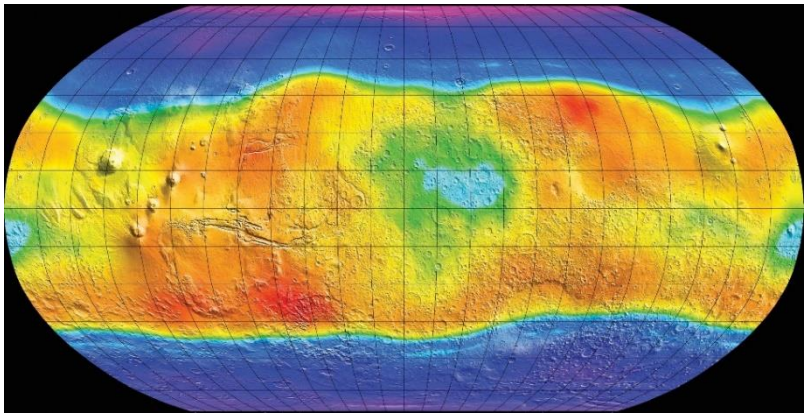
Human Landing Sites Study (HLS^2) Newsletter – November 2017

Hello All:
We wanted to send some updates on ongoing and upcoming initiatives as we move into 2018. The following are some key highlights from this newsletter: We completed our review of the project proposals for the water mapping Request for Proposals (RFP) issued this June. Information on the selected proposals can be found below. Additionally our Google Hangout briefings will be continuing with new topics including how humans will aid the search for life and how entry, descent, and landing affects base selection.

Update on Request for Proposals:
Mapping of Water Deposits to Support Mars Exploration Program Studies



Water map using 2001 Mars Odyssey gamma ray spectrometer data

Coming out of the first HLS^2 workshop there was a strong consensus that landing site selection is highly dependent on knowledge of and access to water feedstocks on Mars. The water mapping RFP issued in June attempts to combine existing data sets in creative ways to bridge the knowledge gaps around water deposits on Mars while we await the next Mars orbiter. NASA recently announced which project teams will be contracted to fill in our knowledge gaps and build these water maps. Both tasks will deliver GIS compatible maps of Mars water feedstocks. The primary investigators for each team as well as a brief description of the tasks they will be working on are below. Given the importance of this work, additional teams for both tasks are currently being considered for contracts as well. Your inputs at the 2015 HLS^2 workshop were critical for getting this project funded.

Task A – Subsurface Ice:
Nathaniel Putzig's team from the Planetary Science Institute has been selected to complete Task A. The team will generate a prototype map of subsurface ice deposits within a 10-20° wide longitudinal swath from 0° to 60°N latitude using data mainly from the Shallow Radar (SHARAD), Thermal Emission Spectrometer (TES), and the Thermal Emission Imaging System (THEMIS). Data from the Mars Orbiter Laser Altimeter (MOLA), the Mars Odyssey Neutron Spectrometer (MONS), and images from the High Resolution Imaging Science Experiment (HiRISE) and High Resolution Stereo Camera (HRSC) will also be used to support the creation of this map. If successful, these mapping techniques may be applied to the entire planet.

Task B – Hydrated Minerals:
John Carter and Francois Poulet's team from the Universite Paris-Sud has been selected to complete Task B. The team will develop algorithms to partially automate the processing of spectra of hydrated mineral detections gathered from the Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) and the Infrared Mineralogical Mapping Spectrometer (OMEGA) instruments. They will use the developed algorithms to generate a GIS compatible global map of all existing near-surface hydrated mineral detections on Mars.

A link to the original Request for Proposals can be found here.

Announcement of Google Hangouts

We will be continuing our Google Hangouts lecture series on subjects relevant to the HLS^2 community. Below is the schedule for upcoming briefings. We will be hosting these Google Hangouts on our YouTube channel (found here):

Title	Date/Time (tentative)	Speaker(s)
How Humans Will Accelerate Life Detection on Mars and What We Need to Know Before They Get There	Dec. 13 1:00pm EST	Jennifer Eigenbrode, Brian Glass, Chris Mckay, Paul Niles, and Andy Spry
Why Where We Land Affects How We Land	TBD 1:00pm EST	Jeff Herath, Steve Hoffman, Michelle Munk

These interactive lectures will be livestreamed via Google Hangouts, recorded, and made available online. We will soon send you calendar invites for the events. We hope that you will be able to join us.

HLS^2 workshop imaging and data requests from MRO:

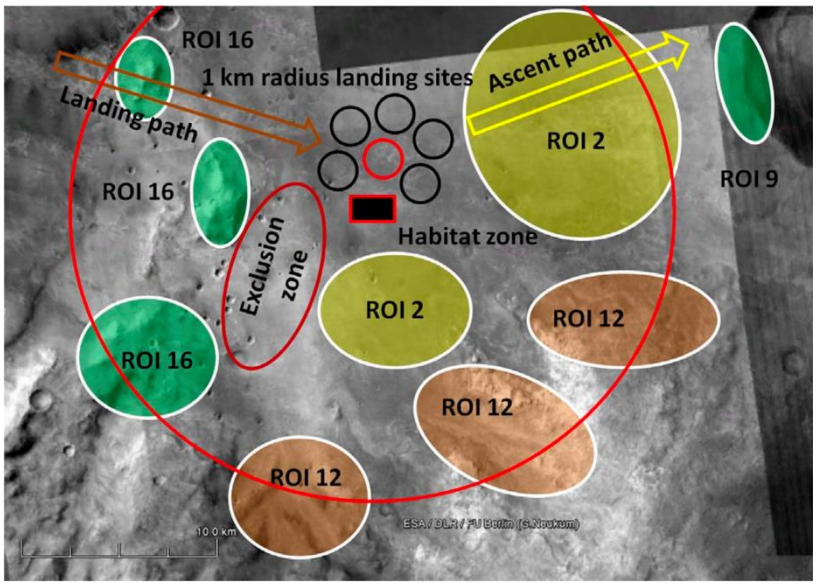
We are still making progress on the HiRISE and CRISM imaging requests made after the last HLS^2 workshop. Unfortunately the pace of CRISM image acquisition has been slowed due to problems with the CRISM cryo-coolers responsible for keeping the instruments at peak operating temperature. The result are: 1) MRO expects CRISM to be able to continue to get the good IR data, but 2) the pace of acquisition is going to be slow. Updated statuses of these imaging requests will be distributed as soon as they are available.

We are also starting a series of Google Hangouts that will serve as briefings for EZs with completed imaging requests. If your EZ imaging requests have been completed and you would like to participate in one of these Hangouts in the future, please let us know by contacting us at: *nasa-mars-exploration-zones@mail.nasa.gov*

Content Submitted from the HLS² Community

Southern Meridiani Planum - A candidate landing site for the first crewed mission to Mars

The following work was submitted by John Clarke. In it the authors examine the details of a landing site proposal at Southern Meridiani Planum in Mars's equatorial latitudes.



The proposed Southern Meridiani Planum exploration zone, with Regions of Interest marking scientific objectives and resource deposits.

Clarke et al. break their proposed exploration zone into an "inner exploration zone" and an "outer exploration zone". They note that this distinction better frames the scalability that comes with a prolonged presence on Mars– the first crews might thoroughly explore the vicinity close to the lander and habitat, but it will take several missions to fully explore the entire >30,000 km^2 exploration zone.

The report evaluates the water resource potential of polyhydrated sulphates, and science goals that the site is suited to achieve, including evaporitic sediments that might have evidence for previous life on Mars, thanks to the predicted preservation properties of the sediments. It also highlights the unique qualities of the site, including Endeavor Crater and the Opportunity rover. The report concludes that "the proposed Meridiani EZ [is] an excellent candidate for the first crewed missions to Mars."

Link to Paper: https://www.nasa.gov/sites/default/files/atoms/files/2017_meridiani_landing_site.pdf

Dissertation Examining the Solar Light Distribution at Mars

The following work was submitted by Raymond Wheeler. In the dissertation titled, "Feasibility of a Mars Surface Inflatable Greenhouse: Availability of Photosynthetic Irradiance and the Durability of Transparent Polymer Films" Jim Clawson examines both photosynthetically active radiation distribution on Mars for two Martian years as well as the impact Martian environmental conditions have on the feasibility of an inflatable greenhouse for crop production. Clawson concludes, "The better assessment of the global availability of PAR on the Mars surface will assist mission planners to refine site selection and evaluate engineering approaches, determine the best location and time of year to operate a greenhouse on Mars, and estimate the potential need for supplemental artificial lighting for greenhouse

operation." He also notes that increased exposure to ultraviolet light, unique to the Martian environment, will require that the design of any greenhouse account for the degradation of structural polymers over the course of its use.

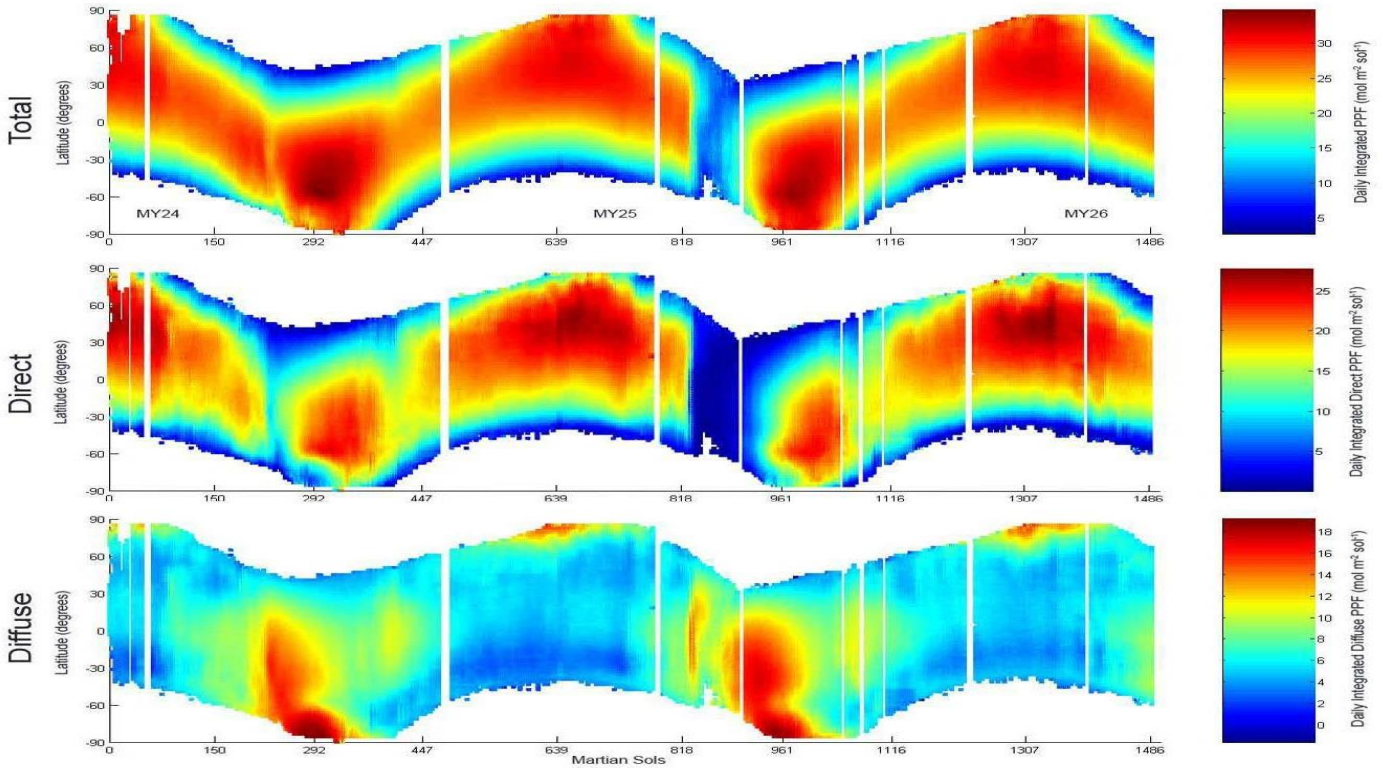


Figure 11 The daily integrated total, direct, and diffuse PPF versus latitude and Martian Sol for two Mars years. The labeled sols correspond to the start of each season on Mars. For example, sol 150 corresponds to the Northern Autumnal equinox.

Link to full paper:
https://www.dropbox.com/s/dym91yksbeitlsz/Clawson_Dissertation_CU_Boulder_Mars_Surface_Light.pdf?dl=0

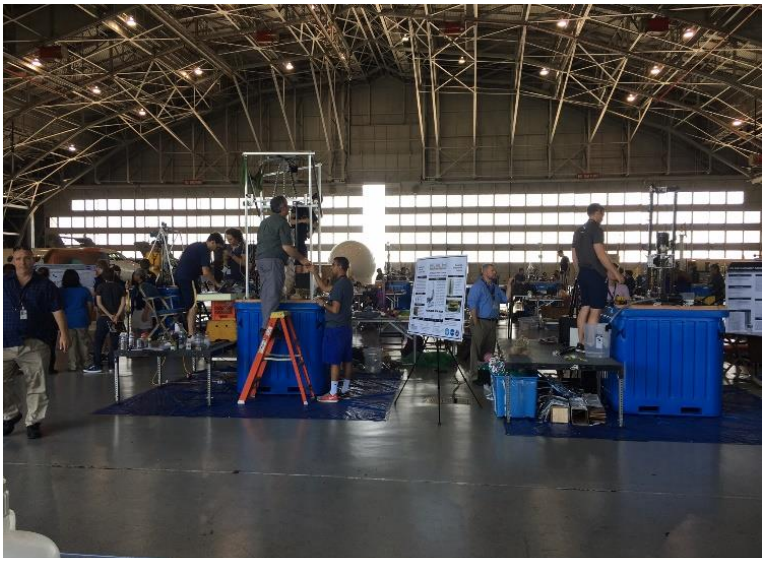
Opportunity for Internship at NASA HQ

The Mars Exploration Program office of the Science Mission Directorate at NASA Headquarters in Washington, DC is looking for an unpaid intern for the spring and/or summer with a strong interest in the robotic/human exploration of Mars. We are looking for driven team players with strong writing and organizational skills to help with our ongoing integration efforts. Candidates will have the opportunity to learn about the strategy and next steps in NASA's journey to Mars. Additionally, the position can be molded to offer a research component for academic credit.

Interested applicants should reach out to: robert.b.collom@nasa.gov for more information.

RASC-AL Mars Ice Challenge

Revolutionary Aerospace Systems Concepts Academic Linkage (RASC-AL) has announced the second year of the Mars Ice Challenge. This student engagement activity, jointly sponsored by SMD, STMD, and Langley Research Center, asks universities from across the country to propose and build drills for extracting sub-surface water ice at Mars. Selected teams will have the opportunity to build and test the water extraction capabilities of their drills at Langley Research Center in June of 2018. More information for prospective applicants can be found here. You can read more about the lessons learned and other findings from the previous year's competition in the Mars Ice Challenge report, here.



University teams test their drills at Langley Research Center during the 2017 Mars Ice Challenge finals

Links of Interest

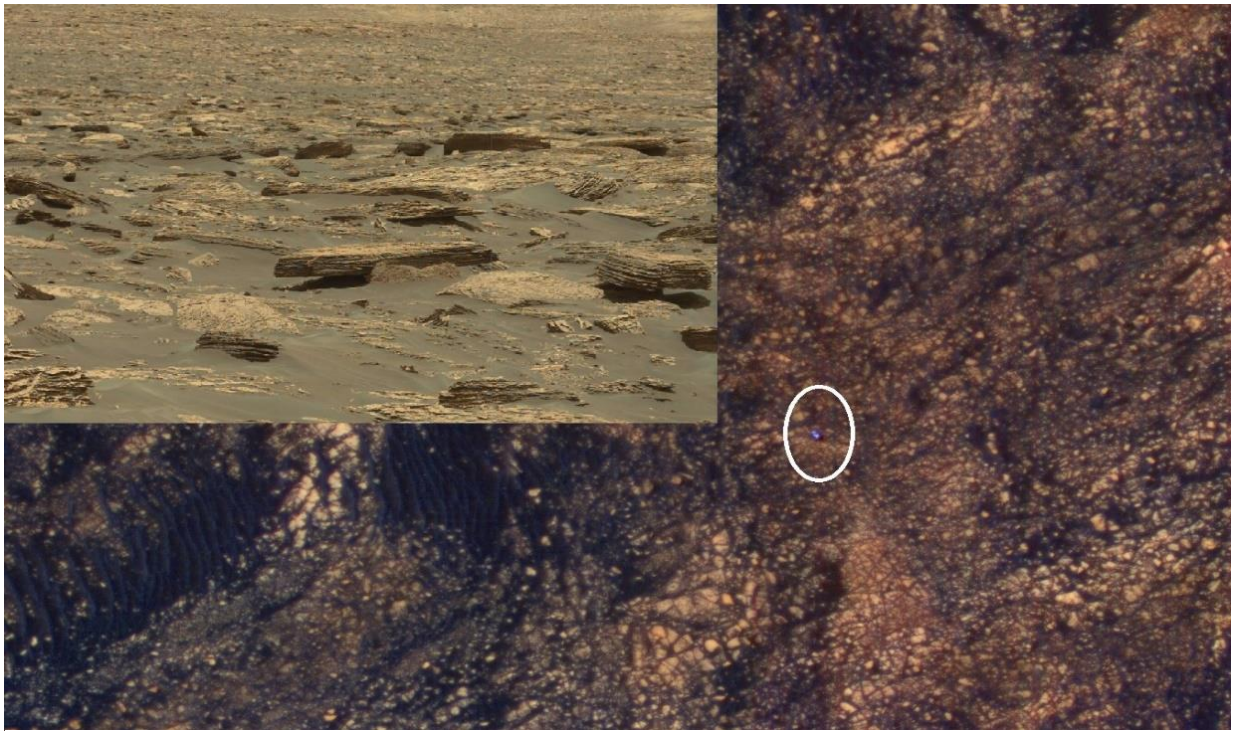
- On Monday, August 25th Associate Administrator for the Science Mission Directorate Thomas Zurbuchen presented on potential Mars Sample Return strategies at the National Academy of Sciences, Engineering, and Medicine Decadal Review.

Zurbuchen's presentation can be found here:
http://sites.nationalacademies.org/cs/groups/ssbsite/documents/webpage/ssb_181241.pdf

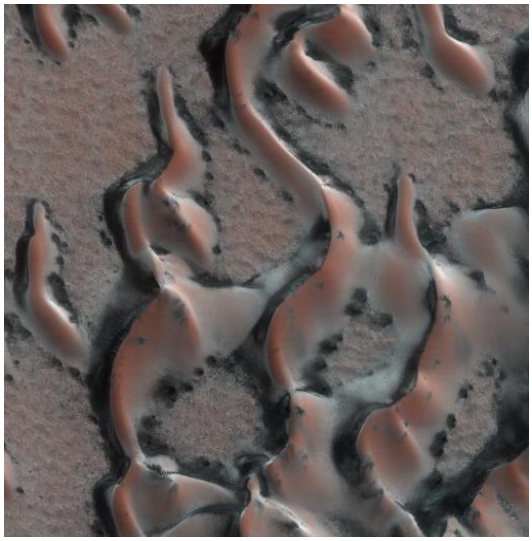
- As part of their citizen science efforts the HiRISE imaging team started the HiWish project. HiWish allows citizen scientists to make imaging requests for any location on the Martian surface.

Link to HiWish registration page:
https://www.uahirise.org/hiwish/

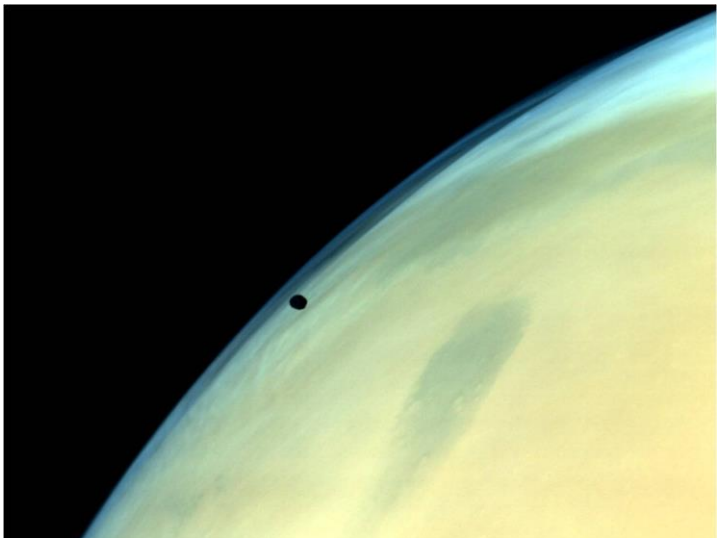
Pictures of Interest



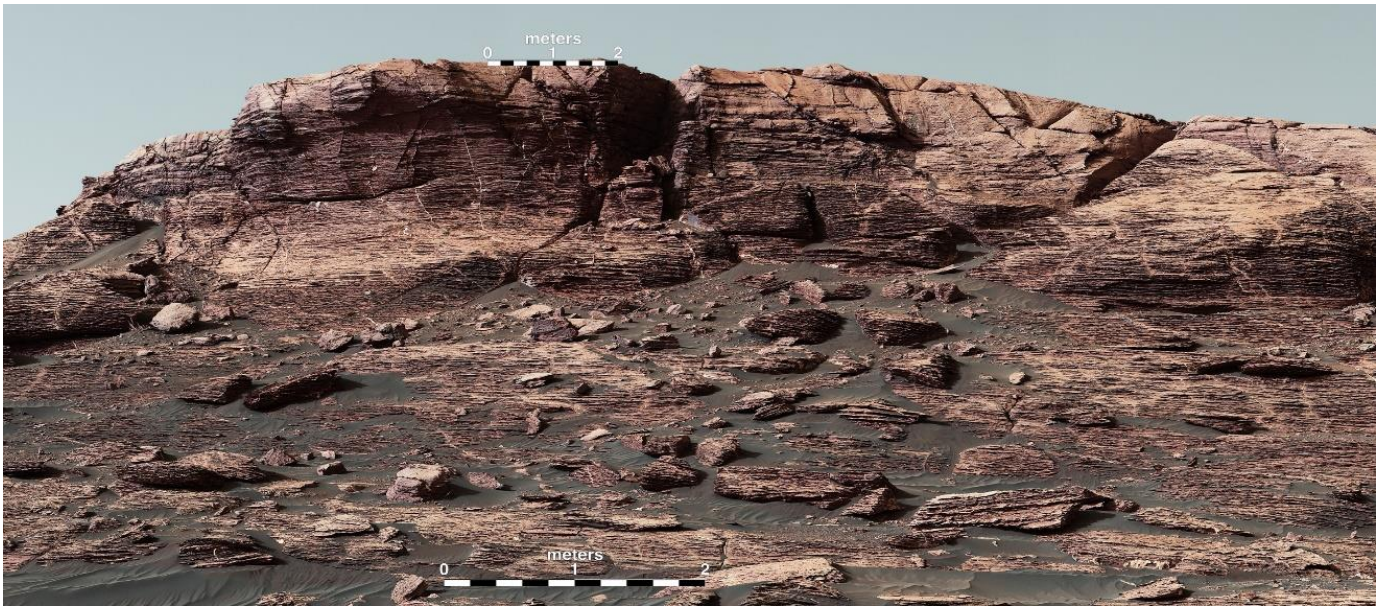
MRO's view of Curiosity from orbit and Curiosity's view of the surface - both taken on sol 1717



This photo from HiRISE shows some of the patterns formed by vast ice deposits in the northern latitudes. This specific image is of icy formations in Vastitas Borealis.



India's Mars Orbiter Mission took this photo of Phobos, silhouetted against Mars, in its first year of operation around Mars.



This image of "Vera Rubin Ridge" was taken by Curiosity on August 13th, 2017. The erosion-resistant ridge has been a place of scientific interest since before the Curiosity rover landed on Mars.