

Lesson 17: Vast Deserts on Mars

Summary

Using a Sandbox experiment and Google Earth students will study the formation of dunes and relate their observations to Mars dune field imagery.

Learning Goals

Students will be able to:

- Identify wind current directions on Earth and Mars
- Explain the formation of certain dune morphologies.
- Use Google Earth to identify changing paleocurrent direction, bounding surfaces, and their potential to be observed/preserved on Mars.

Context for Use

This learning module is meant for integrating the Martian wind into terrestrial analysis. The *In-Class Activities* can be easily adapted for homework when desired.

Description and Teaching Materials

In-Class Activity

In-Class Activity 1: Sandbox Dunes

In-Class Activity 2: Martian

Ventifacts

Homework/Lab

Homework 1: "Bounding" Through Dunes

Teaching Notes and Tips

1. For larger classes (>20 students) you can either create your own Sandbox Dune demonstration or use the Video demonstration (see Resources).

2. In Homework 1: students will need a clear understanding of how dunes and dune processes are recorded in the rock record (marching away from you, toward you, paleocurrent direction etc.).
3. You will often integrate the Explain and Explore sections of the In-Class Activities. Interact with the students as they "explore" and help them define terms/principles (Ex: Sandbox Dunes).

Assessment

Methods of assessment are within each individual *In-Class Activity* and *Homework*.

Mars for Earthlings

References and Resources

1. Image file: [Vast Deserts on Mars](#)
2. Antarctica Ventifacts
3. Sand Box Dune Video: <http://serc.carleton.edu/details/files/44290.html>
4. Grotzinger, J.P. et al., 2005. Stratigraphy and sedimentology of a dry to wet eolian depositional system, Burns formation, Meridiani Planum, Mars. Earth & Planetary Science Letters, v. 240, p.11-72.
5. Burns Formation PanCam Sol 288 Image Source:
<http://marsrover.nasa.gov/gallery/all/1/p/288/1P153752565ESF37MIP2544L7M1.HTML>



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In-Class Activity 2

Vast Deserts_MFE
Martian Ventifacts

Purpose: Explore the existence and formation processes of ventifacts.

Preparation

Depending on your mode of delivery (in class versus a homework setting), load the Image File .ppt for the class and make sure you have an Internet connection to view the associated videos.

Resources:

1. Mojave Desert Ventifact Video: <http://www.youtube.com/watch?v=OOqOm3KgGMw&feature=endscreen>
2. Mars ventifact images: <http://www.psi.edu/pgwg/images/jul09image.html>

Engage

Have students observe the large ventifact in Death Valley (see Image File, Photo by Marjorie Chan)

1. What formation seems odd to the students? Have they seen anything like it? Why is there only one?
2. Ask students to hypothesize how this might have formed.



Figure 1: Death Valley Photo, credit: Marjorie Chan

Explore

Ask students to view the following video and answer the following questions. Start a discussion with your students.

<http://www.youtube.com/watch?v=OOqOm3KgGMw&feature=endscreen>



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1. What do the students look for in order to determine if a rock or feature is a ventifact?
2. How can they discern which direction the wind was/is blowing?
3. What causes the reddish-orange coloration?

Explain

Definition: Ventifact- A rock that has been shaped or polished by the sandblasting effect of wind-blown sand

Elaborate

Here are what might be considered ventifacts on Mars:

<http://www.psi.edu/sites/default/files/imported/pgwg/images/VentFig4.jpg>

1. Bring up images on the screen or provide laminated copies upon which students can make annotations
2. Ask students to label the wind direction on each: A thru G.
3. Discuss with students the preservation potential of these eolian reworked deposits.
 - a. Is the preservation potential higher on Mars or Earth? Have the students explain their reasoning via images where possible.

Evaluate

1. Do the students believe that these are indeed ventifacts? Why or why not? Which images are the best examples of true ventifacts? Which images are more dubious?
2. Discuss student ideas and their understanding of ventifact formation and their indicators for wind current direction.

