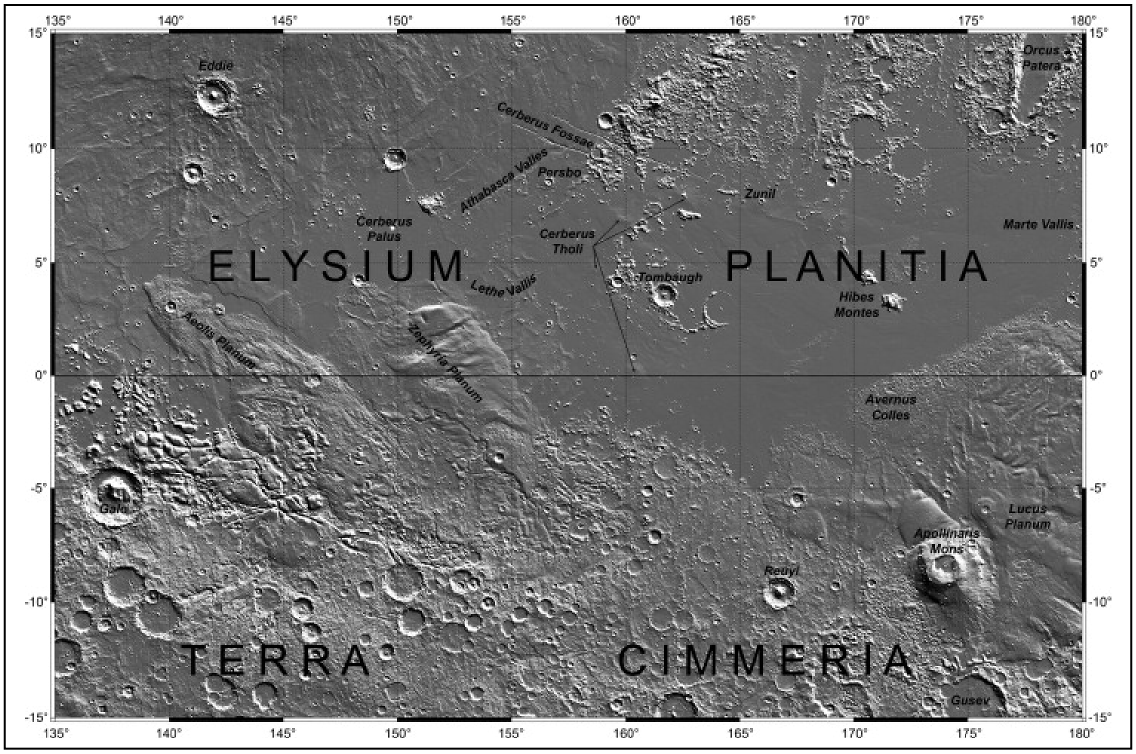
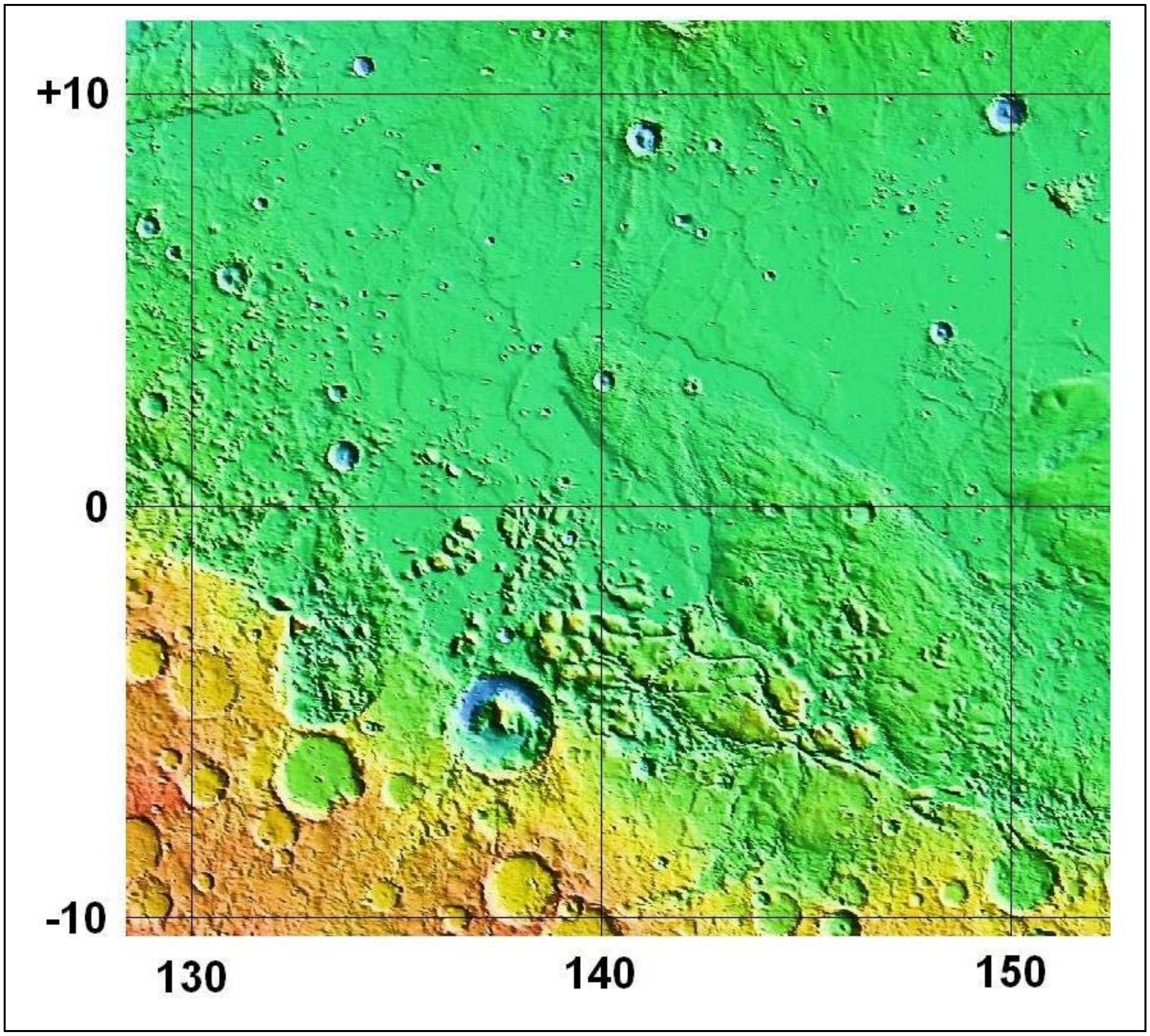


This composite image was obtained by the Mars Reconnaissance Orbiter of the proposed landing area for InSight near Mars latitude +1.5°North and Longitude 139.5°East in the region known as Elysium Planitia.

An equatorial location was selected to make radio communication easier and so that the lander can survive Mars winter conditions, among other reasons.

The lander's temperature probe (HP^3) needs to bore down 5 meters into the martian soil in order to make its measurements of heat flow. The final landing site will be selected based on its having a loose soil-like composition rather than a rocky surface that the drill cannot penetrate.

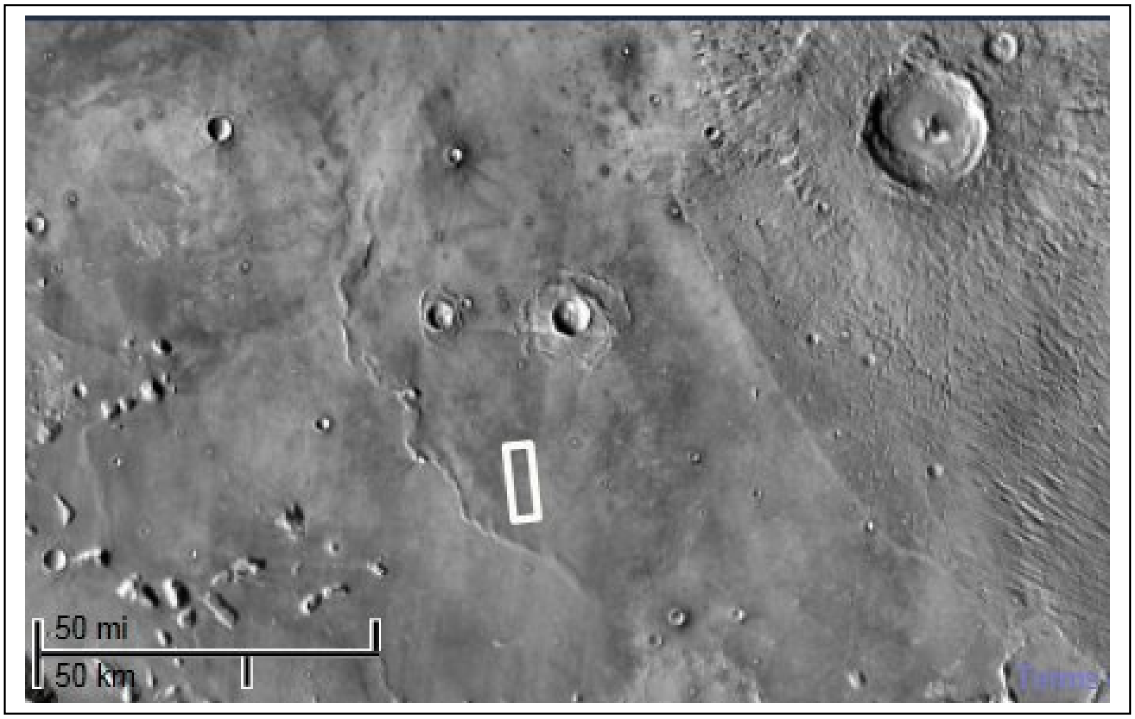
Problem 1 – From the landing coordinates, locate the proposed InSight landing area on the low-resolution map.



Problem 2 – This is a composite image made by the NASA, Mars Orbiter Laser Altimeter (MOLA) instrument of the Elysium Planitia area. The latitude and longitude coordinates are given on a 10^{o} grid. Can you locate the proposed landing area for InSight in this map?

Problem 3 - The map colors indicate the altitude of the region above the average surface of Mars, whose zero-altitude is coded with yellow. Blue means the area is -4 kilometers below this average. Green is -2 kilometers below the average level. Red means the region is +4 kilometers above this average level. What can you say about the landing area from the altimetry data?

Problem 4 – The scale of this map is 10^{o} in longitude= 590 kilometers. If the Curiosity Rover is located in Gale Crater at Latitude -4.6^{o} South and $+137.44^{o}$ East Longitude, about how far from Curiosity is the proposed InSight landing area?

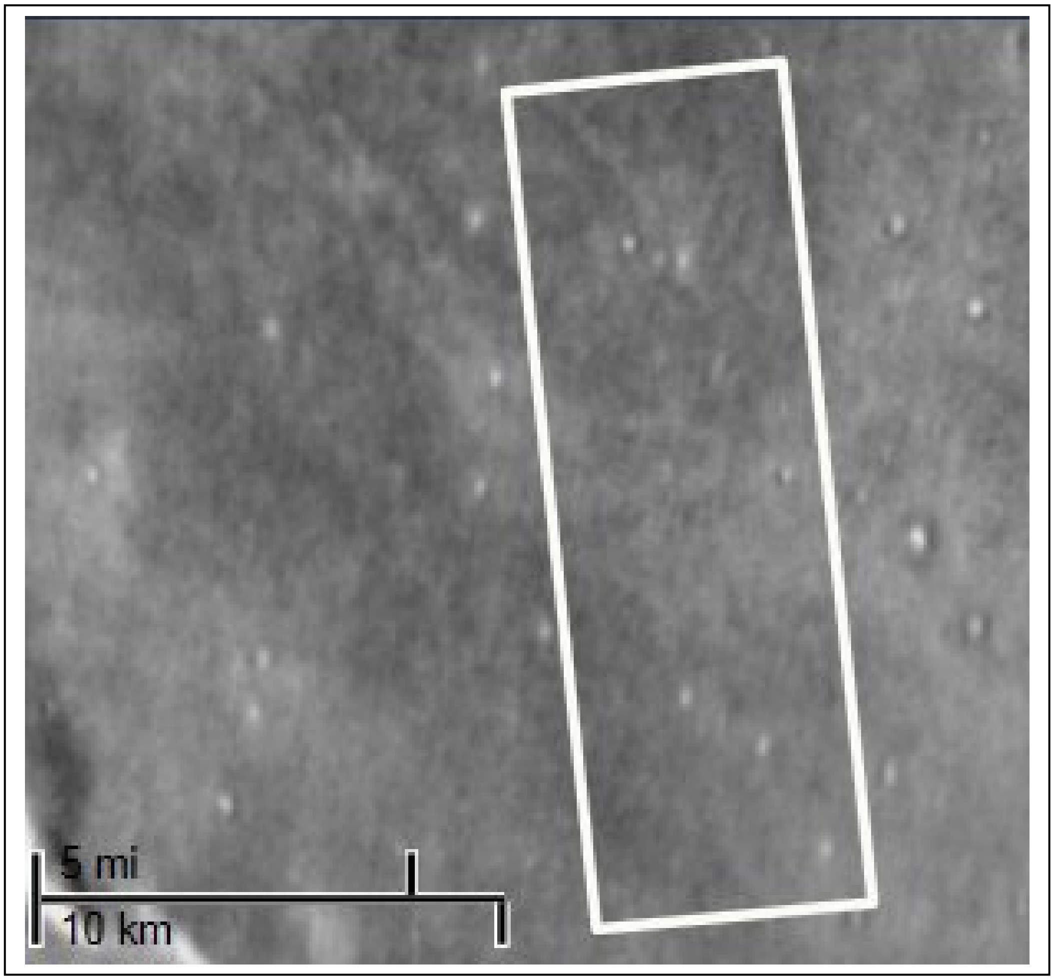


MRO image**: ESP_027702_1815**
Title: Future Landing Site for InSight mission, ellipse E11
Interactive Image: http://www.uahirise.org/hiwish/view/69980
The center of the rectangle is at Latitude +1.617°N and Longitude 138.684° East.

Problem 5 – From this image, and the available information and visual clues, can you identify any features in the MOLA image that appear in this higher-resolution, infrared image?

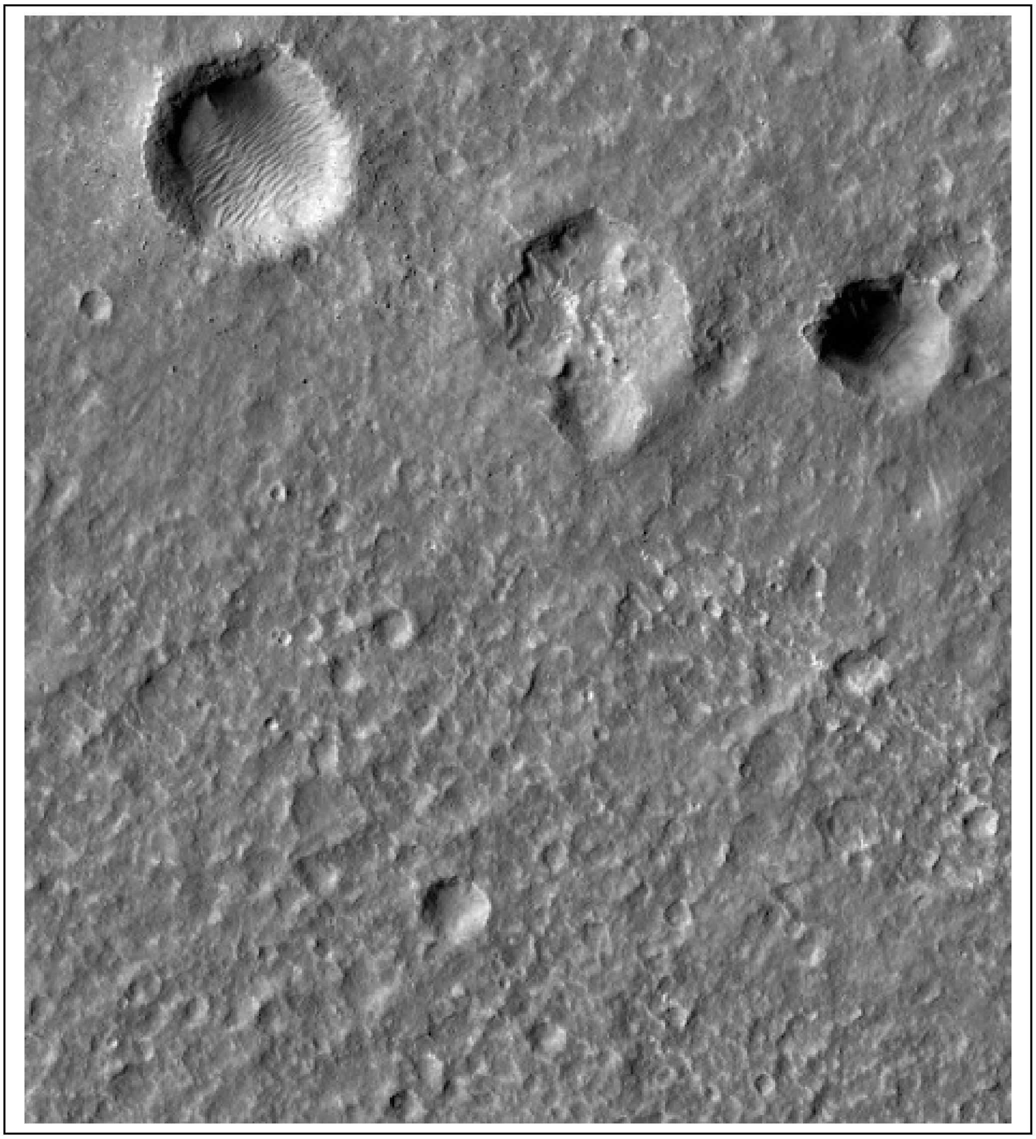
Problem 6 – How big, in meters, are the smallest features you can see, and what are they?

Problem 7 – What clues in this image suggest that, instead of solid rock, the martian ground in this area might actually be much looser?



This is an enlargement of the previous image showing additional detail. The white rectangle is centered on a possible landing area in this region for InSight. Because this is an infrared image sensitive to the temperature of the martian surface, bright features are craters, where the disturbed soil and rock has a higher reflectivity in the infrared spectrum, making the ground appear brighter.

Problem 8 – What is the area of this box in square kilometers?



The Mars Reconnaissance Orbiter High-Resolution (HiRes) imager can take photographs of the martian surface as small as 60-centimeter. This image is an enlargement of a portion of the area inside the landing rectangle. It is 400 meters across.

Problem 9 – Can you find evidence for wind-blown dust?

Problem 10 – Can you find evidence for any large boulders ejected from a meteor impact? If so, how big are they in meters?

Problem 11 – Why do you think that the smaller craters do not show evidence for boulders?

Problem 1 – When printed at normal '81/2x11' page format, the width of the image is 136mm. The scale is 0.33 degrees/mm. The landing area is 13.5 mm from the left-hand edge, and 50 mm from the bottom near the feature called Aeolis Planitia.

Problem 2 – Scale = 55 mm/10 degrees = 5.5 mm/degree.

Problem 3 – The proposed landing area is about 2 kilometers below the average surface level of Mars, and because the color is a constant color, the area is very flat.

Problem 4 – Plot location of Curiosity. Measure distance to InSight with millimeter ruler to get 39.5mm. Scale of the image is 590 km/54.5 mm so distance = 39.5mm x 590km/54.5mm = 427 km. Check your answer at: http://jmars.mars.asu.edu/maps/?layer=MOC_Atlas_256ppd

Problem 5 – The large crater in the upper right corner, together with the two smaller craters near the center of the image are easy to see in the MOLA map, along with several other features.

Problem 6 – The scale of the image is 5okm/28mm = 1.8 km/mm and the smallest crater you can easily see is about 0.5mm across, so the smallest feature is about 900 meters across.

Problem 7 – The two craters near the center of the image have skirts of ejecta that looks like mud flowing downhill. The wavy ridge to their left also looks like the same kind of flow, so the ground is not solid rock, but a mixture of materials that can flow like mud when struck.

Problem 8 – The scale is 10km/62mm = 0.16 km/mm. The box has dimensions 36mm x 112mm which is 5.8km x 18 km, so the area is 104 km^2.

Problem 9 – In the bottom of the crater in the upper left corner you see trapped 'sand dunes' of martian dust.

Problem 10 – Near the edge of the largest crater you see little dots on the surface that are not craters because the shadow is on the opposite side that for craters, so these dots stick up above the landscape and are boulders. They are less than 1mm across in the image so that means from the scale of the image (400m/130mm) that they are less than 3 meters across.

Problem 11 – One possibility is that the impacts were not powerful enough to launch the boulders out of the crater. Another possibility is that the impacts were shallow and did not penetrate to the ground level where the boulders are located.