Orbital observations of the Jezero crater rim indicate the presence of Fe/Mg smectites in proximity to pyroxene-rich materials, which make up the Noachian Basement Group of the west Isidis Basin, the oldest rock exposures on the Martian surface [1]. The observed proximity between smectites and pyroxene-rich materials in the crater rim could indicate transitions between more aqueously altered and less aqueously altered materials [2,3], making them potentially good targets of focus for Martian habitability/astrobiological study. On Earth, the boundary or transitions between parent material and weathered products such as clay minerals are called reaction fronts [2,3]. These reaction fronts are also affected by geologic structures such as veins, fractures, and faults [4,5]. This study aims to map and examine potential reaction fronts in the Jezero crater rim using high spatial and spectral resolution orbital datasets.

Methods: Potential reaction fronts in the Jezero crater rim were analyzed using data from the Context Camera (CTX) [6], Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) [7], and High-Resolution Imaging Science Experiment (HiRISE) [8] aboard the Mars Reconnaissance Orbiter. A CRISM Map-Projected Targeted Reduced Data Record (MTRDR) was processed using the CRISM Analysis Toolkit (CAT) for ENVI to calculate spectral parameters and reference spectra (Figure 2) [9]. CRISM mineral maps were produced by combining the spectral parameters D2300, LCPINDEX2, and OLINDEX into an RGB color composite to detect the presence of Fe/Mg smectites, low-calcium pyroxene, and olivine (Figure 1). D2300 detects the possible presence of Fe/Mg smectites due to the 2.3 µm absorption feature, LCPINDEX2 detects low-calcium pyroxenes with a broad absorption feature centered at 1.8 – 2 µm, and OLINDEX captures broad absorption feature centered at 1 µm [9]. Combining these three spectral parameters into an RGB color composite helps visualize the distribution of the Noachian Basement Group, mainly the Fe/Mg smectites and pyroxene materials in the Jezero crater rim. Olivine was included in the color composite as it was very distinct outside the crater rim [10]. CTX and HiRISE grayscale images were used as base maps for the color composite. Final maps were produced in ArcGIS Pro and ENVI.

Results: Strong spectral signatures of Fe/Mg smectites and pyroxene-rich materials were observed along ridges and steep slopes in Jezero crater rim (Figures 1 & 2). Two areas of interest were selected because of the proximity between the Fe/Mg smectites and pyroxene materials, suggesting the possible presence of potential reaction fronts. The first area of interest is Capitol Reef which has steep slopes with sharp transitions between Fe/Mg smectites and pyroxene materials (Figure 1A). Geomorphic features in the transitions show light and dark mottled terrain with megabreccias. The second area of interest is Mosi-oa-Tunya, which is one of the priority sampling sites of the Perseverance rover in the Jezero crater rim [11, 12]. This area shows an irregular boundary between smectites and pyroxene and is surrounded by extensive megabreccias (Figure 1B). Overall, the transitions between the Fe/Mg smectites and pyroxene-rich materials appear to be associated with megabreccias and fracture-like features indicating that these geologic structures may have enhanced or are related to the formation of potential reaction fronts in the crater rim.

![Figure 1: Study areas in the crater rim with inset boxes of areas of interest with spectral signatures of Fe/Mg smectites close to pyroxene-rich materials (A) in Capitol Reef and (B) in Mosi-oa-Tunya. CRISM mineral maps were produced using spectral parameters D2300, LCPINDEX2, and OLINDEX combined as an RGB color composite [9]. Light pink/red color indicates presence of Fe/Mg smectites, green color indicates pyroxenes, and blue color is olivine.](image)

Further Work: To further examine potential reaction fronts in orbital datasets, changes in the spectral properties in the transition between the Fe/Mg smectites and pyroxene-containing materials will be examined, and a 3D topographic map will be generated to examine closely the relationship of these spectral changes to geomorphic features observed in the study areas.

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