

Mars Timeline of Geological Events

Overview

In this activity students will unravel the order of geological events on the surface of Mars from the analysis of ESA Mars Express images.

Curriculum Links

Geology/Geography KS3-KS5 – river systems, order of geological events, image analysis/observational skills

Context

Scientists study satellite images of Mars to determine the geological history and the current geology/conditions on the planet.

Task 1: The Northern vs Southern Hemisphere

Question 1:

Look at a map of Mars (see slide 1 of the powerpoint, image 1 of the accompanying images or you can investigate this yourself on Google Mars) what differences can you see between the Northern and Southern hemispheres of Mars?

What can you infer from this?

CLUE: in the solar system older surfaces are generally more cratered.

Why is the Earth not as cratered as Mars or the Moon?

Question 2:

Which order do you think the following geological events occurred in the Southern Hemisphere of Mars (see slide 2 and the activity images):

- Impacts (black box)
- Volcanic activity (blue box)
- Tectonic activity (yellow box)

Answer 1:

Northern hemisphere is smooth looking and low altitude.

Southern hemisphere is higher altitude, variable altitude and riddled with impact craters, rifts, volcanic activity.

Southern hemisphere is older, the Northern hemisphere is younger. The Northern hemisphere is smoother because it is younger - previous geological events such as impacts, rivers, volcanic activity have been overwritten.

The Earth has active plate tectonics which means the crust is being regenerated and reworked continually e.g. through subduction and subsequent volcanic activity. The fact that Mars is so cratered

suggests that plate tectonics are no longer active.

Answer 2:

Students need to look for evidence of cross cutting events. Craters are over written by the volcanic activity and the rift (Valles Marinares) runs right through what looks like a volcanic plain.

So the order is Craters (black box) > volcanic activity (blue box) > tectonic activity (yellow box)

Task 2: The Holden and Ebswalde Craters on Mars

This region on Mars was shortlisted, but not selected, as a landing site for NASA's Curiosity rover. It is an area rich in geological events. Slide 3 summarises 4 events that have occurred in the region:

Holden (big) crater event – white circle

Eberswalde (medium) crater event – yellow circle

Little crater events – green circles

River channels – black box and zoomed in image

Question 3:

Using image 3 and a zoomed in image of the river channels (image 4) determine the sequence of the events.

Answer 3:

The medium sized Eberswalde crater is very eroded and is cross cut by the larger Holden crater and the river channels. The Holden crater has the little craters in it and the river channels also have one little crater overlying it (see blue circle below). So the order is:

Eberswalde (medium) crater event – yellow circle

Holden (big) crater event – white circle

River channels – black box and zoomed in image

Little crater events – green circles

