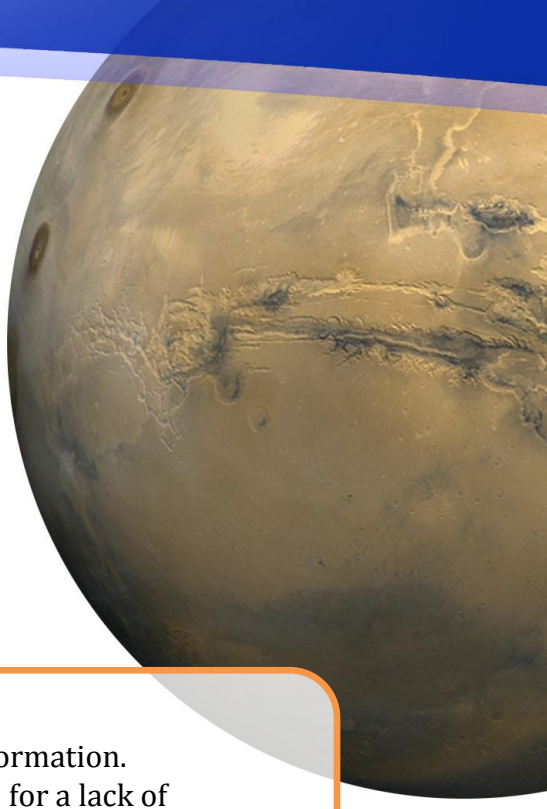
Lesson 14: Mars Water World



Summary
It is hypothesized that an ocean might have existed on Mars. Students will learn what sedimentary structures and landforms in ancient, Earth, marine environments look like and the processes that formed them. From this Earth-analog approach students will observe Mars imagery and determine whether or not a Mars ocean might have existed in the distant past.

Learning Goals

Students will be able to:

- Identify spits on Mars and Earth and understand their formation.
- Recognize and identify carbonate rocks and the reasons for a lack of carbonates on Mars.
- Critically analyze press releases of Mars discoveries and determine what other data, if any, is needed to make the scientific findings valid.

Context for Use
This learning module is meant for adaptation in an introductory Earth science course and/or planetary science course. The *In-Class Activities* can be easily adapted for homework when desired.

Description and Teaching Materials
In-Class Activity

In-Class Activity 1: Spits on Mars
In-Class Activity 2: Where is the carbonate on Mars?

Homework/Lab

Homework 1: Mars Ocean Press Release

Teaching Notes and Tips

1. *In-Class Activity 2:* for classes >20 students we recommend passing around several specimens of carbonate rocks and/or use an overhead microscope system for the classroom so students can observe the texture and make observations of the carbonate rocks without a hand specimen.
2. *Homework 1*: You may need to exchange the press release articles for more current articles depending on the year in which you use this material.
3. You will often integrate the Explanation and Exploration sections of the In-Class Activities. Interact with the students as they "explore" and help them define terms/principles.

Assessment
Each In-Class Activity and/or Homework has its own measure of Assessment.

THE UNIVERSITY OF UTAH®

Sponsored by:
National Aeronautics
and Space Administration
NASA Award (NNX11AH29G)

NASA

Mars for Earthlings

Resources

1. Image File: Water World.
2. Spit Formation in the UK and longshore drift: http://www.youtube.com/watch?v=Fe9YBuK_qEo&feature=endscreen&NR=1
3. Lake Bonneville video: http://www.youtube.com/watch?v=0SJDOluY4OI
4. NASA Video "Keeping up with Carbon": http://www.youtube.com/watch?v=FgEZpX3n5mo
5. Beachy Head geology: http://www.discoveringfossils.co.uk/beachy_head_fossils.htm

Mars for Earthlings

Homework 1
Water World_MFE
Mars Ocean Press Release

Purpose:
Critically assess the validity of media-released discoveries of Mars; in this case, a Mars ocean.

Directions/Questions:
Navigate to the following press release by CU-Boulder in June 2010:
http://www.colorado.edu/news/releases/2010/06/13/new-cu-boulder-study-indicates-ancient-ocean-may-have-covered-one-third

1. What evidence does the article use to support an ancient Mars ocean?

2. In what geologic age of Mars' history would oceans most likely have existed? (Noachian, Hesperian or Amazonian) *Note: The students may need to do some outside research to answer this question.

3. What evidence would convince them that an ocean existed on Mars that this press release did not address?

4. How would they improve the press release overall?

5. Contrast the Science Daily press-release with CU-Boulder's press release. Do they differ? If so, how?http://www.sciencedaily.com/releases/2010/06/100613181245.htm

6. Find a more recent article on the potential Mars Ocean. Summarize the major points. Has scientists' thinking on the topic changed?

Evaluate:
After students turn in this assignment, have students discuss these answers in class, time permitting. It is important for students to discern fact (clear observations) from fiction (interpretations from incomplete evidence or wishful thinking) and recognize a properly-executed scientific inquiry.