

Supplemental information for AGU publication:

New detections of feldspar-bearing volcanic rocks in the walls of Valles Marineris, Mars

by:

Jessica Flahaut^{1*}, Vincent Payet^{1,2}, Frank Fueten³, Martin Guitreau⁴, Marie Barthez¹, Gen Ito¹, Pascal Allemand⁵

¹ Centre de Recherches Pétrographiques et Géochimiques (CRPG), CNRS UMR7358/Université de Lorraine, 15 rue Notre-Dame des Pauvres, 54500 Vandœuvre-lès-Nancy, France

² Institut Pierre Simon Laplace, CNRS, 91120 Palaiseau, France

³ Department of Earth Sciences, Brock University, St. Catharines, Ontario, Canada L2S 3A1

⁴ Université Clermont Auvergne, CNRS, IRD, OPGC, Laboratoire Magmas et Volcans, UMR 6524, F-63000, Clermont-Ferrand, France

⁵Laboratoire de Géologie de Lyon : Terre, Planète, Environnement (LGL, TPE), Université Lyon 1/CNRS, 69622 Villeurbanne Cedex, France

*Corresponding author: Jessica Flahaut (jessica.flahaut@unvi-lorraine.fr)

DOI to come upon publication

Archive content:

This archive contains the CTX and HiRISE DTM computed from stereo-pairs D22_035911_1651_XN_14S057W / F02_036689_1660_XN_14S057W and PSP_010277_1650_RED / PSP_010699_1650_RED respectively, using the NASA AMES stereo-pipeline on ISIS3 (Beyer et al., 2018). Layer dips and thickness were measured on the CTX and HiRISE Digital Terrain Model (DTM) using the Orion software (Pangaea Scientific, 2006), after fitting a plane trace to the upper and lower boundary of the outcrop (Fueten et al., 2008).

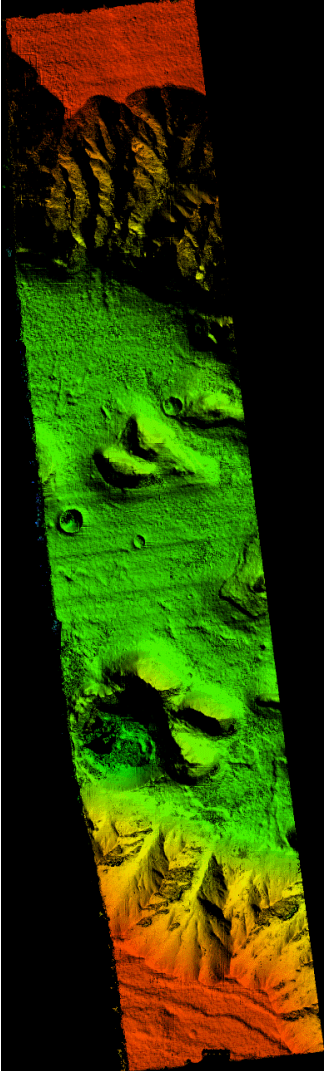
Beyer, R. A., Alexandrov, O., & McMichael, S. The Ames Stereo Pipeline: NASA's open source software for deriving and processing terrain data. *Earth and Space Science*, 5(9), 537-548 (2018).

Fueten, F., Stesky, R., MacKinnon, P., Hauber, E., Zegers, T., Gwinner, K., et al. Stratigraphy and structure of interior layered deposits in west Candor Chasma, Mars, from high resolution stereo camera (HRSC) stereo imagery and derived elevations. *Journal of Geophysical Research: Planets*, 113(E10) (2008).

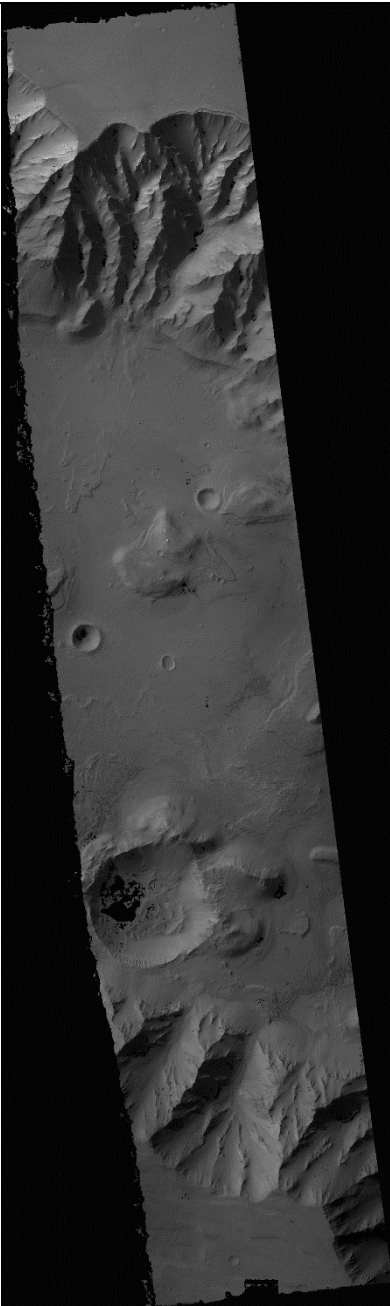
Plain Language Summary of Paper:

Detection of plagioclase feldspar minerals from remote sensing instruments onboard Mars missions is difficult, and only a handful of occurrences have been reported so far. We present here new detections of such minerals in the giant martian canyon of Valles Marineris, exposed in their original context, and associated at least in one location, to a 200 m thick sub-horizontal layer within the walls. Analyses were performed using visible near-infrared spectral data, which are commonly compared to reference spectra of known terrestrial minerals, or mineral powders, acquired in the laboratory. Whereas previous detections were interpreted as evidence for plagioclase-dominated, or at least, nearly mafic-free, plutonic rocks, we argue here that the Valles Marineris outcrops correspond to erupted, volcanic products. The signature of plagioclase could originate from large crystals hosted in mafic, intermediate, or felsic volcanic rocks; from a lava flow, or from welded ashes. Our new observations confirm that plagioclase detections on Mars can correspond to multiple types of rocks and bring more clues to ongoing debates regarding the extent of Mars' magmatic processes and the nature of its crust.

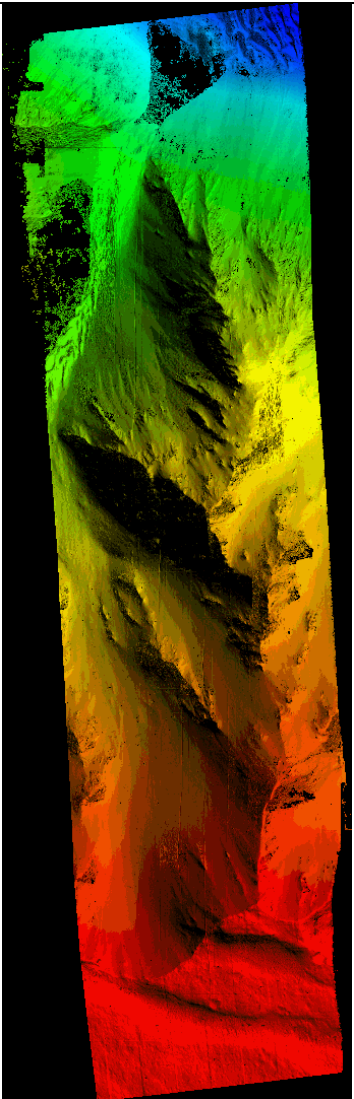
The tables below provide all Metadata for the CTX and HiRISE DTMs and Images. For the HiRISE data 20 m/pixel preview images of coloured DTM and the image are included in the folder. For the CTX data 50 m/pixel preview images are provided.

CTX DTM	Meta Data	Thumbnail
<p>D22_035911_1651_X N_14S057W- F02_036689_1660_XN _14S057W- DEM_cyli.tif</p>	<p>UPPER LEFT X=-3440069.563 UPPER LEFT Y=-759177.134 LOWER RIGHT X=-3400910.664 LOWER RIGHT Y=-889775.725 WEST LONGITUDE=58° 02' 09.7954" W NORTH LATITUDE=12° 48' 27.9988" S EAST LONGITUDE=57° 22' 31.5119" W SOUTH LATITUDE=15° 00' 39.7968" S UL CORNER LONGITUDE=58° 02' 09.7954" W UL CORNER LATITUDE=12° 48' 27.9988" S UR CORNER LONGITUDE=57° 22' 31.5119" W UR CORNER LATITUDE=12° 48' 27.9988" S LR CORNER LONGITUDE=57° 22' 31.5119" W LR CORNER LATITUDE=15° 00' 39.7968" S LL CORNER LONGITUDE=58° 02' 09.7954" W LL CORNER LATITUDE=15° 00' 39.7968" S PROJ_DESC=Equirectangular / MARS2000 / meters PROJ_DATUM=Interplanetary, Mars 2000 (Sphere) PROJ_UNITS=meters COVERED AREA=5114.1 sq km NUM COLUMNS=4167 NUM ROWS=13895 NUM BANDS=1 PIXEL WIDTH=9.4 meters PIXEL HEIGHT=9.4 meters MIN ELEVATION=-11595.176 meters MAX ELEVATION=3109.876 meters ELEVATION UNITS=meters BIT DEPTH=32 SAMPLE TYPE=32-bit Floating Point GT_CITATION=unnamed GEOG_CITATION=GCS Name = unnamed ellipse Datum = unknown Ellipsoid = unnamed Primem = Greenwich PHOTOMETRIC=Greyscale (Min is Black) BIT_DEPTH=32 SAMPLE_FORMAT=Floating Point ROWS_PER_STRIP=1 COMPRESSION=None</p>	

	PIXEL_SCALE=(9.39964, 9.39964, 1) TIEPOINTS=(0.00, 0.00, 0.00) --> (- 3440074.263, -759172.434, 0.000) MODEL_TYPE=Projection Coordinate System RASTER_TYPE=Pixel is Area VERT_DATUM=None Specified	
--	---	--

CTX Image	Meta Data	Thumbnail
<p>D22_035911_1651_XN_14S057W - F02_036689_1660_XN_14S057W- DRG_cyli.tif</p>	<p>UPPER LEFT X=-3440074.263 UPPER LEFT Y=-759172.434 LOWER RIGHT X=- 3400905.965 LOWER RIGHT Y=-889780.425 WEST LONGITUDE=58° 02' 10.0808" W NORTH LATITUDE=12° 48' 27.7133" S EAST LONGITUDE=57° 22' 31.2265" W SOUTH LATITUDE=15° 00' 40.0823" S UL CORNER LONGITUDE=58° 02' 10.0808" W UL CORNER LATITUDE=12° 48' 27.7133" S UR CORNER LONGITUDE=57° 22' 31.2265" W UR CORNER LATITUDE=12° 48' 27.7133" S LR CORNER LONGITUDE=57° 22' 31.2265" W LR CORNER LATITUDE=15° 00' 40.0823" S LL CORNER LONGITUDE=58° 02' 10.0808" W LL CORNER LATITUDE=15° 00' 40.0823" S PROJ_DESC=Equiarectangular / MARS2000 / meters PROJ_DATUM=Interplanetary , Mars 2000 (Sphere) PROJ_UNITS=meters COVERED AREA=5115.7 sq km GDAL_NO_DATA_VALUE=- 11600 NUM COLUMNS=4167 NUM ROWS=13895 NUM BANDS=1 PIXEL WIDTH=9.4 meters PIXEL HEIGHT=9.4 meters BIT DEPTH=8 SAMPLE TYPE=Unsigned 8-bit Integer</p>	

	<p>GT_CITATION=unnamed GEOG_CITATION=GCS Name = unnamed ellipse Datum = unknown Ellipsoid = unnamed Primem = Greenwich PHOTOMETRIC=Greyscale (Min is Black) BIT_DEPTH=8 SAMPLE_FORMAT=Unsigned Integer ROWS_PER_STRIP=1 COMPRESSION=None PIXEL_SCALE=(9.39964, 9.39964, 1) TIEPOINTS=(0.00, 0.00, 0.00) --> (-3440074.263, - 759172.434, 0.000) MODEL_TYPE=Projection Coordinate System RASTER_TYPE=Pixel is Area</p>	
--	--	--

HiRISE DTM	Meta Data	Thumbnail
<p>PSP_010277_1650_RED- PSP_010699_1650_RED- DEM_cyli.tif</p>	<p>UPPER LEFT X=-3417365.543 UPPER LEFT Y=-860104.317 LOWER RIGHT X=-3410479.988 LOWER RIGHT Y=-881756.430 WEST LONGITUDE=57° 39' 10.8854" W NORTH LATITUDE=14° 30' 37.7283" S EAST LONGITUDE=57° 32' 12.6969" W SOUTH LATITUDE=14° 52' 32.7515" S UL CORNER LONGITUDE=57° 39' 10.8854" W UL CORNER LATITUDE=14° 30' 37.7283" S UR CORNER LONGITUDE=57° 32' 12.6969" W UR CORNER LATITUDE=14° 30' 37.7283" S LR CORNER LONGITUDE=57° 32' 12.6969" W LR CORNER LATITUDE=14° 52' 32.7515" S LL CORNER LONGITUDE=57° 39' 10.8854" W LL CORNER LATITUDE=14° 52' 32.7515" S PROJ_DESC=Equirectangular / MARS2000 / meters PROJ_DATUM=Interplanetary, Mars 2000 (Sphere) PROJ_UNITS=meters COVERED AREA=149.09 sq km NUM COLUMNS=6337 NUM ROWS=19925 NUM BANDS=1 PIXEL WIDTH=1.087 meters PIXEL HEIGHT=1.087 meters MIN ELEVATION=-6442.049 meters MAX ELEVATION=952.285 meters ELEVATION UNITS=meters BIT DEPTH=32 SAMPLE TYPE=32-bit Floating Point GT_CITATION=unnamed GEOG_CITATION=GCS Name = unnamed ellipse Datum = unknown Ellipsoid = unnamed Primem = Greenwich PHOTOMETRIC=Greyscale (Min is Black)</p>	

	BIT_DEPTH=32 SAMPLE_FORMAT=Floating Point ROWS_PER_STRIP=1 COMPRESSION=None PIXEL_SCALE=(1.08674, 1.08674, 1) TIEPOINTS=(0.00, 0.00, 0.00) --> (- 3417366.086, -860103.774, 0.000) MODEL_TYPE=Projection Coordinate System RASTER_TYPE=Pixel is Area VERT_DATUM=None Specified	
--	--	--

HiRISE Image	Meta Data	Thumbnail
<p>PSP_010277_1650_RED- PSP_010699_1650_RED- DRG_cyli.tif</p>	<p>UPPER LEFT X=-3417366.086 UPPER LEFT Y=-860103.774 LOWER RIGHT X=-3410479.445 LOWER RIGHT Y=-881756.974 WEST LONGITUDE=57° 39' 10.9184" W NORTH LATITUDE=14° 30' 37.6953" S EAST LONGITUDE=57° 32' 12.6639" W SOUTH LATITUDE=14° 52' 32.7845" S UL CORNER LONGITUDE=57° 39' 10.9184" W UL CORNER LATITUDE=14° 30' 37.6953" S UR CORNER LONGITUDE=57° 32' 12.6639" W UR CORNER LATITUDE=14° 30' 37.6953" S LR CORNER LONGITUDE=57° 32' 12.6639" W LR CORNER LATITUDE=14° 52' 32.7845" S LL CORNER LONGITUDE=57° 39' 10.9184" W LL CORNER LATITUDE=14° 52' 32.7845" S PROJ_DESC=Equirectangular / MARS2000 / meters PROJ_DATUM=Interplanetary, Mars 2000 (Sphere) PROJ_UNITS=meters COVERED AREA=149.12 sq km GDAL_NO_DATA_VALUE=-6444 NUM COLUMNS=6337 NUM ROWS=19925 NUM BANDS=1 PIXEL WIDTH=1.087 meters PIXEL HEIGHT=1.087 meters BIT DEPTH=8 SAMPLE TYPE=Unsigned 8-bit Integer GT_CITATION=unnamed GEOG_CITATION=GCS Name = unnamed ellipse Datum = unknown Ellipsoid = unnamed Primem = Greenwich </p>	

	PHOTOMETRIC=Greyscale (Min is Black) BIT_DEPTH=8 SAMPLE_FORMAT=Unsigned Integer ROWS_PER_STRIP=1 COMPRESSION=None PIXEL_SCALE=(1.08674, 1.08674, 1) TIEPOINTS=(0.00, 0.00, 0.00) --> (-3417366.086, -860103.774, 0.000) MODEL_TYPE=Projection Coordinate System RASTER_TYPE=Pixel is Area	
--	---	--