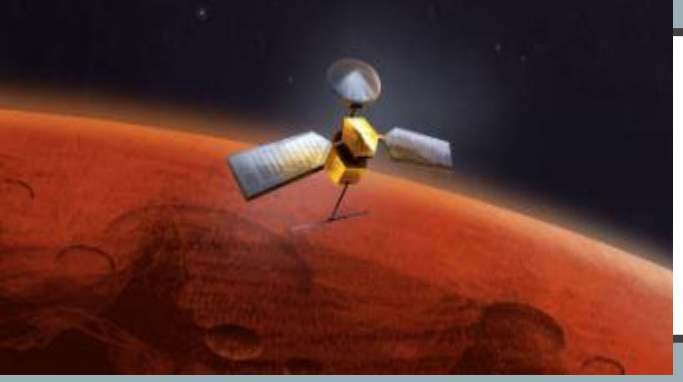
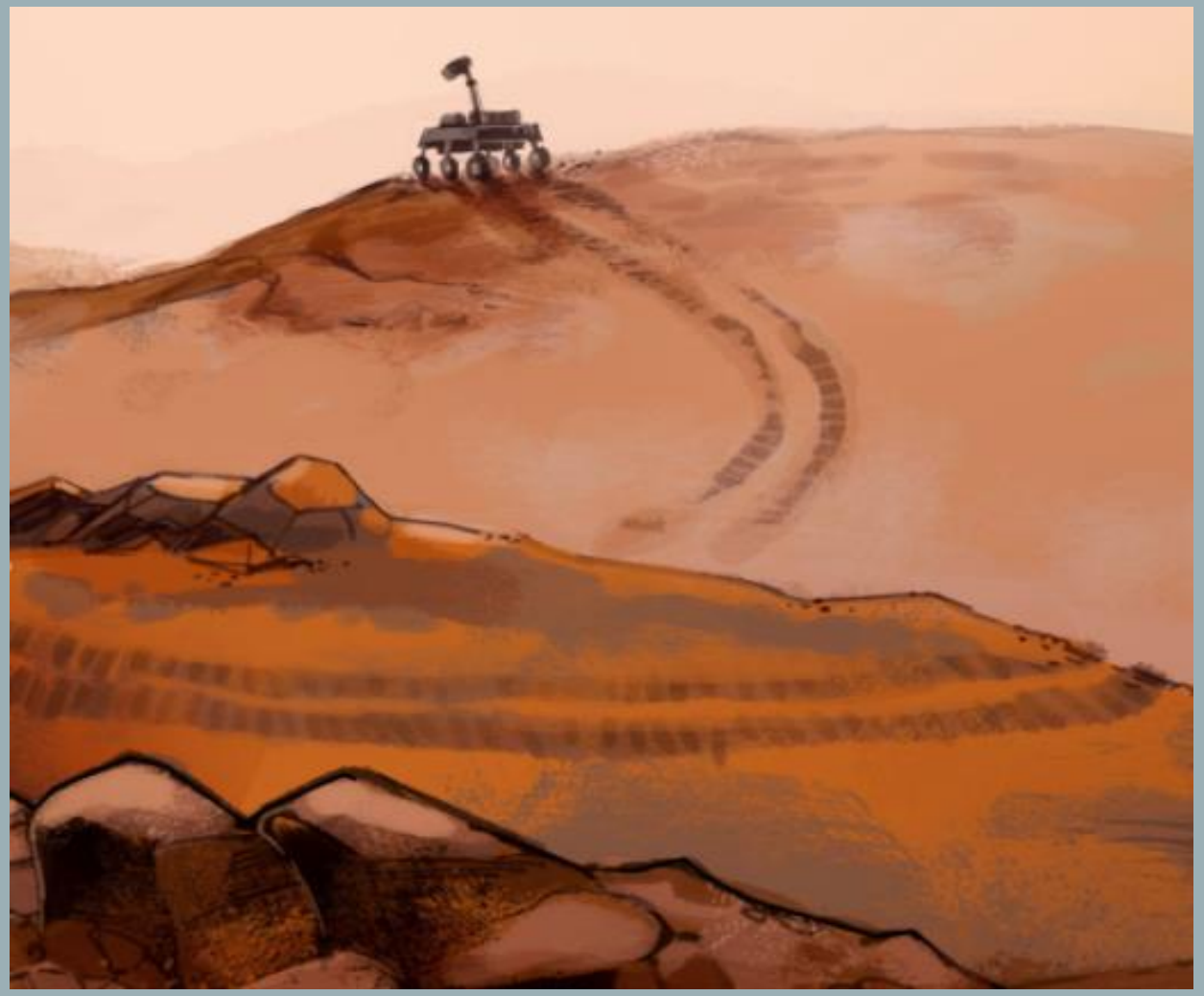


GEOLOGY ON MARS

Unit 1 - Chapter 3-1

Analyzing New Evidence



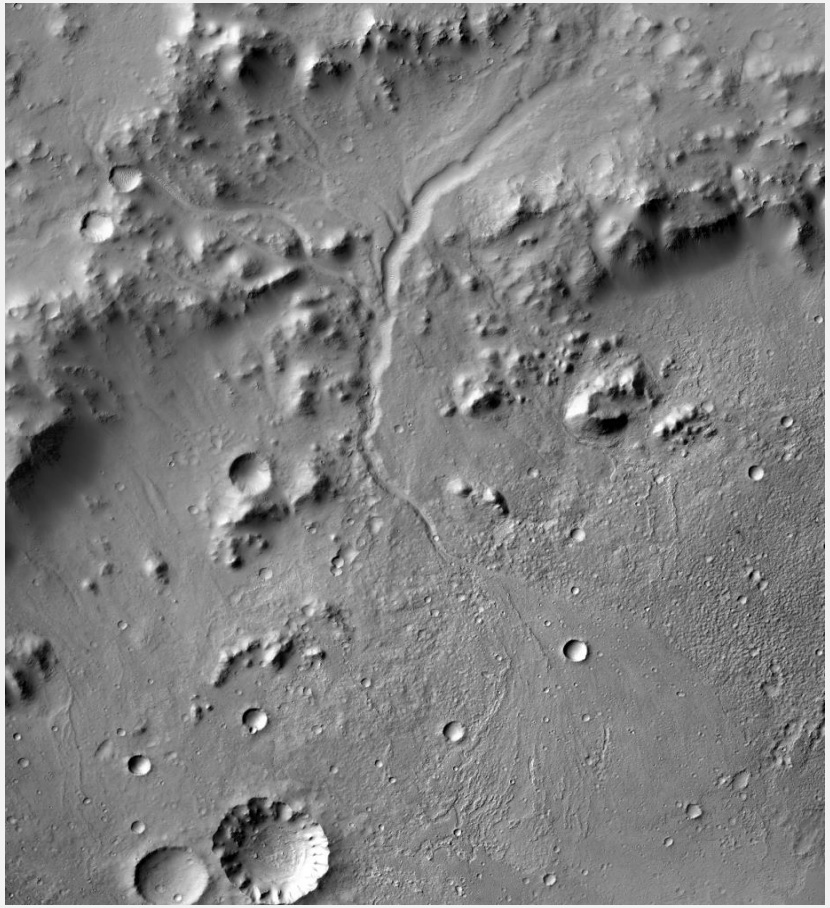
Warm-Up

Warm-Up – 3.1.1

HAND IN

Our Scientific Question

What geologic process could have formed the channel on Mars?



We have been thinking about two claims that are possible explanations for how the channel on Mars was formed. We have considered evidence from images, as well as from the Flowing Water Model and the Flowing Lava Model.

1. Select the claim you think is best supported by the evidence you have seen so far.

- ○ Claim 1: Flowing water formed the channel on Mars.
- ○ Claim 2: Flowing lava formed the channel on Mars.

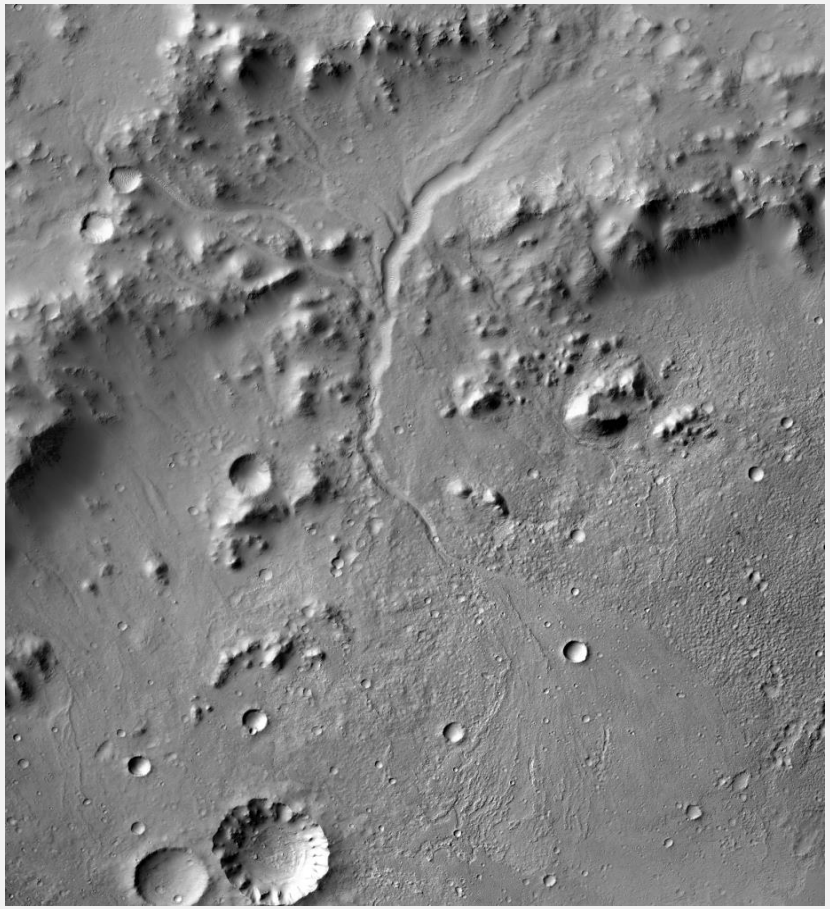
2. Why do you think the claim you selected is best supported by the evidence?

1 WARM UP
Warm-Up

Warm-Up – 3.1.1

Our Scientific Question

What geologic process could have formed the channel on Mars?



We have been thinking about two claims that are possible explanations for how the channel on Mars was formed. We have considered evidence from images, as well as from the Flowing Water Model and the Flowing Lava Model.

1. Select the claim you think is best supported by the evidence you have seen so far.

Claim 1 and Claim 2 are both acceptable answers at this point.

2. Why do you think the claim you selected is best supported by the evidence?

Answers will vary. Example: I think the flowing water claim is best supported by the evidence because the image of the channel on Mars looks really similar to one of the images of channels formed by flowing water on Earth.

2 TEACHER LED DISCUSSION
The Evidence Gradient

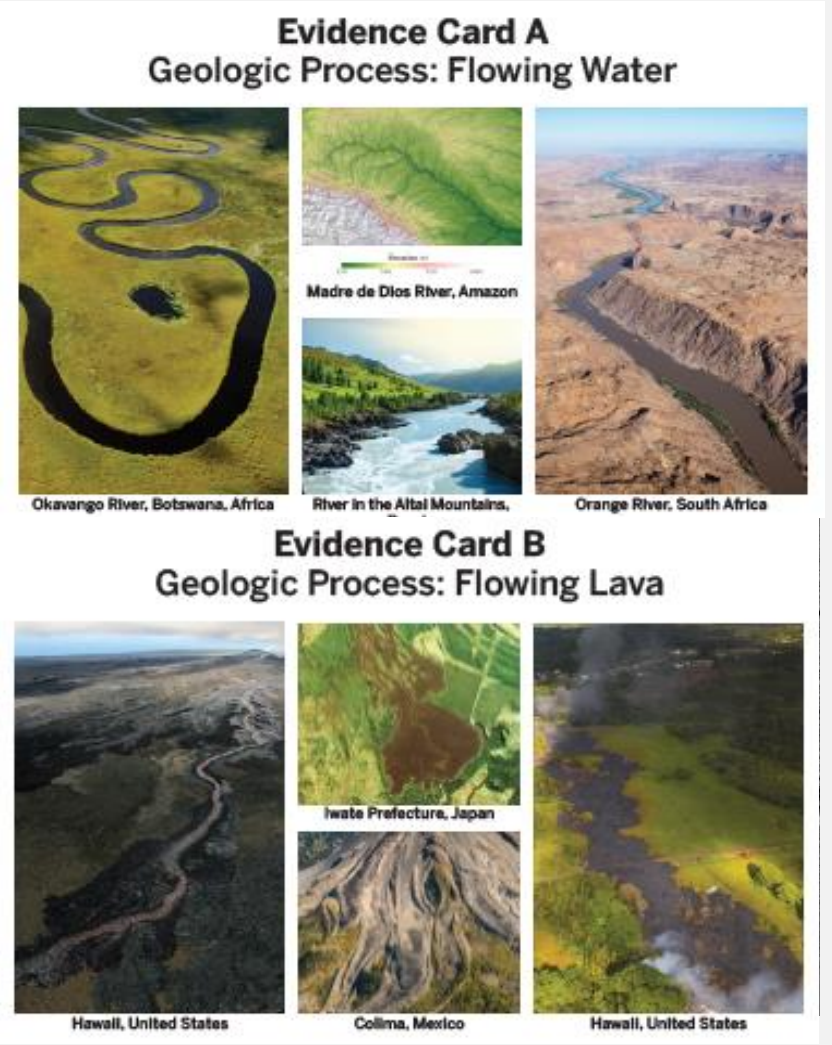
CHAPTER 3 QUESTION

How can we decide which geologic process formed the channel on Mars?

The two types of evidence you have analyzed.

In the Warm-Up, you thought about how the information you have so far might be used to support one of the claims about the channel on Mars.

We have considered satellite and aerial images of Earth showing landforms created by flowing lava and flowing water to see if these landforms were similar to the channel on Mars.



2 TEACHER LED DISCUSSION
The Evidence Gradient

CHAPTER 3 QUESTION

How can we decide which geologic process formed the channel on Mars?

These images gave us some evidence about what geologic process might have formed the channel.

We have also used models to get additional evidence about whether flowing water or flowing lava could have formed the channel on Mars.

Evidence Card C
Flowing Water Model

Evidence Card D
Flowing Lava Model

2 TEACHER LED DISCUSSION
The Evidence Gradient

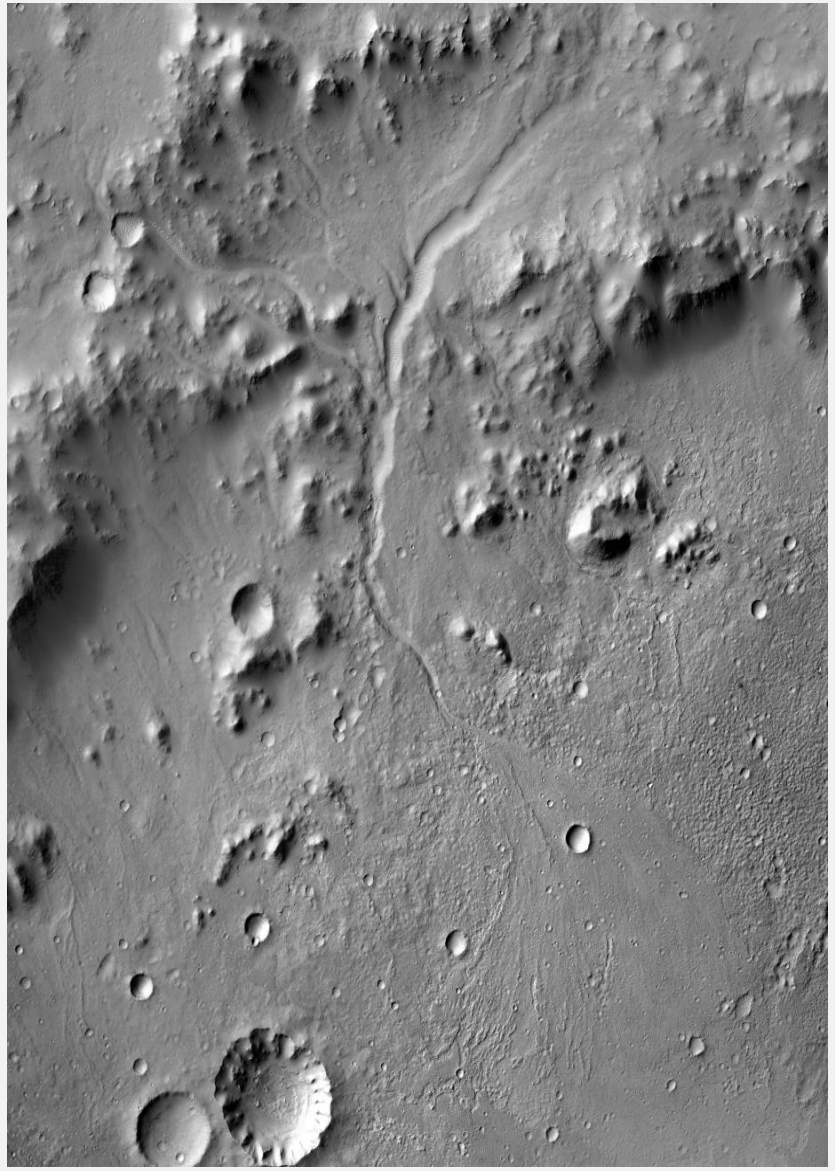
EXAMINE WARM-UP QUESTION POLLING

These are your current ideas about which claim is best supported by the evidence, but your ideas may change as you consider additional evidence in upcoming lessons.

Scientists often disagree about claims and have different interpretations of evidence.

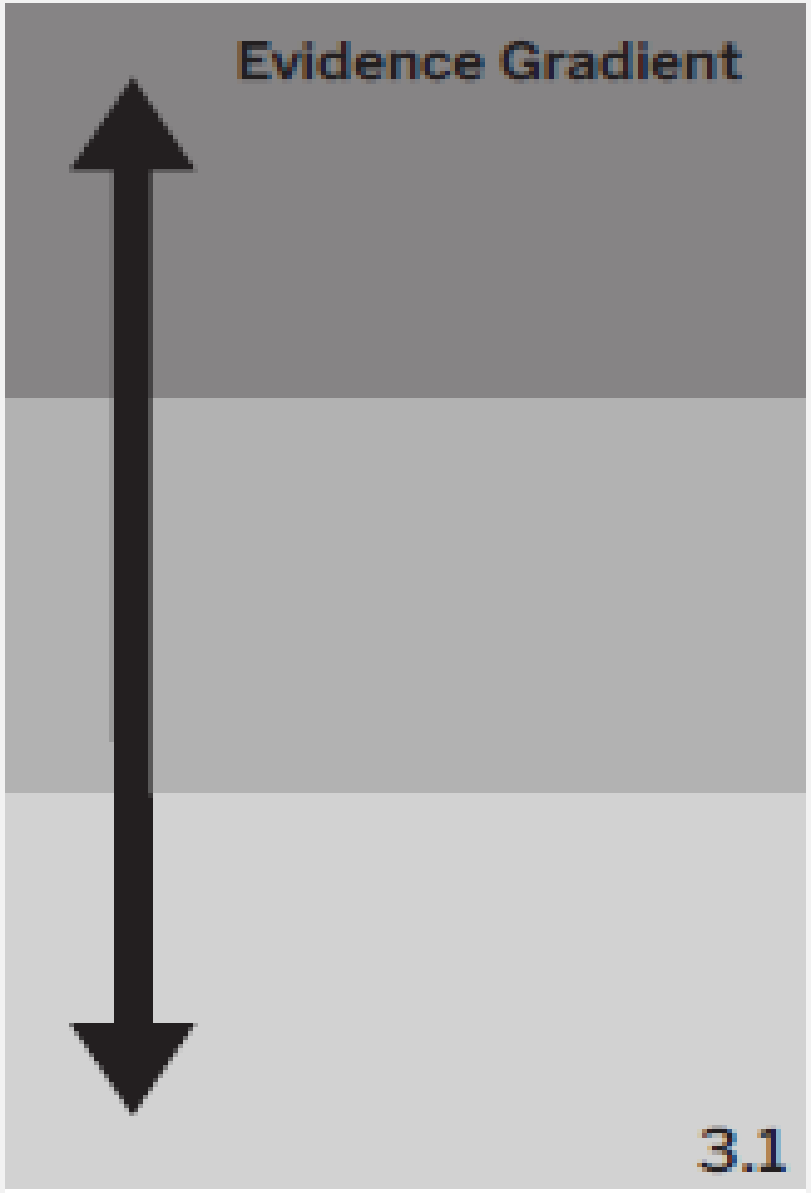
Scientists deepen their understanding of evidence by discussing it together.

Today, we will consider which pieces of evidence are more convincing and which are less convincing.



2 TEACHER LED DISCUSSION
The Evidence Gradient

INTRODUCTION TO THE EVIDENCE GRADIENT



This is a tool called the Evidence Gradient, which will help us as we think about how convincing the evidence is.

Because we might be thinking about the evidence in different ways, we need a way to explain our thinking to one another.

This tool will help us talk to one another and share our thinking.

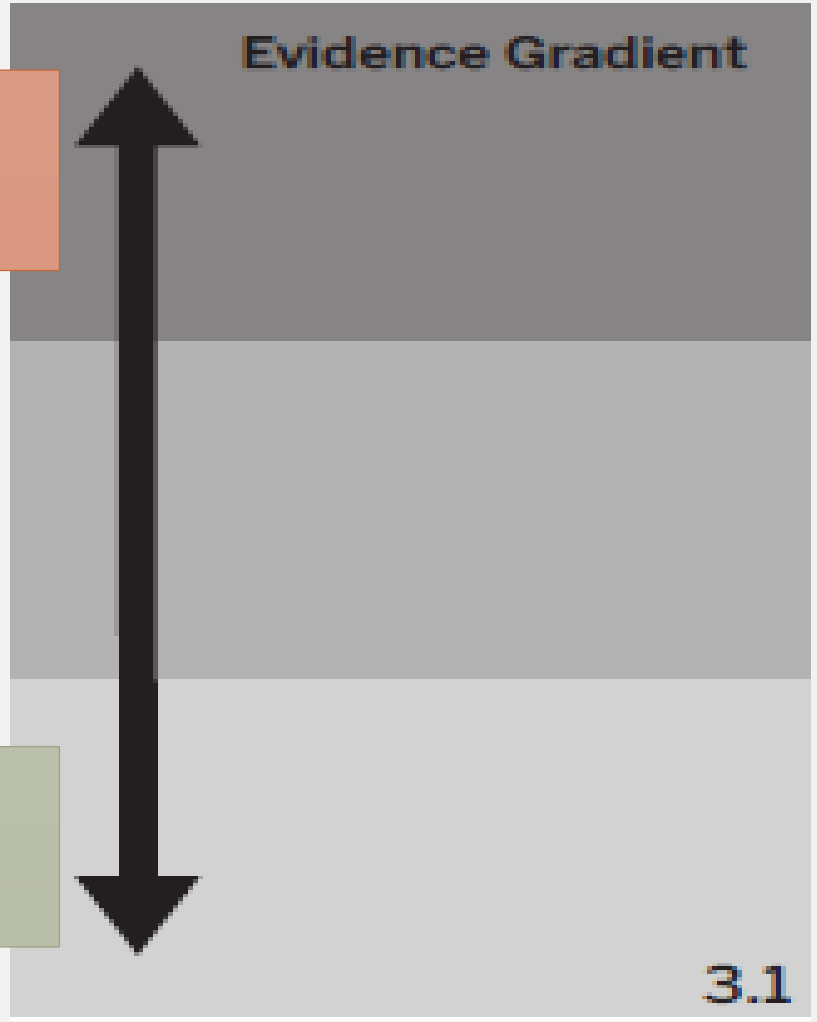
2 TEACHER LED DISCUSSION
The Evidence Gradient

PLACING EVIDENCE ON THE EVIDENCE GRADIENT

There are different shades of gray on the tool.

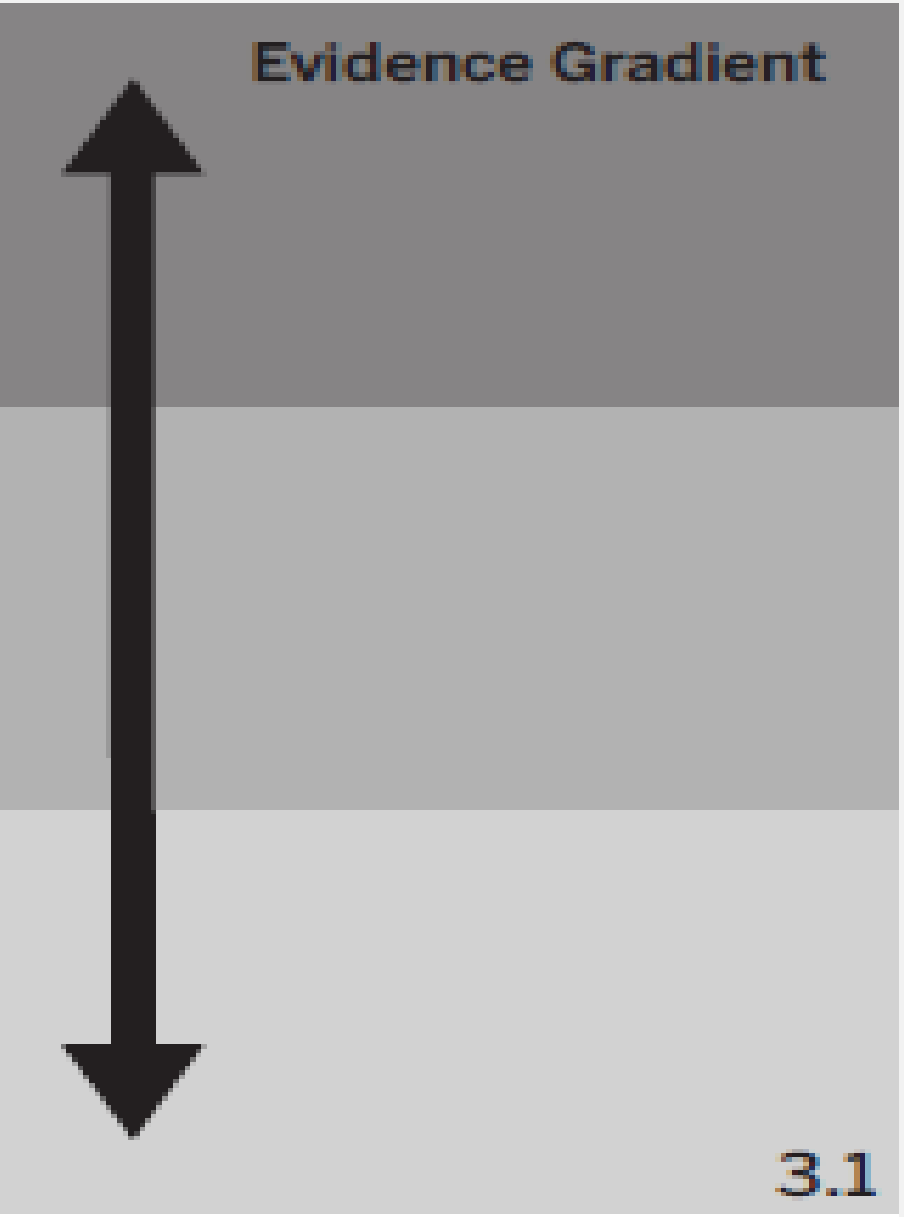
Most convincing evidence – Top – Dark Gray

Least convincing evidence – Bottom – light gray.



2 TEACHER LED DISCUSSION
The Evidence Gradient

USING THE EVIDENCE GRADIENT



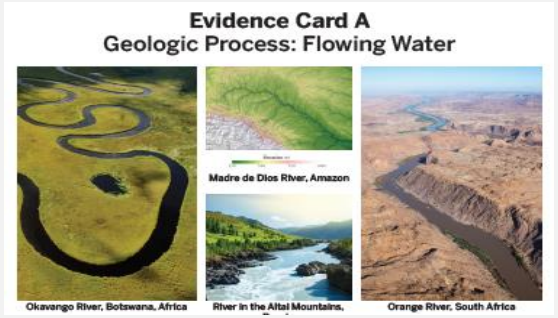
Partner 1 begins with an opinion of evidence card and where this might be placed on the gradient.

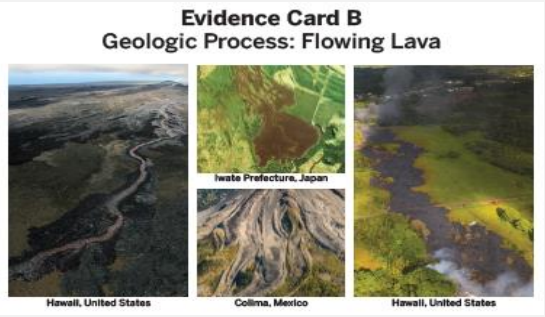
Partner 2 listens and formulates an opinion after partner 1 has finished.

Both partners discuss where to place the evidence card.

Proceed to the next evidence card.

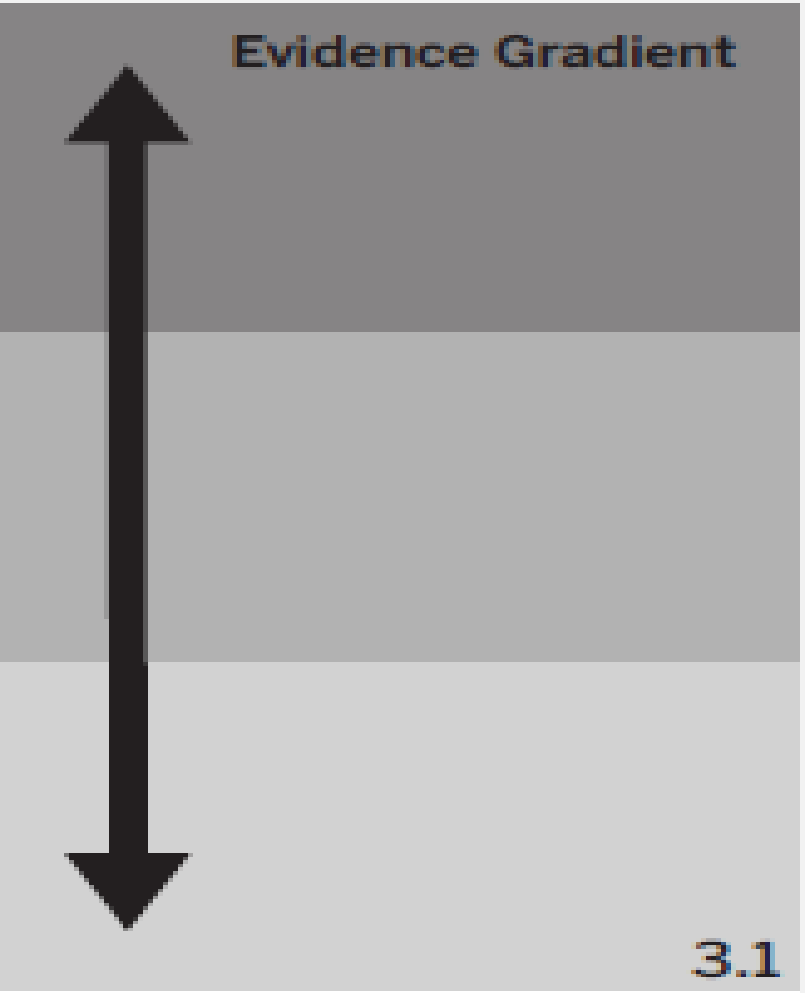
Your ideas about where each card goes might change when you get more information.





2 TEACHER LED DISCUSSION
The Evidence Gradient

WITH YOUR PARTNER
USE THE EVIDENCE GRADIENT FOR C AND D

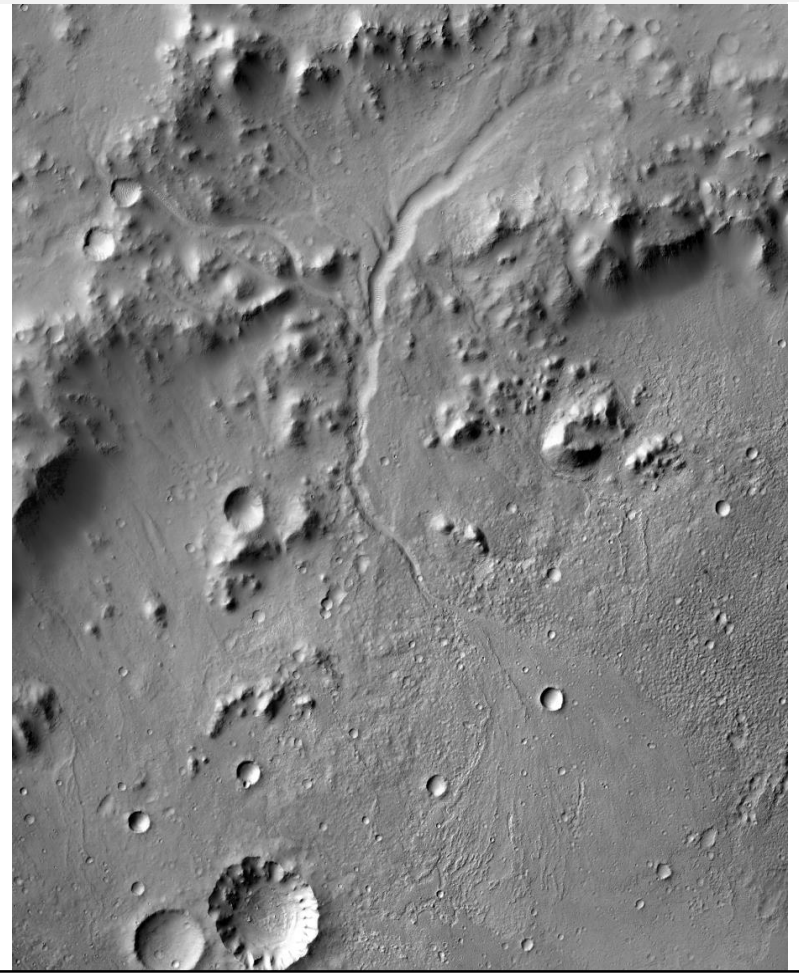


Evidence Card C
Flowing Water Model

Evidence Card D
Flowing Lava Model

2 TEACHER LED DISCUSSION
The Evidence Gradient

WHICH OF THESE CHANNELS LOOKED MORE SIMILAR TO THE CHANNEL ON MARS?



Evidence Cards C and D are more convincing when considered together.

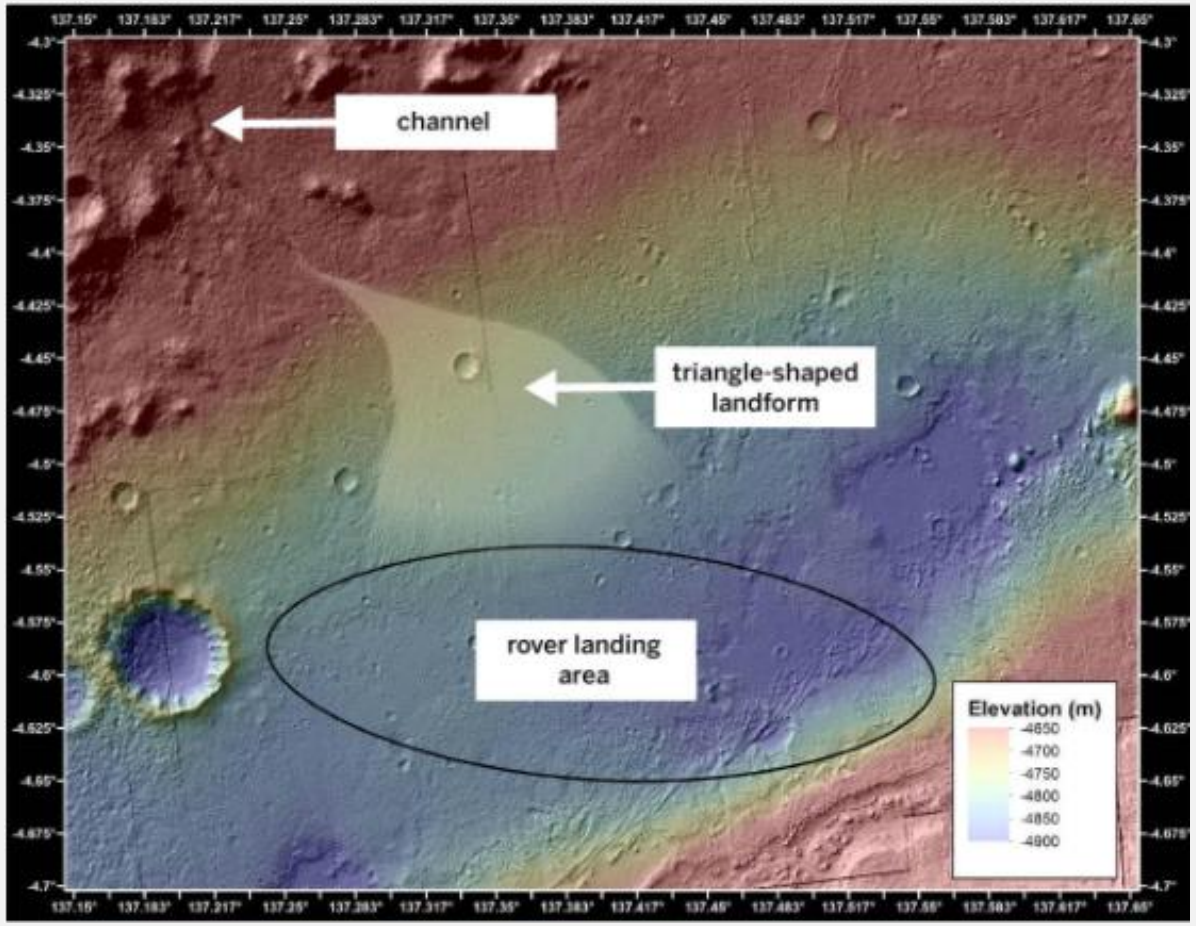
Channels formed in both the Flowing Water Model and the Flowing Lava Model.

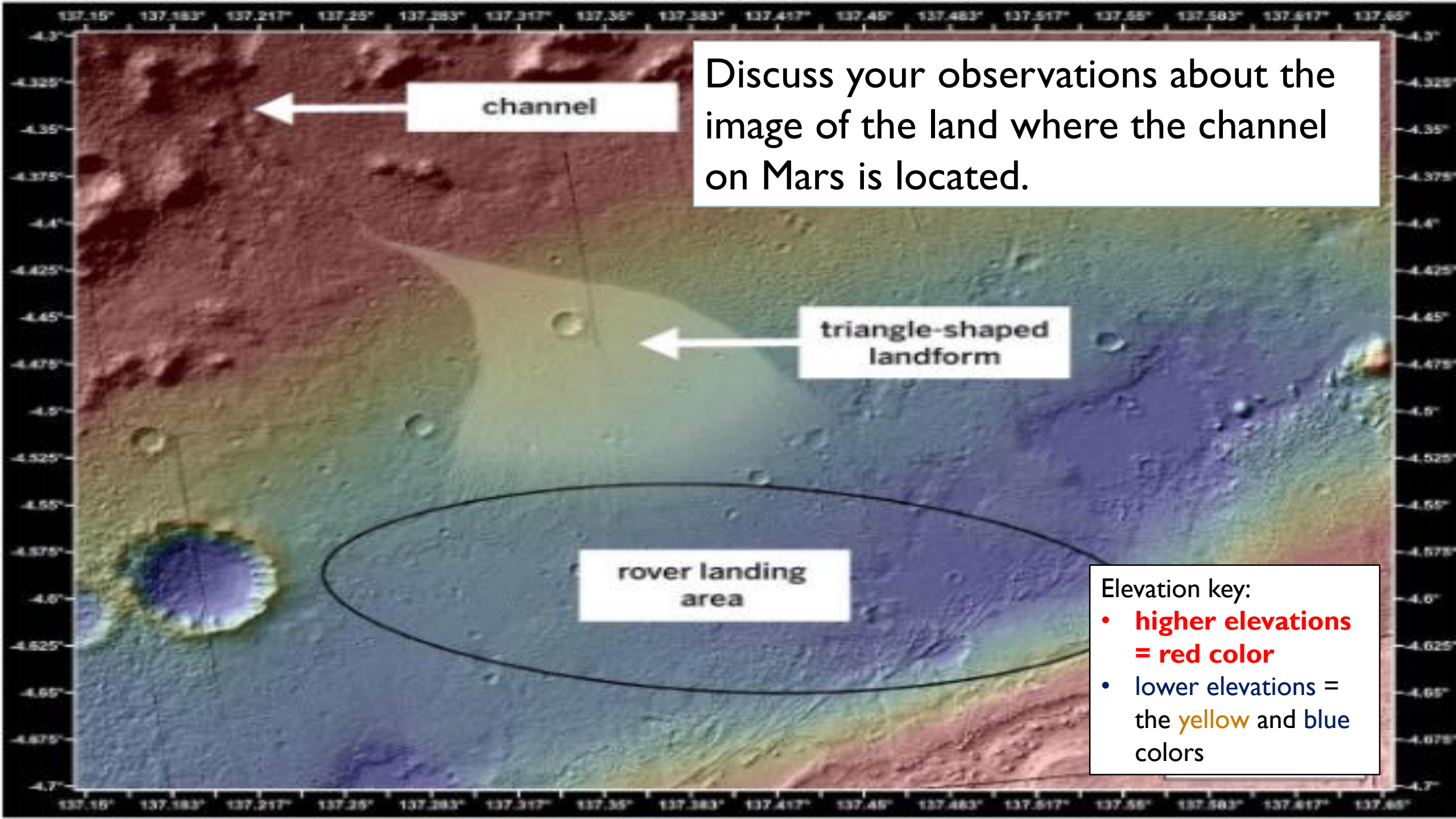
NEW INFORMATION ABOUT THE CHANNEL ON MARS

NASA has shared new information with the Universal Space Agency.

The Agency has asked them to assess whether this new evidence supports one of the claims about the channel on Mars.

This is real data about Mars, that was gathered by instruments on spacecraft orbiting Mars.





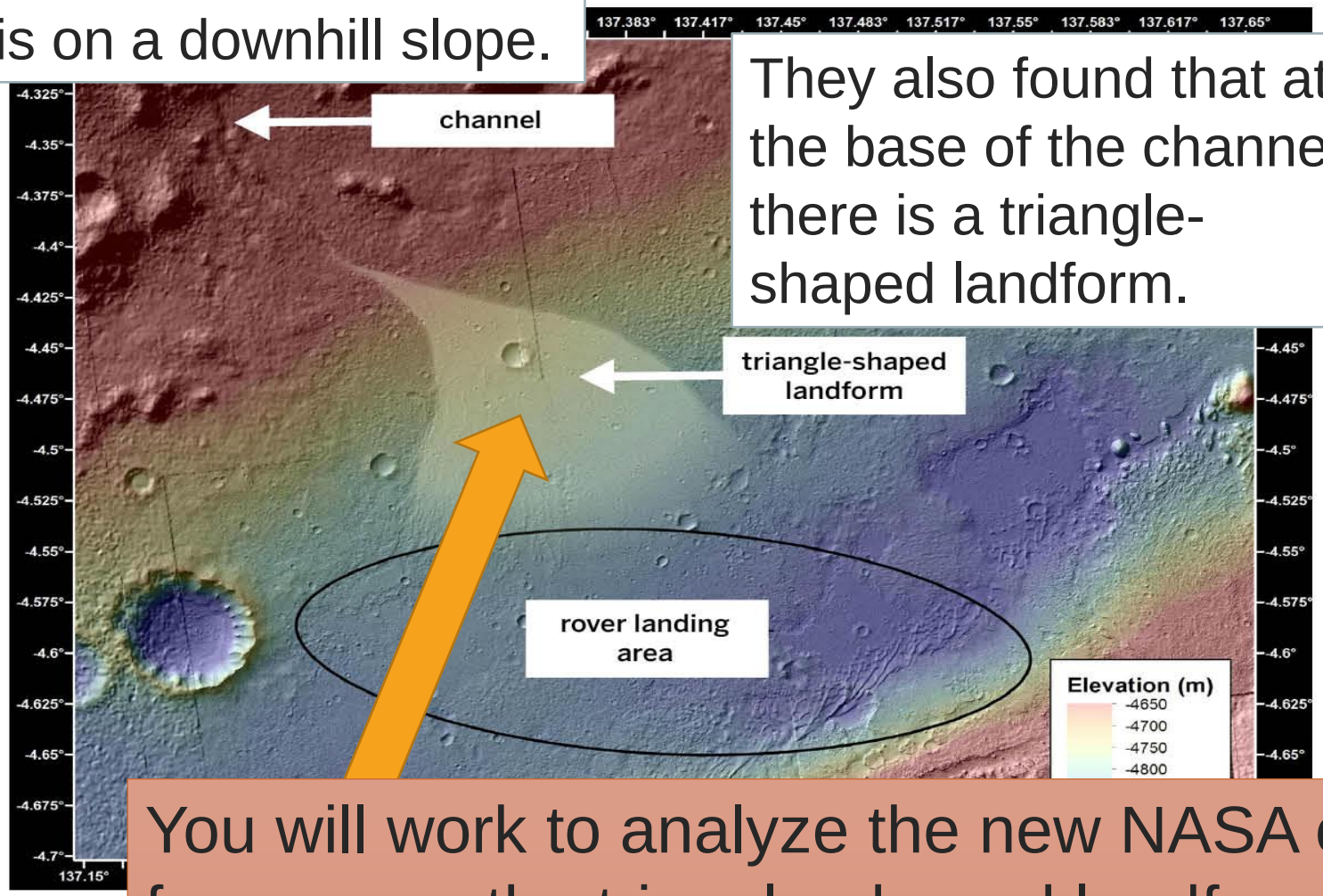
Discuss your observations about the image of the land where the channel on Mars is located.

Elevation key:

- **higher elevations = red color**
- lower elevations = the yellow and blue colors

New Information from NASA About the Channel: Elevation of the Land at the Channel Location

The channel on Mars is on a downhill slope.



They also found that at the base of the channel there is a triangle-shaped landform.

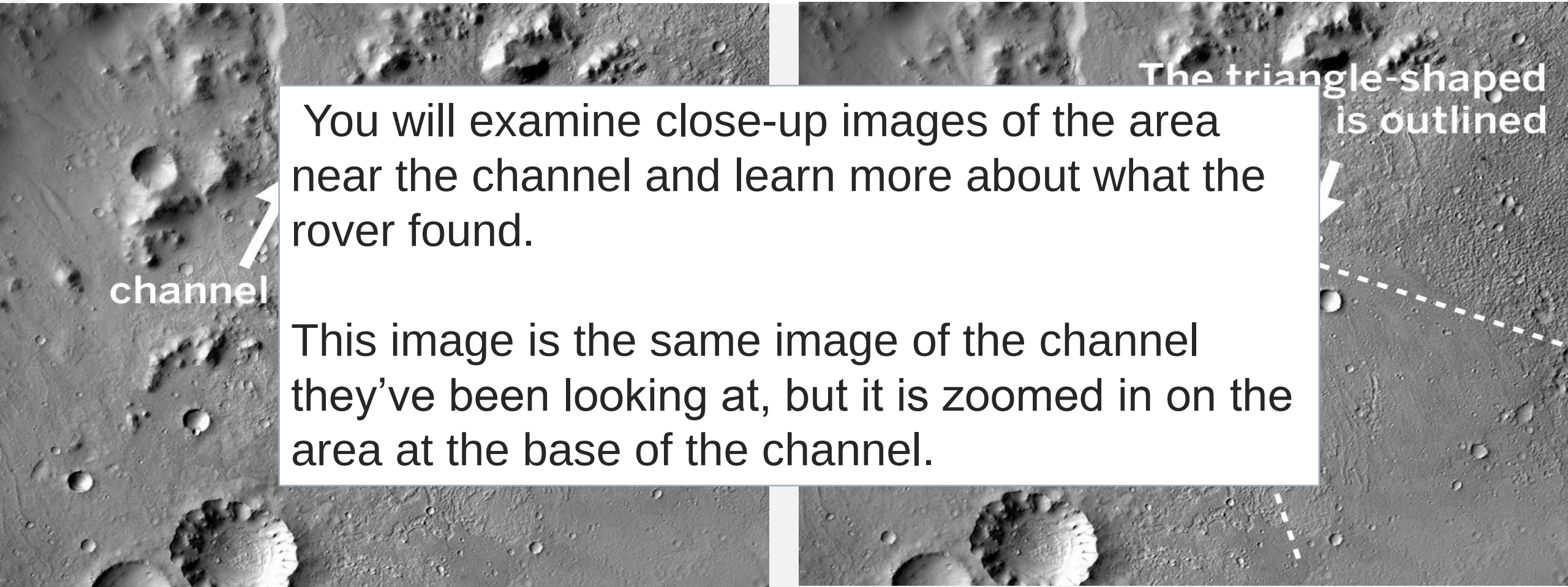
- The NASA team collected information about the elevation of the land where the channel on Mars is located.
- This image shows that the top of the channel is at a higher elevation than the bottom and that the channel is on a steep slope. The bottom of the channel is also more flat.

You will work to analyze the new NASA evidence that focuses on the triangle-shaped landform.

3 STUDENT TO STUDENT DISCUSSION
New Information About the Channel on Mars

Triangle-Shaped Landform on Mars

NASA scientists found a triangle-shaped landform at the bottom of the channel on Mars. Based on information gathered from satellites and the *Curiosity* rover, scientists believe this triangle-shaped landform is made of a different type of rock than the rock around it.

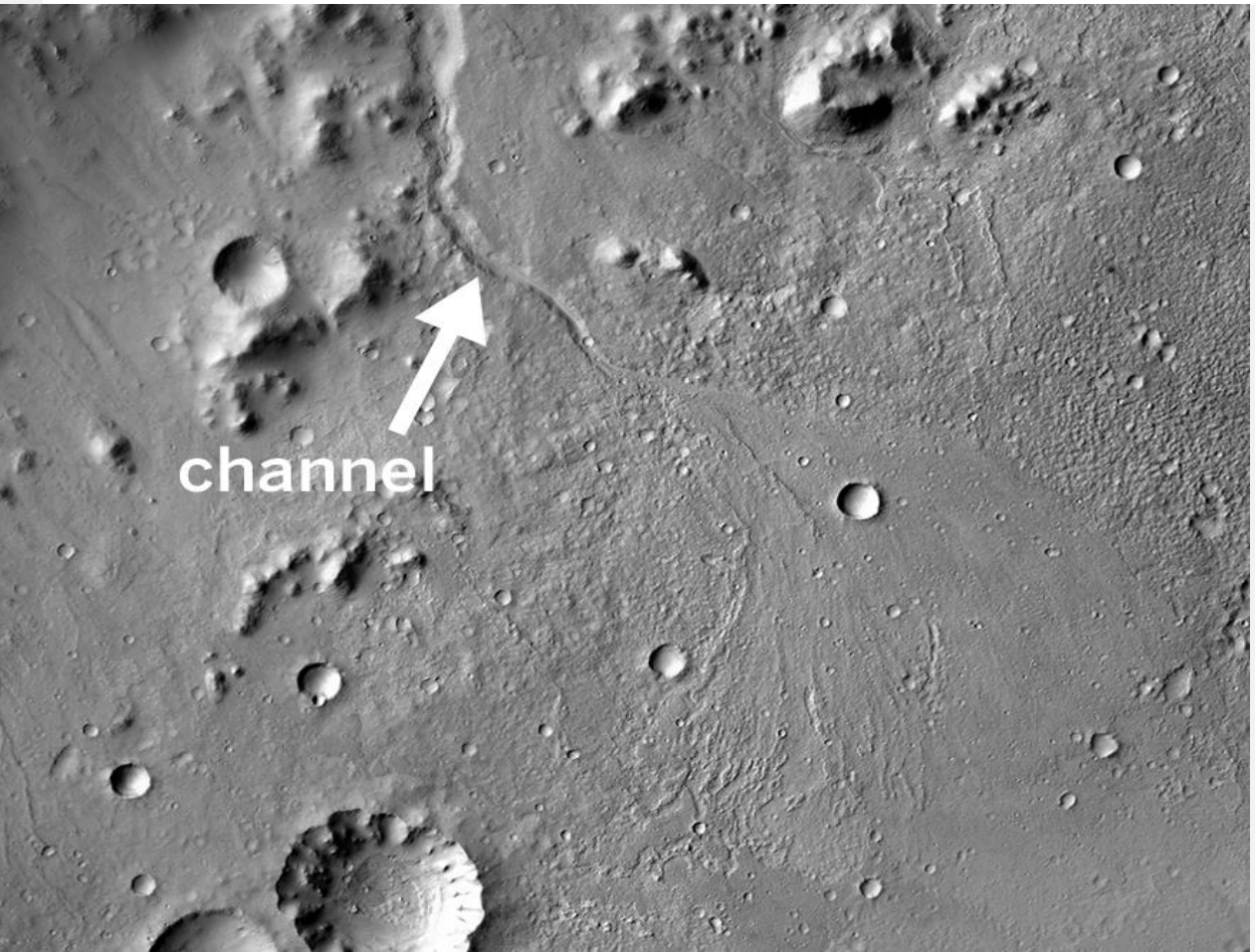


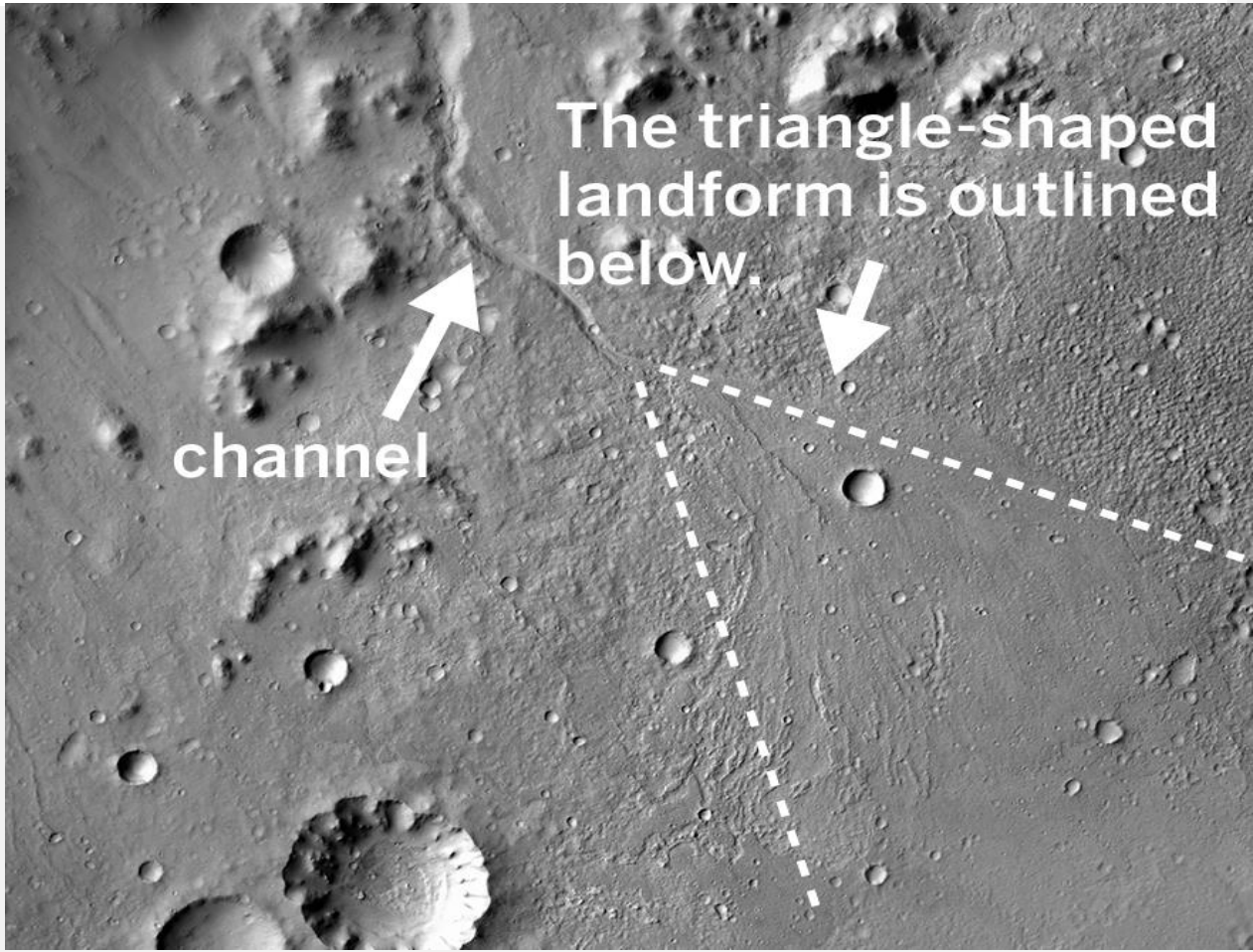
You will examine close-up images of the area near the channel and learn more about what the rover found.

This image is the same image of the channel they've been looking at, but it is zoomed in on the area at the base of the channel.

Evidence Card E
Triangle-Shaped Landform on Mars

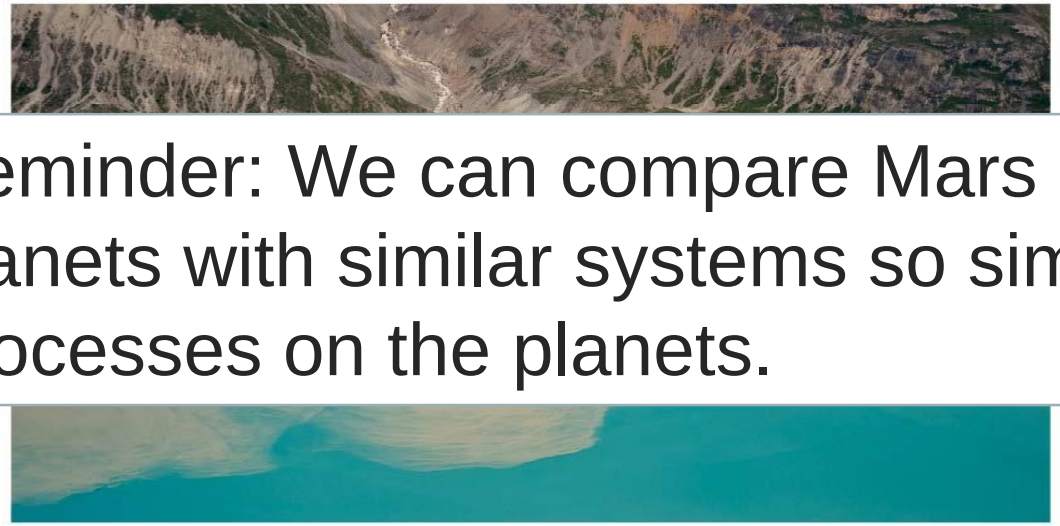
NASA scientists found a triangle-shaped landform at the bottom of the channel on Mars. Based on information gathered from satellites and the *Curiosity* rover, scientists believe this triangle-shaped landform is made of a different type of rock than the rock around it.





Background Information: Triangle-Shaped Landforms

Triangle-Shaped Landforms on Earth at Channels Formed by Water



Alaska, United States

When water flows down a steep slope onto a flat area, the water carries small pieces of rock, called sediment. As the water reaches the flat area, it spreads out and deposits the sediment in a triangle-shaped area. Over time, the different pieces of sediment are pressed and cemented together to form solid rock. The triangle-shaped solid rock that forms over time is called an alluvial fan.

Triangle-Shaped Landforms on Earth at Channels Formed by Lava

Iwate Prefecture, Japan

Flowing lava can form triangle-shaped landforms at the end of a channel. These landforms are made of rock that forms when the lava cools. The rock that makes up these landforms is often black in color because it is made of cooled lava.

Reminder: We can compare Mars and Earth because they are both rocky planets with similar systems so similar landforms suggest similar processes on the planets.

3 STUDENT TO STUDENT DISCUSSION
New Information About the Channel on Mars

COMPARING TRIANGLE-SHAPED LANDFORMS ON MARS AND EARTH

Channel on Mars

1. What did you learn about the channel on Mars from the new NASA data? After you look at the new evidence card about Mars, describe the new information you learned.

Channel on Earth Formed by Flowing Water

2. What did you learn from the background information about this type of channel? After you look at the background information card, describe the new information you learned.

Channel on Earth Formed by Flowing Lava

3. What did you learn from the background information about this type of channel? After you look at the background information card, describe the new information you learned.

4. Which claim does the evidence about the triangle-shaped landform near the channel on Mars best support?

- Flowing water formed the channel on Mars.
- Flowing lava formed the channel on Mars.
- Both claims.

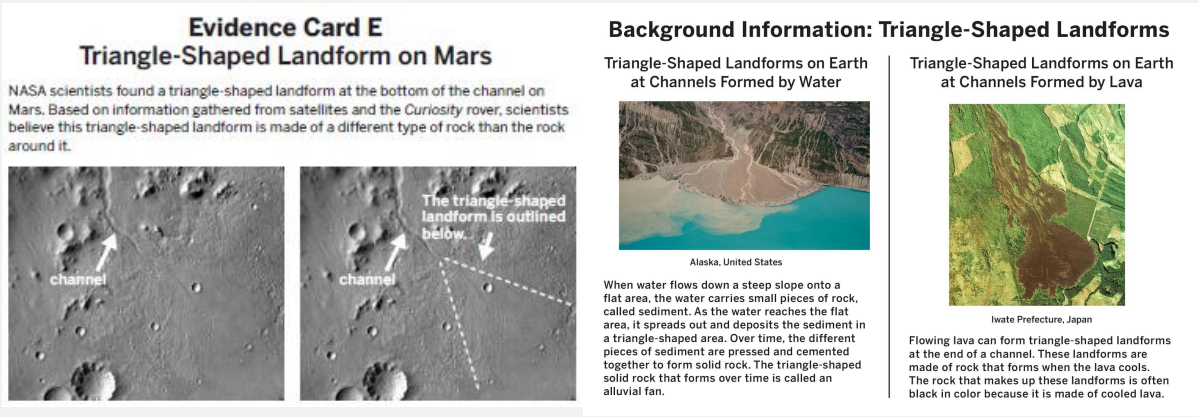
5. Explain how the evidence supports the claim you selected.

3 STUDENT TO STUDENT DISCUSSION
New Information About the Channel on Mars

COMPARING TRIANGLE-SHAPED LANDFORMS ON MARS AND EARTH

Your and a Partner will receive…

- **1 Evidence Card E**
- **1 Background Information: Triangle-Shaped Landforms Card to each pair of students.**



Evidence Card E
Triangle-Shaped Landform on Mars

NASA scientists found a triangle-shaped landform at the bottom of the channel on Mars. Based on information gathered from satellites and the *Curiosity* rover, scientists believe this triangle-shaped landform is made of a different type of rock than the rock around it.

Background Information: Triangle-Shaped Landforms

Triangle-Shaped Landforms on Earth at Channels Formed by Water

Alaska, United States

When water flows down a steep slope onto a flat area, the water carries small pieces of rock, called sediment. As the water reaches the flat area, it spreads out and deposits the sediment in a triangle-shaped area. Over time, the different pieces of sediment are pressed and cemented together to form solid rock. The triangle-shaped solid rock that forms over time is called an alluvial fan.

Triangle-Shaped Landforms on Earth at Channels Formed by Lava

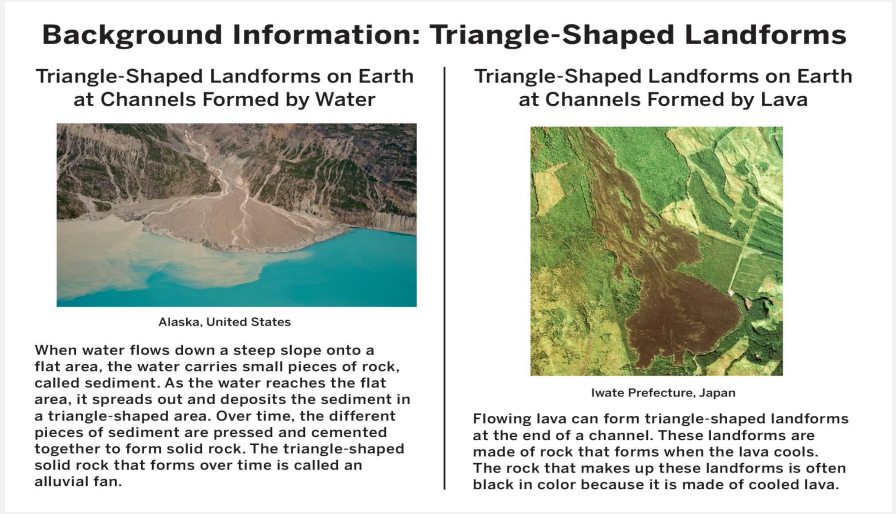
Iwate Prefecture, Japan

Flowing lava can form triangle-shaped landforms at the end of a channel. These landforms are made of rock that forms when the lava cools. The rock that makes up these landforms is often black in color because it is made of cooled lava.

Examine the evidence and record your ideas.

Discuss Evidence Card E and place on the Evidence Gradient.

Use the background information to help interpret evidence.



Background Information: Triangle-Shaped Landforms

Triangle-Shaped Landforms on Earth at Channels Formed by Water

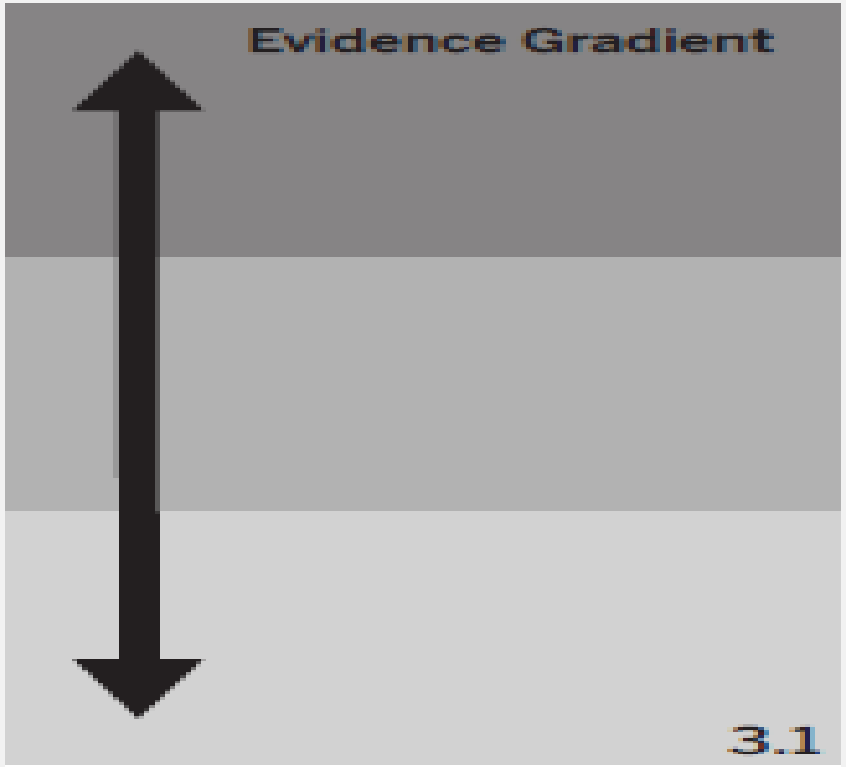
Alaska, United States

When water flows down a steep slope onto a flat area, the water carries small pieces of rock, called sediment. As the water reaches the flat area, it spreads out and deposits the sediment in a triangle-shaped area. Over time, the different pieces of sediment are pressed and cemented together to form solid rock. The triangle-shaped solid rock that forms over time is called an alluvial fan.

Triangle-Shaped Landforms on Earth at Channels Formed by Lava

Iwate Prefecture, Japan

Flowing lava can form triangle-shaped landforms at the end of a channel. These landforms are made of rock that forms when the lava cools. The rock that makes up these landforms is often black in color because it is made of cooled lava.



3 STUDENT TO STUDENT DISCUSSION
New Information About the Channel on Mars

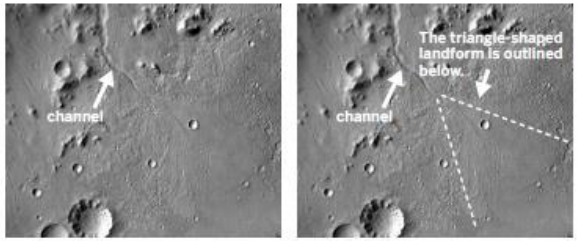
DISCUSS WHICH CLAIM EVIDENCE CARD E SUPPORTS.

Share your ideas about whether the new evidence supports the flowing water claim or the flowing lava claim.

It is okay if you are unsure or not confident in your ideas at this point: you don't have all the information yet.

Evidence Card E
Triangle-Shaped Landform on Mars

NASA scientists found a triangle-shaped landform at the bottom of the channel on Mars. Based on information gathered from satellites and the *Curiosity* rover, scientists believe this triangle-shaped landform is made of a different type of rock than the rock around it.

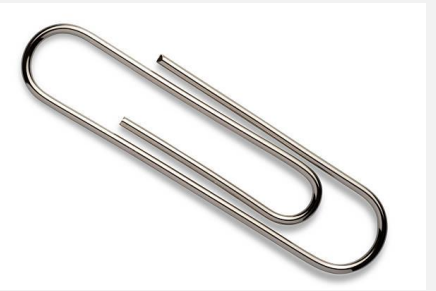


Evidence Card E could support either claim.

You will have more time to think about which claim each piece of evidence supports in the next lesson.

Claim 1:
Flowing water formed the channel on Mars.

Claim 2:
Flowing lava formed the channel on Mars.



ORGANIZE CARDS FOR NEXT CLASS

3 STUDENT TO STUDENT DISCUSSION
New Information About the Channel on Mars

COMPARING TRIANGLE-SHAPED LANDFORMS ON MARS AND EARTH

Channel on Mars

1. What did you learn about the channel on Mars from the new NASA data? After you look at the new evidence card about Mars, describe the new information you learned.

I learned that there is a triangle-shaped landform at the bottom of the channel on Mars. Reading the background information, I found out that both flowing lava and flowing water can make these types of landforms at the bottom of a channel.

Channel on Earth Formed by Flowing Water

2. What did you learn from the background information about this type of channel? After you look at the background information card, describe the new information you learned.

Flowing water going down a hill carries small rocks with it. When it gets to the bottom of the hill, it drops these rocks and it makes a triangle-shaped landform.

Channel on Earth Formed by Flowing Lava

3. What did you learn from the background information about this type of channel? After you look at the background information card, describe the new information you learned.

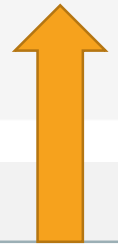
Flowing lava can make a triangle-shaped landform at the end of a channel when the lava cools into black rock.

3 STUDENT TO STUDENT DISCUSSION
New Information About the Channel on Mars

COMPARING TRIANGLE-SHAPED LANDFORMS ON MARS AND EARTH

4. Which claim does the evidence about the triangle-shaped landform near the channel on Mars best support?

- Flowing water formed the channel on Mars.
- Flowing lava formed the channel on Mars.
- Both claims.



Either claim can be supported by this evidence, so any answer is acceptable.

5. Explain how the evidence supports the claim you selected.

Example: I think the triangle-shaped landform made by flowing water in Alaska looks a little bit more like the one on Mars, so I think the evidence best supports the flowing water claim.