

THE FIRST DECADE OF HIRISE AT MARS. A. S. McEwen¹, S. S. Sutton¹, C. J. Hansen², and the HiRISE team. ¹LPL, University of Arizona, Tucson AZ 85721 USA (mcewen@lpl.arizona.edu), ²PSI, Tucson, AZ USA.

Introduction: The Mars Reconnaissance Orbiter (MRO) arrived at Mars on March 10, 2006, and the High Resolution Imaging Science Experiment (HiRISE) acquired its first images on March 25 [1-2]. Following aerobraking and solar conjunction, systematic mapping began November 8, 2006. As of early January 2016, HiRISE has acquired 41,547 observations, which would cover 2.47% of Mars if all were unique coverage. Given 4,503 stereo images and many repeat images to monitor the changing surface, the unique coverage of Mars is ~2%.

The purpose of this poster is to show off a tiny fraction of the beautiful HiRISE images in the form of large prints displayed in the poster session room. The large print format is still the best way to appreciate these images, which can be up to 20,000 x 100,000 pixels, so ~500 2k x 2k computer monitors are needed to display such an image at full resolution.

HiRISE Results: Based on a NASA ADS full-text search at the beginning of 2016, there are 1,129 refereed publications that utilize HiRISE data (Figure 1). Topics range from current processes to ancient bedrock. Ground-breaking discoveries, including seasonal flows of briny water, have been found in HiRISE images. HiRISE has helped or is helping to locate and characterize landing sites for the 2008 Phoenix lander, 2013 Curiosity rover, 2016 ExoMars lander demonstration, 2018 InSight lander, 2018/2020 ExoMars rover, 2020 NASA rover, and future human exploration zones.

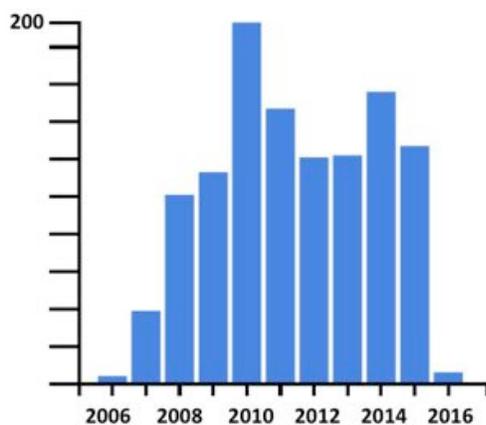


Figure 1. HiRISE refereed publications by year.

HiRISE Images: There are many HiRISE data products archived in the Planetary Data System (PDS) [3]. For this poster we will highlight images for which the HiRISE team has produced Digital Terrain Models

(DTMs) [4-5] (Figure 2), which provide 1-m resolution 3D representations of the surface. To illustrate the information in these HiRISE stereo pairs, we will show 3 image products for each location: (1) Merged IRB or RGB color on full RED (panchromatic) swath; (2) Color-coded altimetry merged with one of the RED orthoimages; and (3) Stereo anaglyphs (need red-green glasses). An example (at greatly reduced scale) is shown in Figure 3.

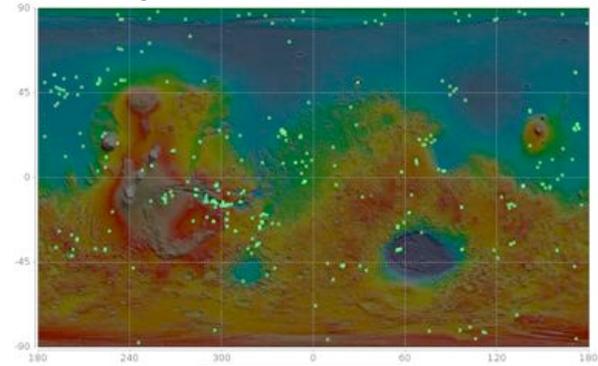


Figure 2. Map of HiRISE DTM locations (see <http://www.uahirise.org/dtm/>).

You Can Help Target HiRISE: Just go to our HiWish site (uahirise.org/hiwish). It is really easy to use, and we have already acquired images for 4,224 public suggestions.

HiRISE Future: MRO has sufficient fuel to continue for another ~18 years, but mechanical and electronic failures are likely before the tank is empty. For HiRISE, one of the 14 CCDs stopped returning data in August 2011 due to a failure in the associated electronics; fortunately it was on the edge of the swath, so images are just 10% narrower rather than containing gaps. On the spacecraft, one of the Inertial Measurement Units (IMU) is near end of life, so MRO is using the redundant IMU. In case that 2nd IMU fails, the project is developing a mode of operation that uses star-tracker data only, not the IMU, for attitude control; if the pointing stability is degraded in this mode, then HiRISE will acquire more images with pixel binning (2x2 or 4x4). We cannot predict what else may fail in the future or when this may happen.

References: [1] McEwen, A.S. et al. (2007) JGR, 112, E05S02. [2] McEwen, A.S. et al. (2010) Icarus, 205, 2-37. [3] McEwen, A.S. et al., this conference. [4] Kirk, R.L. et al. (2008) JGR, 113, E00A24. [5] Sutton, S. et al. (2015) 2nd Planetary Data Workshop, LPI Contr. 1846, #7056.

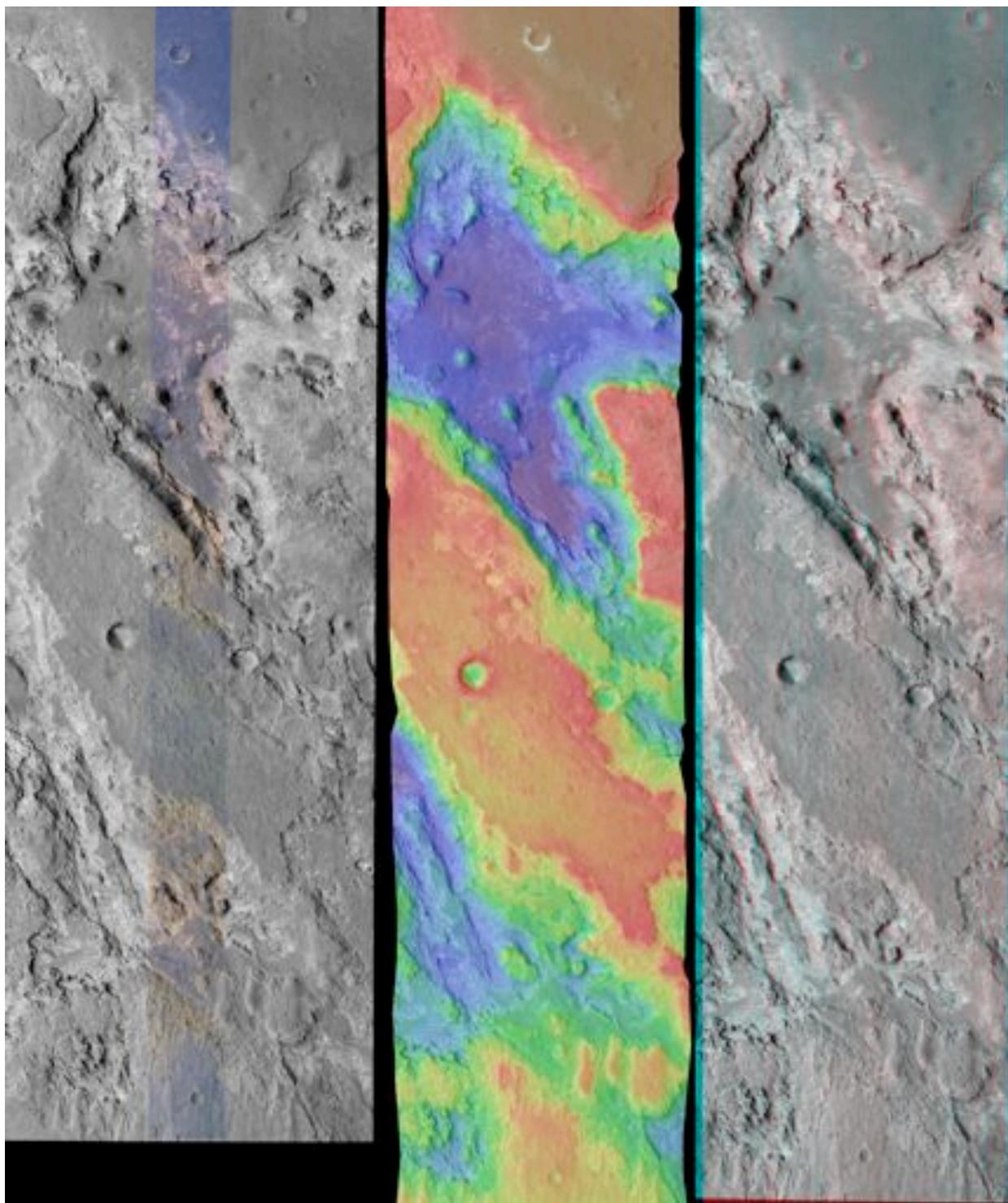


Figure 3. Exposures of layered bedrock northwest of Hellas basin. Left: HiRISE merged IRB color for ESP_013688_1540, 30 degree oblique view from the west (left). Middle: Color-coded DTM altimetry merged with RED orthoimage, DTM from ESP_013688_1540 and ESP_012620_1540. Right: stereo anaglyph from same images as in middle. Several hundred pages would be needed to show all the details in these images. *Happy DTMs are here again! The MB stops here! Remember the anaglyph! Size does matter!*