

Mars for Earthlings

LESSON 6: Igneous Rocks & Volcanics***In-Class Activity 2***

Igneous Rocks & Volcanics_MFE

Columnar Jointing on Mars

Purpose: Become familiar with the formation and the processes of columnar jointing and its apparent formation on Mars.

Are these columns natural?

Study Figure 1 (a) below. A. In a few sentences, write down your hypothesis for how these features form. B. Are there any other features in your daily life or on Earth that have similar characteristics?

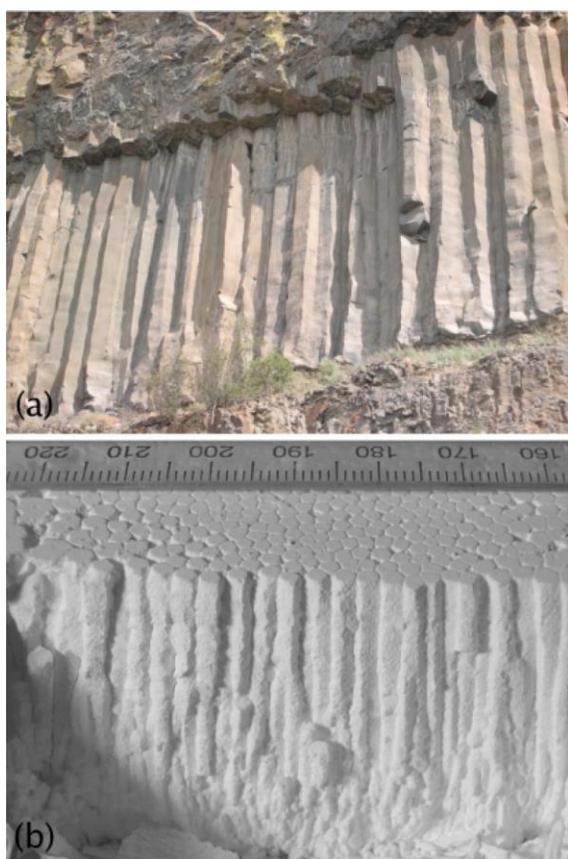


Figure 1 Columnar jointing in (a) basalt of the Columbia Plateau near Banks Lake ~95 cm average diameter, and (b) in desiccated corn starch. (Image Credit: Gohering L., Morris, S.W., and Lin, Z., 2006. Experimental investigation of the scaling of columnar joints. PHYSICAL REVIEW E 74, 036115, p. 1-12.)

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Watching columnar jointing in action:

Read the following article or view the following cornstarch experiment video used to illustrate columnar jointing (Figure 1 (b) is a still from the experiment). Consult the explanation under the video window.

Video: www.youtube.com/watch?v=CJWfneKdv08

Article: <http://www.sciencedaily.com/releases/2008/12/081216104325.htm>

1. Is there perfect similarity between the “real” columnar joints of the Columbia River basalts and the experiment? Why or why not?
2. How do the fractures/cracks form? Are they widening, re-forming through time, or starting new fractures?
3. What might enhance the cracks?
4. How could you foresee such features forming on Mars?

A Discovery!

View the following 2009 Mars discovery:

1. **Figure 2** (below) shows images of columnar jointing on Mars using the HiRISE camera (see original HiRISE link). Using arrows, point to where you think the columnar joints are exposed in this terrain.
2. What does this image tell you about igneous rocks and their history on Mars?



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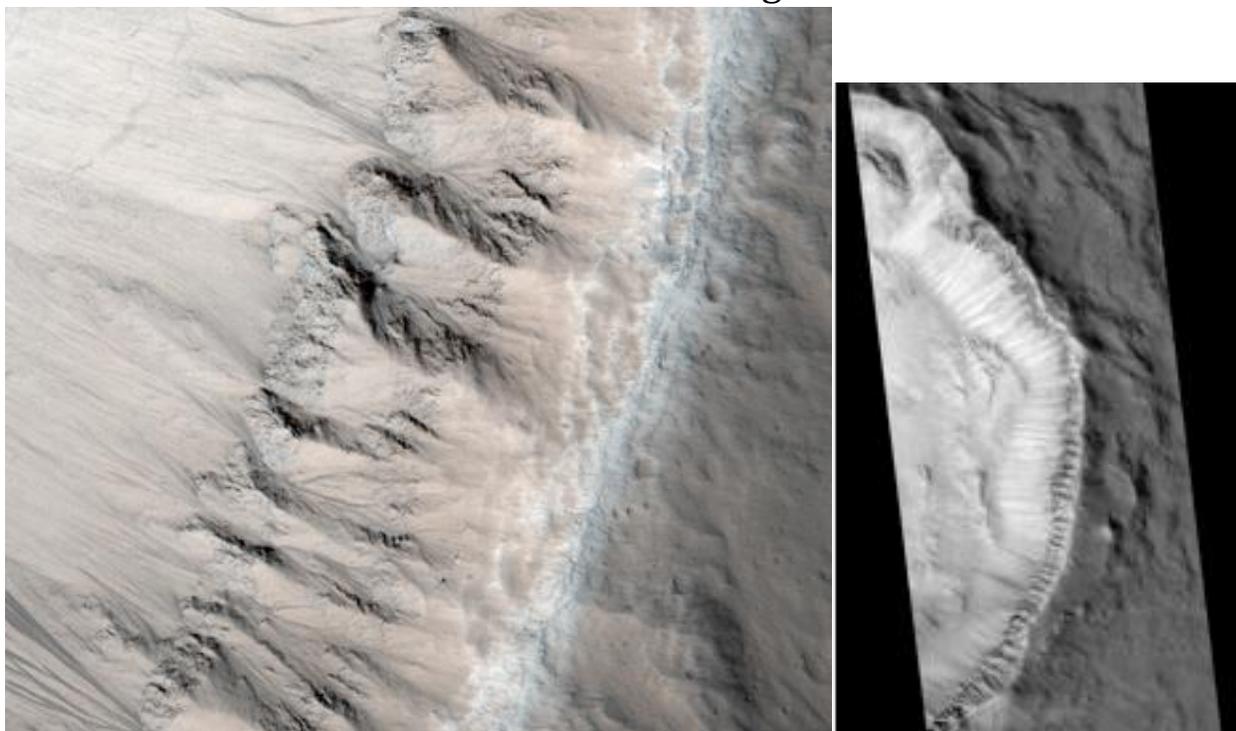


Figure 2 http://hirise.lpl.arizona.edu/PSP_005917_2020 (Image Credit: NASA/HiRISE)

References:

Goehring, L., et al., 2008, Nonequilibrium scale selection mechanism for columnar jointing, PNAS, V. 106, p. 387

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Long, P.E., and Wood, B.J., 1986, Structures, textures, and cooling histories of Columbia River basalt flows: Geol. Soc. America Bull., v. 97, p. 1144-1155.

Mallet, R., 1875, Origin and mechanism of production of prismatic (or Columnar) structure in basalt: Phil. Mag. v. 4, p. 122-135 and 201-226.

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