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Didascalie delle immagini del calendario

Copertina

PIA08813: 'Victoria Crater' at Meridiani Planum

"Victoria Crater," about 800 meters (one-half mile) in diameter, has been home ground for NASA's Mars Exploration Rover Opportunity for more 14 of the rover's first 46 months on Mars. This view shows the rover's path overlaid on an image of the crater taken by the High Resolution Imaging Science Experiment on NASA's Mars Reconnaissance Orbiter.
Opportunity first reached the crater's rim on Sept. 27, 2006, during the 951st Martian day, or sol, of the rover's work in the Meridian Planum region of Mars. The rover then explored clockwise about one-fourth of the way around the rim before returning to a point close to its first overlook. On the mission's 1,293rd sol (Sept. 13, 2007), Opportunity began a sustained exploration of the interior of the crater, entering at an alcove called "Duck Bay" on the western side of Victoria.

Gennaio

Colorful Ancient Rocks Near Mawrth Vallis (PSP_010183_2035)

This image covers part of a proposed rover landing site in the Mawrth Vallis region of Mars. The portion visible here is roughly 200 meters, or 650 feet, across, and shows an enhanced color view of light-toned rocks ranging in color from light blue to tan.
Polygonal fracture patterns (similar to a tiled floor) are visible on the surfaces of some of these rocks, and **yellow/brown ridges protruding from the surface** may be composed of hard minerals or cemented sediments formed when water flowed through fractures in the ancient bedrock. Dark blue dunes or ripples of wind-blown sand are also visible on the surface here.
Elsewhere in the image, exposures of the light-toned rocks in the steep walls of impact craters reveal that these rocks are finely layered, similar to sedimentary rocks on Earth. The orbiting infrared spectrometers **OMEGA** and **CRISM** have demonstrated that these layered rocks contain clay minerals, which can only form in the presence of water. The different colors of the rocks typically reflect differences in composition, suggesting that multiple styles or episodes of water activity may be recorded in the rock record here.
These characteristics have made Mawrth Vallis a prime candidate landing site for future Mars rover missions, including NASA’s **Mars Science Laboratory** due to launch in 2009.

OBSERVATION TOOLBOX

Acquisition date:	27 September 2008	Local Mars time:	3:28 PM
Latitude (centered):	23.2 °	Longitude (East):	342.5 °
Range to target site:	289.9 km (181.2 miles)	Original image scale range:	29.0 cm/pixel (with 1 x 1 binning) so objects ~87 cm across are resolved
Map projected scale:	25 cm/pixel and north is up	Map projection:	EQUIRECTANGULAR
Emission angle:	9.2 °	Phase angle:	57.8 °
Solar incidence angle:	49 °, with the Sun about 41 ° above the horizon	Solar longitude:	133.6 °, Northern Summer
For non-map projected products:			
North azimuth:	97 °	Sub-solar azimuth:	9.6 °

For map projected products:			
North azimuth:	270°	Sub solar azimuth	183.94°

Febbraio

Indicators of Recent Winds on Mars (PSP_007153_2505)

Windblown sand can be used to tell us the wind direction on Mars. Small-scale features, such as ripples and wind tails, indicate the most recent wind directions.
Wind tails may be the remnants of a formerly widespread mantle of sediment that has been removed. Alternatively, they may have formed when aeolian sediment is deposited in the wind-shadow zone behind obstacles such as the 1.5 meter diameter boulders **on the crater rim**. Their orientation points in the downwind direction. In the figure, two wind tails extend from some boulders indicating winds from at least two directions.
Ripples occur on the surface of all dunes imaged at HiRISE resolution on Mars. The alignment of ripples often results from the influence of more than one wind direction. **In this figure**, the ripples are superimposed on a low dome dune. On Earth, ripples on the surface of sand dunes may re-orientate in a matter of hours. The time required to re-orientate ripples on Mars is unknown.

OBSERVATION TOOLBOX			
Acquisition date:	04 February 2008	Local Mars time:	2:11 PM
Latitude (centered):	70.4 °	Longitude (East):	266.5 °
Range to target site:	315.4 km (197.1 miles)	Original image scale range:	31.6 cm/pixel (with 1 x 1 binning) so objects ~95 cm across are resolved
Map projected scale:	25 cm/pixel	Map projection:	POLAR STEREOGRAPHIC
Emission angle:	0.5 °	Phase angle:	63.0 °
Solar incidence angle:	63 °, with the Sun about 27 ° above the horizon	Solar longitude:	27.4 °, Northern Spring
For non-map projected products:			
North azimuth:	100 °	Sub-solar azimuth:	315.3 °
For map projected products:			
North azimuth:	3.50478°	Sub solar azimuth	220.464°

Marzo

Dunes in Abalos Undae (PSP_010219_2785)

The Abalos Undae dune field stretches westward, away from a portion (Abalos Colles) of the ice-rich north polar layered deposits that is separated from the main Planum Boreum dome by two large chasms. These dunes are special because their sands may have been derived from erosion of the Rupes Tenuis unit (the lowest stratigraphic unit in Planum Boreum, beneath the icier layers) during formation of the chasms. Some researches have argued that these chasms were formed partially by melting of the polar ice.
The enhanced color data illuminate differences in composition. The dunes appear blueish because of their basaltic composition, while the reddish-white areas are probably covered in dust. Upon close inspection, tiny ripples and grooves are visible on the surface of the dunes; these features are formed by wind action, as are the dunes themselves.
It is possible that the dunes are no longer migrating (the process of dune formation forces dunes to

move in the direction of the main winds) and that the tiny ripples are the only active parts of the dunes today.

OBSERVATION TOOLBOX			
Acquisition date:	30 September 2008	Local Mars time:	5:12 AM
Latitude (centered):	81.6 °	Longitude (East):	279.9 °
Range to target site:	319.5 km (199.7 miles)	Original image scale range:	63.9 cm/pixel (with 2 x 2 binning) so objects ~192 cm across are resolved
Map projected scale:	50 cm/pixel	Map projection:	POLAR STEREOGRAPHIC
Emission angle:	8.1 °	Phase angle:	80.7 °
Solar incidence angle:	74 °, with the Sun about 16 ° above the horizon	Solar longitude:	134.9 °, Northern Summer
For non-map projected products:			
North azimuth:	246 °	Sub-solar azimuth:	319.8 °
For map projected products:			
North azimuth:	350.126°	Sub solar azimuth	65.7738°

Aprile

Stratigraphy of the North Polar Deposits (PSP_010198_2645)

This image shows an example of layers in the Martian north polar deposits. These deposits, part of the Planum Boreum dome, are composed mainly of water ice and small amounts of dust.
The layers within these deposits are exposed by shallowly-sloping troughs that cut into them. This image is particularly interesting because it crosses complicated trough geometry, making the layers appear curved and exposing multiple stratigraphic levels.
Note that layers of different thicknesses are visible. Layer thickness is directly related to the accumulation rate of the layer; a higher accumulation rate will lead to a thicker layer. However, a myriad of factors work together to influence accumulation rate, such as the amount of sunlight reaching the surface and the amount of water in the contemporaneous atmosphere.
This image, 1.2 kilometer in width (0.75 miles) **shows enhanced color data.** Redder areas have more dust, and the blueish-white areas have more ice; but much of the color may be due to dust and ice deposited on the wall of the trough, after the layers were exposed by trough formation (i.e., color may not directly relate to layer composition).

OBSERVATION TOOLBOX			
Acquisition date:	29 September 2008	Local Mars time:	1:08 PM
Latitude (centered):	84.4 °	Longitude (East):	253.1 °
Range to target site:	319.7 km (199.8 miles)	Original image scale range:	32.0 cm/pixel (with 1 x 1 binning) so objects ~96 cm across are resolved
Map projected scale:	25 cm/pixel	Map projection:	POLAR STEREOGRAPHIC
Emission angle:	7.8 °	Phase angle:	73.4 °
Solar incidence angle:	67 °, with the Sun about 23 ° above	Solar longitude:	134.1 °, Northern Summer

	the horizon		
For non-map projected products:			
North azimuth:	128 °	Sub-solar azimuth:	323.5 °
For map projected products:			
North azimuth:	16.9316°	Sub solar azimuth	214.544°

Maggio

Stair-Stepped Layered Exposed in Gale Crater (PSP_009927_1750)

Gale Crater contains a massive central mound of layered material that has an average vertical thickness of almost 4 kilometers (2.4 miles), making it more than twice as thick as the layers exposed along the Grand Canyon on Earth. Gale Crater is approximately 152 km in diameter.
The subimage is a small portion of a HiRISE image detailing the fine-scale layering evident in the upper mound. The layered deposits can be divided into two types: a lower mound with near-horizontal, flat layers, and an upper mound with more numerous, thinner layers (some of which have greater degree of tilt than the lower layers).
The origin of these thin, repetitive layers is unknown, but they likely reflect environmental changes that occurred while the layers were being deposited. Today, erosion by wind scour has shaped them into the stair-step pattern that is reminiscent of parts of the American southwest.

OBSERVATION TOOLBOX

Acquisition date:	08 September 2008	Local Mars time:	3:41 PM
Latitude (centered):	-4.9 °	Longitude (East):	137.7 °
Range to target site:	289.9 km (181.2 miles)	Original image scale range:	29.0 cm/pixel (with 1 x 1 binning) so objects ~87 cm across are resolved
Map projected scale:	25 cm/pixel and north is up	Map projection:	EQUIRECTANGULAR
Emission angle:	24.9 °	Phase angle:	41.0 °
Solar incidence angle:	60 °, with the Sun about 30 ° above the horizon	Solar longitude:	124.0 °, Northern Summer
For non-map projected products:			
North azimuth:	93 °	Sub-solar azimuth:	34.3 °
For map projected products:			
North azimuth:	270°	Sub solar azimuth	207.193°

Giugno

PIA09190: Light-Toned Bedrock Along Cracks as Evidence of Fluid Alteration

This enhanced-color image from the High Resolution Imaging Science Experiment Camera on NASA's Mars Reconnaissance Orbiter shows a landscape of sand dunes and buttes among a background of light-toned (tan-colored) bands and dark-toned (blue-colored) bands in the Candor Chasma region of Mars' Valles Marineris canyon system.
The scene includes examples of thin dark lines bordered by light-toned bedrock [Figures 2A, 2B, and 2C]. The dark lines are interpreted as fractures, called joints, that were formerly underground but have been exposed at the surface by erosion of overlying material. The light-toned material

along the joints is interpreted as features called halos, resulting from mineral alteration (bleaching, cementation or both) of the walls of the fractures by fluid moving through the fractures.
The image was acquired on Sept. 30, 2006, during winter in Mars' southern hemisphere, at a local Mars time of 3:29 p.m. It combines separate band passes taken by the High Resolution Imaging Science Experiment in blue-green light, red light and near-infrared light.
The scene is illuminated from the west (left) with a solar incidence angle of 58.5 degrees. The image scale is 26 centimeters (10 inches) per pixel, the scale of the red bandpass image. The other bandpasses were acquired with two-by-two pixel binning to 52 centimeters (20 inches) per pixel.

Luglio

Craters and Pit Crater Chains in Chryse Planitia (PSP_008641_2105)

This image was taken of a region in Chryse Planitia where Tiu, Ares, and Kasei Valles end. This relatively flat region is pockmarked by impact craters large and small.
This image contains the side of one crater that is about 5 kilometers in diameter, several closer to 1 km, and many that are smaller than 100 meters. In the large 5 km crater, layers of rock are exposed in the crater wall. This is not surprising, given that Tiu, Ares and Kasei Valles all probably dumped tremendous amounts of sediments here, and each of the layers may represent sedimentary layers. Rays of ejecta are observed in radiating out from the large crater. There is also a younger small crater about half-way down, on the right side of the image that has dark ejecta rays still preserved on the surface.
Pit crater chains, in contrast, are not formed by impacts, but by the collapse of material into a void. **In the center of the image** is a pit crater chain along the linear feature. This linear feature is a graben, which is a block that had dropped down between two parallel faults. Pit chains commonly form in grabens, where there is collapse of material into the subsurface void. This is because this is an area of extension, or pulling apart of the crust. Pit crater chains are also observed associated with lava tubes in other locations on Mars. So these holes in the ground are distinctly different from the craters caused by impacts visible in the rest of the image.

OBSERVATION TOOLBOX

Acquisition date:	30 May 2008	Local Mars time:	3:11 PM
Latitude (centered):	30.4 °	Longitude (East):	323.4 °
Range to target site:	292.6 km (182.9 miles)	Original image scale range:	58.5 cm/pixel (with 2 x 2 binning) so objects ~176 cm across are resolved
Map projected scale:	50 cm/pixel and north is up	Map projection:	EQUIRECTANGULAR
Emission angle:	0.3 °	Phase angle:	42.4 °
Solar incidence angle:	42 °, with the Sun about 48 ° above the horizon	Solar longitude:	78.8 °, Northern Spring
For non-map projected products:			
North azimuth:	97 °	Sub-solar azimuth:	10.4 °
For map projected products:			
North azimuth:	270°	Sub solar azimuth	184.373°

Agosto

Stair-Stepped Mounds in Meridiani Planum (PSP_008930_1880)

This image shows layered sedimentary rocks that fill an impact crater in the Meridiani Planum region of Mars.
These layered rocks may have formed through the accumulation of sediment (sand and dust) that were transported into this crater by blowing wind or flowing water. These sediments formed an extensive deposit that once covered the floor of the surrounding impact crater.
This crater is so large that the HiRISE image is entirely within it, and the crater rim is not visible.
These sedimentary rocks were then eroded, likely by the wind. The original sand and dust were deposited in distinct layers within the crater; these layers now give the mounds their distinctive stair-stepped appearance, and are all that remain from this once extensive deposit.

OBSERVATION TOOLBOX			
Acquisition date:	22 June 2008	Local Mars time:	3:15 PM
Latitude (centered):	7.7 °	Longitude (East):	353.2 °
Range to target site:	282.3 km (176.4 miles)	Original image scale range:	28.2 cm/pixel (with 1 x 1 binning) so objects ~85 cm across are resolved
Map projected scale:	25 cm/pixel and north is up	Map projection:	EQUIRECTANGULAR
Emission angle:	13.7 °	Phase angle:	61.4 °
Solar incidence angle:	50 °, with the Sun about 40 ° above the horizon	Solar longitude:	88.7 °, Northern Spring
For non-map projected products:			
North azimuth:	98 °	Sub-solar azimuth:	33.2 °
For map projected products:			
North azimuth:	270°	Sub solar azimuth	206.501°

Settembre

Gypsum-Rich Dunes in Olympia Undae (PSP_010071_2615)

In this enhanced-color image are dunes within the largest collection of dunes on Mars, Olympia Undae, near the margin of the north polar deposits, Planum Boreum.
This section of Olympia Undae is particularly interesting because the dunes are rich in gypsum, a mineral that forms in the presence of water. The material comprising these dunes is thought to have eroded from geologic units near the base of the polar deposits, but these units have poor to no gypsum content. Therefore, water likely affected these dunes after the sand had eroded out from the polar deposits. Several ideas have been proposed to explain the formation of gypsum, including hydrothermal (hot water) activity and melting of water-ice in the polar deposits.
While gypsum dunes on Earth (for example, at White Sands, New Mexico) are white (the color of gypsum), these Martian dunes are dark due to the presence of basaltic grains that lower the brightness of the dunes. **CRISM,** another instrument on MRO, has found that the crests of the dunes are the most gypsum-rich.
So, what is the bright, polygonally-fractured material in the low spaces between the dunes? Perhaps it is polar ice lying beneath, desiccated (dried) gypsum material whose fine grain size makes it difficult for CRISM to detect, or something else altogether.

OBSERVATION TOOLBOX			
Acquisition date:	19 September 2008	Local Mars time:	2:22 PM
Latitude (centered):	81.5 °	Longitude (East):	139.6 °
Range to target site:	321.0 km (200.6 miles)	Original image scale range:	from 32.1 cm/pixel (with 1 x 1 binning) to 128.4 cm/pixel (with 4 x 4 binning)
Map projected scale:	25 cm/pixel	Map projection:	POLAR STEREOGRAPHIC
Emission angle:	0.1 °	Phase angle:	64.0 °
Solar incidence angle:	64 °, with the Sun about 26 ° above the horizon	Solar longitude:	129.4 °, Northern Summer
For non-map projected products:			
North azimuth:	109 °	Sub-solar azimuth:	325.0 °
For map projected products:			
North azimuth:	130.363°	Sub solar azimuth	348.144°

Ottobre

Volcanic and Clay Materials Near Nili Fossae (PSP_007055_2015)

This image is located west of the Nili Fossae trough, one of the proposed landing sites for the **Mars Science Laboratory**. Here, we combine information from two other MRO instruments, the **Context Camera** (CTX) and the **Compact Reconnaissance Imaging Spectrometer for Mars** (CRISM), to provide insight into the geology of the region.
The first subimage shows the CTX image, with the HiRISE footprint shown in yellow. This footprint covers dark and light terrain. Looking at the HiRISE image, the dark terrain is fairly featureless in some areas, whereas other parts, when zoomed in to high resolution, show ripples, sand deposits resulting from wind activity. The lighter terrain is bedrock.
Zooming in, this material commonly has a polygonal texture. **The second subimage** shows the HiRISE footprint with the location, shown as a red rectangle, of a color enhanced portion of the image; this color product **is visible here**. It combines HiRISE?s blue-green, red, and infrared filters and is enhanced to bring out detail.
By folding in data from CRISM, we can correlate the colors to materials and composition. The green and bluish colors represent a composition rich in mafic (iron- and magnesium-rich) minerals such as pyroxene and maybe olivine, with green having the greatest concentration. The green-blue material at the upper right is mostly rock, whereas the materials in the bedforms (at left) are composed of sand. The reddish materials are composed of magnesium- and iron-rich clays, possibly formed by ancient water that altered volcanic rock. In this scenario, the polygonal texture could represent cracks formed after the clays dried. CRISM also detects minor amounts of clay in the green and blue units.

OBSERVATION TOOLBOX			
Acquisition date:	28 January 2008	Local Mars time:	2:35 PM
Latitude (centered):	21.2 °	Longitude (East):	72.7 °
Range to target site:	280.5 km (175.3 miles)	Original image scale range:	28.1 cm/pixel (with 1 x 1 binning) so objects ~84 cm across are resolved

Map projected scale:	25 cm/pixel and north is up	Map projection:	EQUIRECTANGULAR
Emission angle:	0.2 °	Phase angle:	39.1 °
Solar incidence angle:	39 °, with the Sun about 51 ° above the horizon	Solar longitude:	23.8 °, Northern Spring
For non-map projected products:			
North azimuth:	97 °	Sub-solar azimuth:	354.6 °
For map projected products:			
North azimuth:	270°	Sub solar azimuth	169.381°

Novembre

Impact Crater amid the Deuteronilus Mensae (PSP_009654_2245)

This crater with spectacular ejecta is located in the northern mid-latitudes in the Deuteronilus Mensae, located near the dichotomy boundary, where the southern highlands transition into the northern lowlands.
The crater has raised, fluidized ejecta. Scientists think that fluidized ejecta forms when an impact occurs into ice-rich material. The interior of the crater shows some material, particularly on the west wall, that has detached and is flowing into the crater center. This suggests the presence of ground ice.

OBSERVATION TOOLBOX			
Acquisition date:	17 August 2008	Local Mars time:	3:22 PM
Latitude (centered):	44.2 °	Longitude (East):	23.4 °
Range to target site:	303.4 km (189.6 miles)	Original image scale range:	60.7 cm/pixel (with 2 x 2 binning) so objects ~182 cm across are resolved
Map projected scale:	50 cm/pixel and north is up	Map projection:	EQUIRECTANGULAR
Emission angle:	7.8 °	Phase angle:	38.7 °
Solar incidence angle:	46 °, with the Sun about 44 ° above the horizon	Solar longitude:	114.1 °, Northern Summer
For non-map projected products:			
North azimuth:	96 °	Sub-solar azimuth:	355.1 °
For map projected products:			
North azimuth:	270°	Sub solar azimuth	170.433°

Dicembre

Multiple Generations of Dark Slope Streaks on a Crater in Arabia Terra (PSP_008322_1865)

This image is of a crater in Arabia Terra, which is a large swath of bright (high albedo) terrain in the Martian cratered uplands. The steep interior walls of the crater are covered with numerous slope streaks, thought to be caused by dust avalanches that strip away layers of dust to reveal a darker underlying surface.
Here, **multiple generations of slope streaks** are present. The most recent features appear the darkest, and they appear to gradually brighten over time as more dust is deposited from the thin

Martian atmosphere. Causes of dust avalanches include small impact craters, rockfalls, and oversteepening of the surface as dust accumulates. This last mechanism is similar to the way in which snow-covered slopes in high mountain areas on Earth accumulate enough snow to become gravitationally unstable, leading eventually to avalanches.

OBSERVATION TOOLBOX

Acquisition date:	05 May 2008	Local Mars time:	3:09 PM
Latitude (centered):	6.5 °	Longitude (East):	37.6 °
Range to target site:	273.1 km (170.7 miles)	Original image scale range:	from 27.3 cm/pixel (with 1 x 1 binning) to 54.6 cm/pixel (with 2 x 2 binning)
Map projected scale:	25 cm/pixel and north is up	Map projection:	EQUIRECTANGULAR
Emission angle:	3.1 °	Phase angle:	51.1 °
Solar incidence angle:	49 °, with the Sun about 41 ° above the horizon	Solar longitude:	68.0 °, Northern Spring
For non-map projected products:			
North azimuth:	97 °	Sub-solar azimuth:	30.9 °
For map projected products:			
North azimuth:	270°	Sub solar azimuth	205.393°