

The case of the contrasting planets

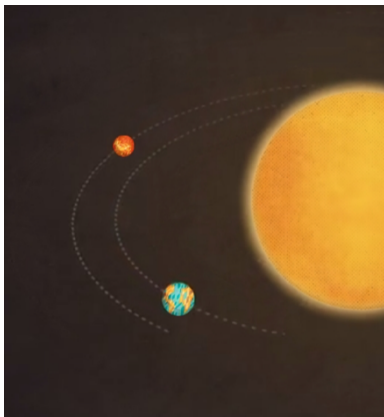


The person that leads a scientific experiment for a space mission is called a P.I. (Principal Investigator). Just like P.I.s in mystery novels, P.I.s for space missions are essentially detectives, deciding how best to investigate a problem, looking for clues and analysing the evidence. Planet P.I. challenges you to investigate the climates of Earth and Mars and try to understand why there are differences and similarities.

Case Notes

Mars and Earth

Mars is about half the size of Earth. Of the planets in the Solar System, the climates of Earth and Mars are most similar, particularly in the daily cycle and yearly seasons.



Both planets experience day and night because they spin about an axis. Days on Mars are a little longer than those on Earth: one martian day, or sol, is 24 hours 39 minutes, and 5.244 seconds long. The axes of rotation for both planets are also tilted from vertical (by 25.2° for Mars and 23.4° for Earth), so they experience summer and winter as the northern and southern hemispheres are tilted towards or away from the Sun.

Mars completes an orbit around the Sun in 687 Earth days – just under 2 Earth years. However, Mars is on average 1.5 times as far away from the Sun (1.5 AU), so Mars receives only about half as much sunlight as the Earth over one complete orbit.

The atmosphere of Mars is very thin, with an average surface pressure of only 6.1 mbar, compared to 1013 mbar on Earth. Its composition is very different from Earth's atmosphere. The martian atmosphere has 95 % carbon dioxide with nitrogen and argon accounting for nearly all the remaining 5 %. Oxygen and water vapour make up less than 0.2 % of Martian air. Earth's atmosphere is 78% nitrogen and 21% oxygen, with the remaining 1% other gases including argon (0.9%) and carbon dioxide (0.04%).

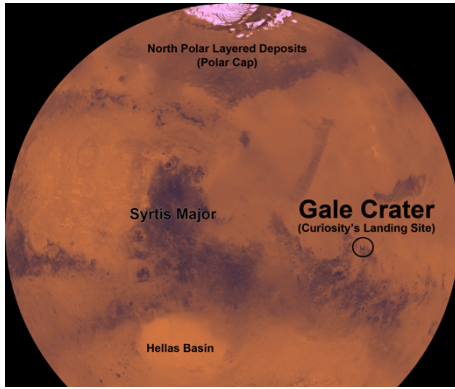
Mars's thin atmosphere and its greater distance from the Sun mean that the martian surface is colder than Earth's and experiences greater seasonal temperature changes and much bigger daily variations.

Mars Science Laboratory and the Curiosity Rover

NASA's Mars Science Laboratory landed on Mars in August 2012 and released the car-sized Curiosity Rover. Curiosity has been exploring the Gale Crater area ($4.49^\circ\text{S } 137.42^\circ\text{E}$) on Mars ever since. Curiosity carries the Rover Environmental Monitoring Station (REMS), built by the Centre for Astrobiology in Madrid and the Finnish Meteorological Institute. REMS measures wind speed and direction, pressure, relative humidity, ground temperature, air temperature and ultraviolet radiation.



Selfie by the Curiosity Rover on Mars.
Credit: NASA/JPL-Caltech/MSSS



Curiosity's landing site on Mars is near the equator. Credit: NASA/ChemCam

Curriculum Links:

Maths: Collecting, analysing, evaluating and presenting data and information.

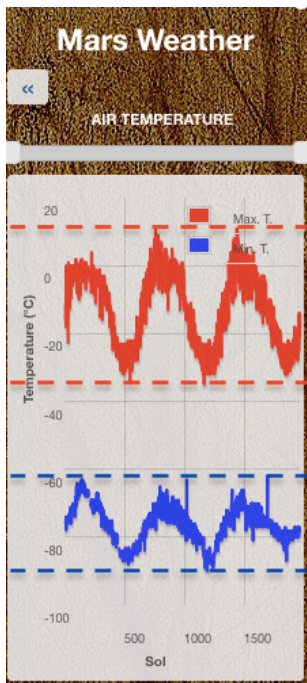
Science: Seasons, movement of the Earth and other planets relative to the sun in the solar system, the composition of Earth's atmosphere

Geography: understanding geographical similarities and differences, using maps, atlases, globes and digital/computer mapping to locate, describe and understand key aspects of physical geography.

Investigation

This Planet P.I. project investigates air temperature measured by the Curiosity's REMS instrument on Mars and by weather stations at locations around Earth.

By estimating the highest and lowest temperatures on the graphs, you will find the range of temperatures in that location and compare data from Earth and Mars. Once you have uploaded the information to the Planet P.I. Report Form, you will be able to compare your Findings with other schools and Global Lab partners at different locations on Earth.



1. The overall temperature range where you live

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