

**Mastcam Stereo Analysis and Mosaics (MSAM).** R. G. Deen<sup>1</sup>, J. N. Maki<sup>2</sup>, S. S. Algermissen<sup>3</sup>, H. E. Abarca<sup>4</sup>, N. A. Ruoff<sup>5</sup>, <sup>1</sup>Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr, Pasadena, CA 91109, [Bob.Deen@jpl.nasa.gov](mailto:Bob.Deen@jpl.nasa.gov), <sup>2</sup>same, [Justin.Maki@jpl.nasa.gov](mailto:Justin.Maki@jpl.nasa.gov), <sup>3</sup>same, [Stirling.Algermissen@jpl.nasa.gov](mailto:Stirling.Algermissen@jpl.nasa.gov), <sup>4</sup>same, [Hallie.E.Gengl@jpl.nasa.gov](mailto:Hallie.E.Gengl@jpl.nasa.gov), <sup>5</sup>same, [Nicholas.Ruoff@jpl.nasa.gov](mailto:Nicholas.Ruoff@jpl.nasa.gov)

**Introduction:** This abstract introduces the Mastcam Stereo Analysis and Mosaics (MSAM) task to the planetary science community. MSAM is a new task funded by the NASA PDART (Planetary Data Archive, Restoration, and Tools) program, which should start in May 2017 (all dates are approximate).

MSAM will create higher-order data sets using all available MSL Mastcam data, consisting of stereo processing results, terrain meshes, and three types of mosaics. The task will use the well-validated software and procedures created by the Multimission Image Processing Lab (MIPL) at JPL, which is used daily to make Mastcam, Navcam, and Pancam products for MSL and MER science and operations.

The results will be made available via PDS in a format compatible with current Navcam images delivered to PDS (PDS 3/VICAR), but will be fully compliant with PDS 4. They should be available by July 2018.

With this abstract we solicit feedback from the planetary science community (see the end).

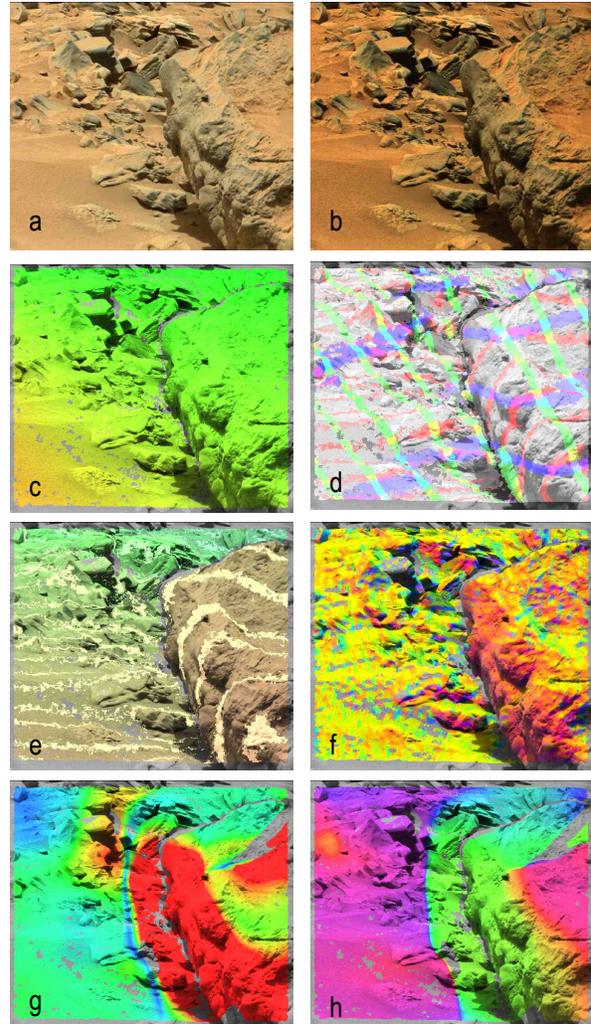
**Stereo Products:** MSAM will process all of the ~11,900 Mastcam stereo pairs in PDS (as of Release 11). Products to be created include: decompanded images, de-Bayered images, disparity maps, XYZ point clouds, surface normals, range maps, slope maps, slope aspects, stereo anaglyphs, and range errors.

These are all the same as what MIPL produces for navcams and they are described in the camera SIS [1]. Examples of some of these are shown in Figure 1. They can be visualized using the marsviewer program [2].

**Terrain Meshes:** Terrain meshes will be made by converting the XYZ point clouds into triangular facets, using the image as a texture “skin”. They will be in OBJ format, which is widely accepted by many 3-D visualization programs (such as MeshLab [3]). See Figure 2a.

**Mastcam-Navcam Coregistered Mosaics:** Sets of Mastcam and Navcam frames from the same location (including non-stereo images) will be combined into cylindrical-projection mosaics. The Navcam frames will serve as context images for the Mastcam frames and all of them will be coregistered to reduce geometric seams. See Figure 2b.

**Stereo Mosaics:** Stereo mosaics will be made from as many data sets as possible (excluding close-ups of rover hardware, which are not conducive to stereo viewing).

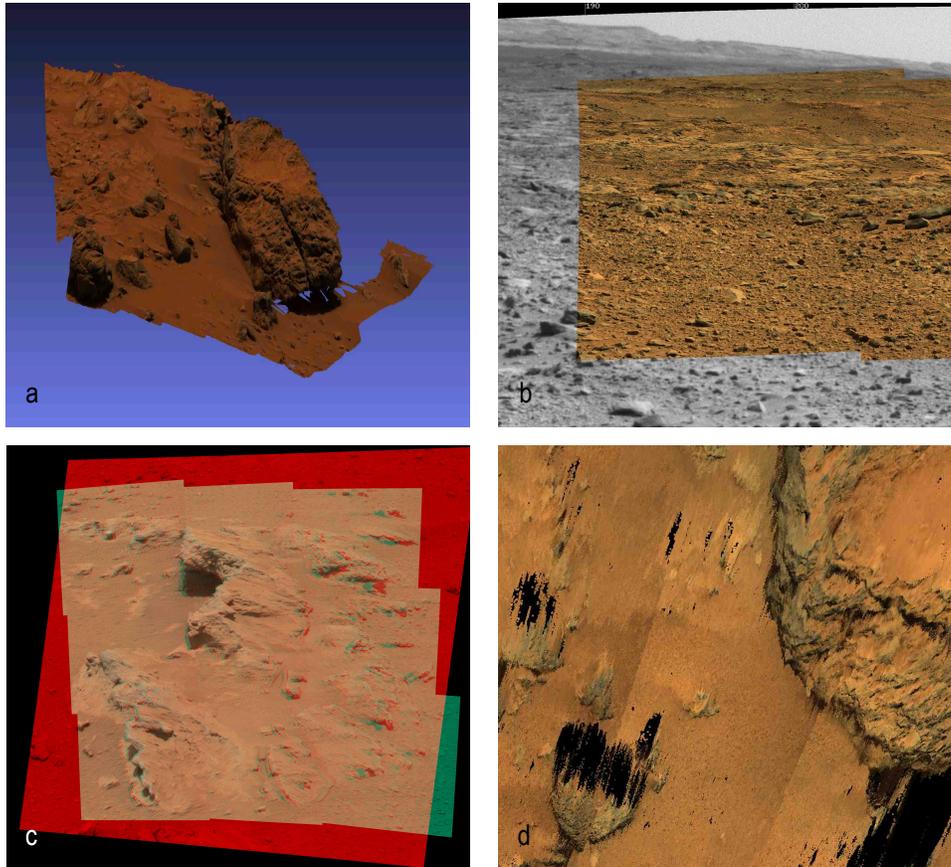


**Figure 1: Examples of MSAM products (sol 735). a) original, b) decompanded, c) disparity, d) XYZ, e) range, f) surface normal, g) slope aspect (heading).**

These can be viewed with either stereo hardware or standard red/blue glasses. See Figure 2c.

**Orthorectified mosaics and DEMs:** Orthorectified mosaics provide a “true” overhead view of the terrain by using XYZ data to remove layover effects and parallax distortion. Along with these will be coregistered Digital Elevation Maps (DEMs). See Figure 2d.

**Radiometric Correction:** Independently, Jim Bell of Arizona State University also had a PDART accepted this year to do radiometric processing of Mastcam



**Figure 2: Examples of MSAM mesh and mosaic products (sol 735 except c=121). A) Mesh in 3D viewer, b) Part of Mastcam-Navcam combination mosaic, c) Stereo anaglyph mosaic, d) orthorectified mosaic.**

data. We are planning to use his results for MSAM processing, which will greatly improve the quality of the mosaics and meshes. Although the details have not yet been worked out, and it was not part of the MSAM proposal, all parties are enthusiastic about making this happen.

**PDS Peer Review:** The MSAM project will be conducting a PDS Peer Review in the Dec 2017-Feb 2018 time frame. We are looking for reviewers. If you are interested in helping us ensure the quality and suitability of the MSAM data set, please contact us.

**Feedback:** We welcome comments, questions, suggestions, or concerns from the planetary data community - solicitation of these is the primary purpose of this abstract. If you have any, please contact the lead author, Bob.Deen@jpl.nasa.gov.

**References:** [1] Alexander, D. and Deen, R. (2013), MSL Software Interface Spec., PDS data set MSL-M-NAVCAM-2-EDR-V1.0.  
 [2] <http://pds-imaging.jpl.nasa.gov/tools/marsviewer/>  
 [3] <http://meshlab.sourceforge.net/>