Mars for Earthlings

LESSON 16: Weathering & Patterned Ground

Homework 1

Weathering and Soils_MFE

Chemical vs. Mechanical

Introduction: This exercise will focus on your ability to identify weathering processes/features on Earth and on Mars. The last part of this exercise will involve using Google Mars to recognize weathering features through high-resolution images.

PART I—Weathering of Earth

For the following 4 images, determine whether they are the result of mechanical or chemical weathering, and identify the specific process that formed the weathering feature.

Sandstone
Australia
Humid continental

Image 1 (Image Source: http://commons.wikimedia.org/wiki/File:Cracked_boulder_DMCR.jpg, "Devil's Marbles" Author: Prince Roy)

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Sandstone
Oregon,
Coastal/temperate

Image 2 (Image Source: http://www.earthscienceworld.org/images/search/results.html?Category=&Continent=&ImageID=hhrhsr#null Photographer: Marli Miller, University of Oregon)

Sandstone
Anza-Borrego Desert State Park,
California,
Semi-arid/rain shadow

Image 3 (Image Credit: Michael Szoenyi/Science Photo Library; http://www.sciencephoto.com/media/173681/enlarge)

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Granite
Enchanted Rock,
Texas
Humid Subtropical

Image 4 (Image Source http://en.wikipedia.org/wiki/File:GeologicalExfoliationOfGraniteRock.jpg)

PART II—Weathering of Mars

For the following images, identify whether the features are caused by mechanical or chemical weathering and answer the additional questions for each image.

Image 5

1. What are 3 likely processes causing the pits in the rock in the image below?
2. What does that mean for the type of environment that could have existed on Mars?
3. Name 3 geographic areas on Earth that would work as an analog to this rock.

Volcanic rock
Ares Valles region,
Pathfinder landing site

Image 5 (Image Source: http://science.ksc.nasa.gov/mars/mpf/stereo-arc.html)

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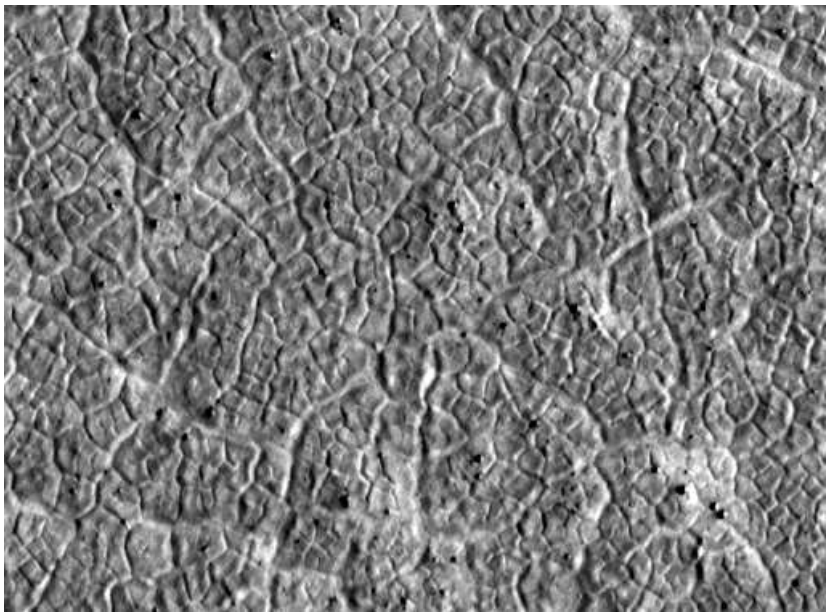
Image 6

1. What feature is shown below?
2. What are 3 processes/influences that can cause these features?



Likely sand-siltstone
Near North Pole

Image 6 (Image Source: http://web.pdx.edu/~pdx06058/Planetary_Research.html)

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Image 7

1. This is a false-color image of the surrounding area around the Sojourner Rover. What is the red tone on the Martian surface and what does that mean?

2. Which direction is the wind coming from (This does not have to do with weathering)?

Volcanic rock (Yogi rock)
Ares Valles region
Pathfinder Lander location

Image 7 (Image Source: http://nssdc.gsfc.nasa.gov/planetary/marspath_images_2.html)

Image 8

1. What is the nickname given to the little balls scattered in the image below?

2. What are they? How are they formed and what does that mean for surface processes in the Martian past?

3. What weathers faster: the host rock or the little balls scattered on the surface? Give some reasons to support your answer.

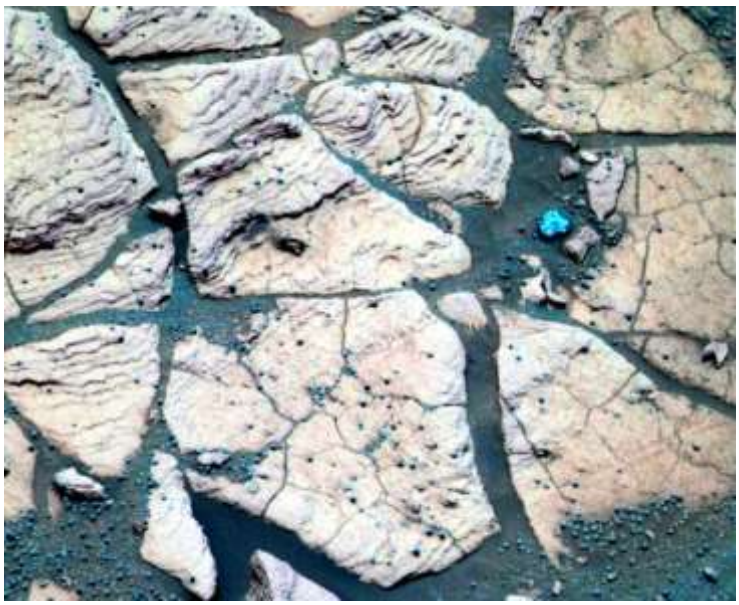

Photo by MER Opportunity Rover At rock outcrop "Shoemaker's Patio"

Image 8 (Image Credit: NASA/JPL; Source: http://photojournal.jpl.nasa.gov/catalog/PIA05584)

PART III—Google Mars

1) The images in questions 1 and 3 were taken by the Mars Pathfinder Lander.
   a. Where is the lander located (lat/long)?
   b. Go into the "presidential" panorama and describe the image and features that you see.
   c. It landed in Ares Valles. Describe the area in terms of the geomorphic features and why it presently looks this way.

2) The image in question 2 was taken by the HiRISE camera aboard the Mars Reconnaissance Orbiter. The coordinates are approximately 71° 38' N and 145° 20' E.
   a. What kind of environment would create a surface like this? Is this process continuing today on Mars? Is it continuing on Earth?

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3) The MER Opportunity rover took the image 8. Go to the following website: http://mars.nasa.gov/mer/home/
   Click on Multimedia
   - Click on images
   - Go to All Raw images for the Opportunity Rover
   - Next go down to Science Cameras/Panoramic Camera and scroll down to Sol 109, Click "View Selected Images"
   - Scroll down and explore images 8-20 under Sub-Frame EDR (not numbered)

   a. Determine why it took so many images of the same spot on the surface.
   b. Record the Sol from the latest image (go back one page). How does this Sol compare to the expected life of the mission?

   c. Go back to Google Mars and determine approximately where the rover was when it took these pictures, both geographically and lat/long.

   d. Go to the panoramic, "Crater of Clues" and briefly describe what you see, both around the rim of the crater as well as within the crater.