A COMPARISON OF MARS ORBITAL DATA: SITE CONTEXT INTERPRETATIONS IN JEZERO CRATER.

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Introduction: Large parts of the Martian surface have been imaged with orbiters. The Mars Express (MEx) orbiter and Mars Reconnaisance Orbiter (MRO) carry a variety of instruments that can be used to study the Martian surface. The instruments provide images with differing coverage, resolution and wavelength sensitivity. We aim to understand the link between different orbital imagers in interpreting site morphology by studying images of Jezero Crater from various instruments aboard MEx and MRO. Interpretations for this region can ultimately be compared to in-situ data from the Perseverance rover.

Background: Jezero Crater is an impact crater located in the Nili Fossae region of Mars. The site features a (volcanic) basement interpreted as Noachian [1]. The presence of two inlet valleys (on the northern and western rim) and an outlet valley (eastern rim) suggests that the basin contained a standing body of water. The fan deposits have been interpreted as detrital in origin based on the major geomorphic units in their watersheds [2], highlighting the relevance of studying the regions upstream the fluvial valleys in understanding the history and composition of Jezero Crater. The Perseverance rover landed in Jezero Crater in February 2021. Figure 1 provides an overview of the surroundings; Figure 2 shows the western fan and the rover traverse as of December 2022 since landing.

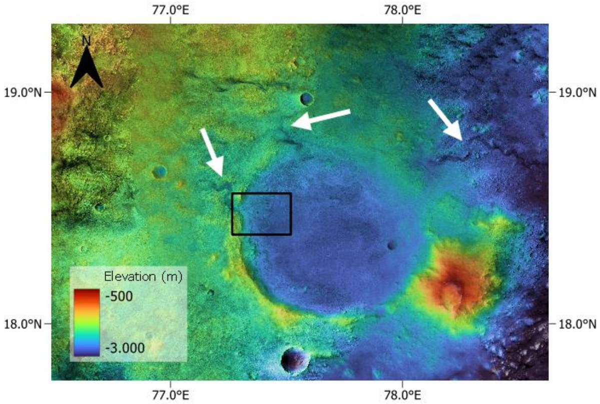

Figure 1 – a MOLA-HRSC blended DTM [3] overlain on a CTX mosaic [4] of Jezero Crater and its immediate surroundings. The western and northern inlet valleys and eastern outlet valley to and from the crater are indicated with arrows. The black rectangle indicates the location of Figure 2.

Methods: We focus mapping efforts on on Jezero Crater and its surroundings, most notably the watersheds of the northern and western fans.

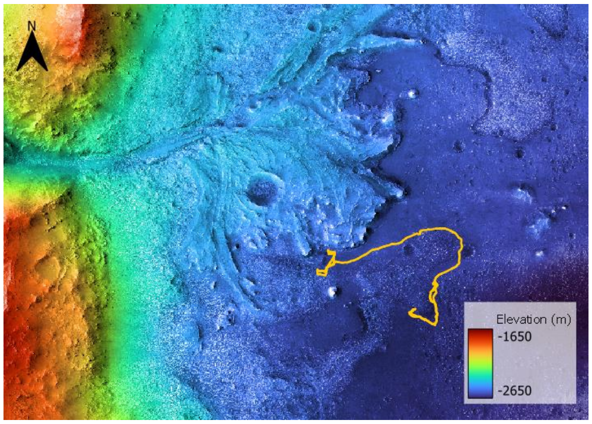

Figure 2 – a HiRISE DTM overlain on a HiRISE basemap showing the western fan of Jezero Crater. The traverse of the Perseverance rover is shown as a yellow line.

MRO Context Camera (CTX; [5]) images are available for the entire area. We manually define geologic units in the region based on visual features such as tone and texture in these greyscale images in the visual band. Stratigraphy and height profiles across CTX-derived geologic contacts follow from High Resolution Stereo Camera (HRSC; [6]) and Mars Orbiter Laser Altimeter (MOLA; [7])-derived Digital Terrain Models (DTMs), and the higher-resolution High Resolution Imaging Science Experiment (HiRISE; [8]) DTMs where available. We investigate mineralogical differences between mapped units using MRO Compact Reconnaissance Imaging Spectrometer for Mars (CRISM; [9]) spectra of the Martian surface where available. We can infer the extent to which visually distinct units are spectroscopically different on Mars and possibly formulate expectations for the mineralogical composition of regions where CRISM observations are not available. Projection and coregistration of these images and mapping of geologic units is performed in QGIS.

This way, we use data from various instruments to compare properties of CTX-derived geologic units and their contacts. We can learn to what extent the instruments complement each other in formulating the geologic history of a site, but also what we can unravel about a site where CRISM and HiRISE have no coverage.

Acknowledgments: CRISM images were retrieved from the NASA Planetary Data System. This research is supported by LUNEX EuroMoonMars and EuroSpaceHub academy.

References: [1] Sun V. Z. and Stack K. M. (2020) *US Geological Survey Scientific Investigations Map, 3464(10.3133)*. [2] Goudge T. A. et al. (2015) *JGR, 120.4*, 777-808. [3] Fergason R. L. et al. (2018) *US Geological Survey* [4] Dickson J.L. et al. (2018) *LPSC 49* [5] Malin M. C. et al. (2007) *JGR, 112.E5*. [6] Jaumann R. et al. (2007) *Planetary and Space Science 55.7-8* 928-952. [7] Zuber M. T. et al. (1992) *JGR, 97.E5* 7781-7797. [8] McEwen A. S. et al. (2007) *JGR, 112.E5*. [9] Murchie S. et al. (2007) *JGR, 112.E5*.