

MISSION TO MARS

PROJECT BASED LEARNING



Mission to Mars: Project Based Learning

Water on Mars

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Project funded by the Center for Instructional Technologies, University of Texas at Austin



<http://www.edb.utexas.edu/missiontomars/bench/bench.html>

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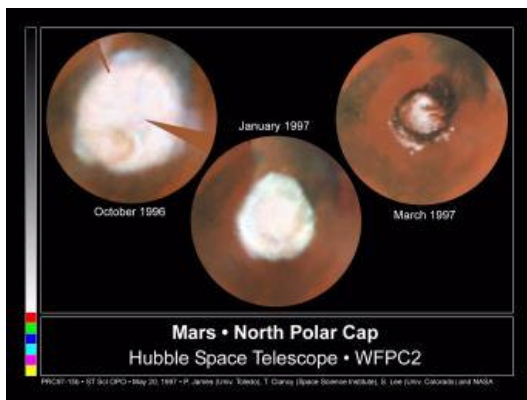
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Water on Mars

By: Elisabeth Ambrose

Polar Ice Caps

Mars has ice caps on both its north and south poles. The ice caps are made of water ice and carbon dioxide ice (dry ice). There are two kinds of ice caps on Mars: seasonal ice caps and residual ice caps. Seasonal ice caps accumulate during the winter season, and evaporate during the summer. The residual caps remain during the entire year.

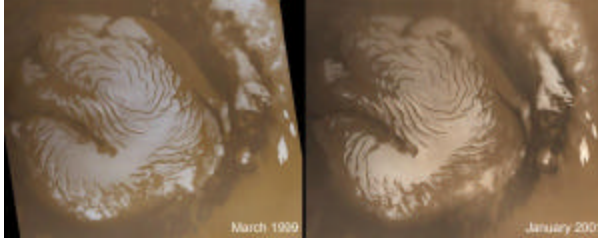


Martian North Polar Cap. NASA/JPL.

Mars' seasonal ice caps are entirely dry ice that is about 1 meter thick. The southern seasonal cap measures about 4000 km across when its largest during southern winter, and

the northern cap measures about 3000 km across at its largest, during northern winter. When summer temperatures rise above 150K (-120 C), the ice sublimates (passes directly from the solid state into the gaseous state, bypassing the liquid state) into the atmosphere. Large seasonal changes in the amount of carbon dioxide in the atmosphere cause large seasonal changes, up to 30% different, in the atmospheric pressure on Mars.

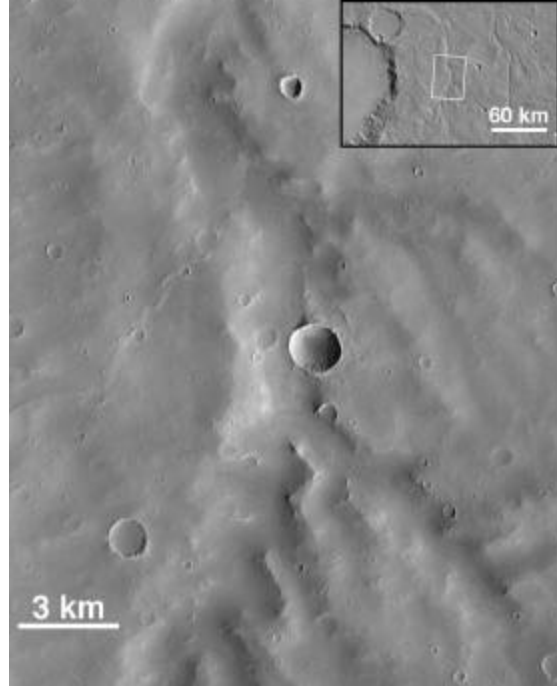
Mars' residual caps vary by hemisphere. The northern cap is about 1000 km across and is made of mostly water ice. In fact, it is the main repository of water on Mars. The southern cap is much smaller, only about 350 km across. It is made of carbon dioxide ice.



Martian North Polar Cap. NASA/JPL.

Water channels

While there is no running water on Mars today, there is plenty of evidence that it once existed on the surface. Most of this evidence is in the form of dry channels in the ground that were formed by running water. Water existed on the surface of Mars several billion years ago, when the atmosphere of the planet was thicker and the temperature was warmer.



Water channels on Mars. NASA/JPL.

There are two kinds of channels on Mars that have been left by water flows: runoff channels and outflow channels. Runoff channels are the equivalent of dry river beds on Mars. They are a series of meandering, connecting pathways that are found only in the southern highlands. They, like the southern highlands, are thought to be about 4 billion years old.

Outflow channels are channels that were created during enormous flash floods on Mars. After the time of free

flowing water, when the runoff channels were formed, the climate on Mars became very cold and much of the water froze into ice caps or permafrost just below the surface. About one billion years later, volcanoes became active on the planet and melted much of the water. The melting water cascaded to lower elevations in huge flash floods, carving outflow channels as it went. Many teardrop shaped “islands” were also formed in the outflow channels. When the volcanism ended, the water refroze into the conditions that exist today.



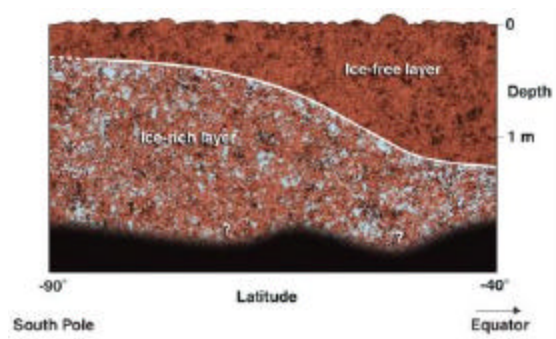
Water channels on Mars. NASA/JPL.



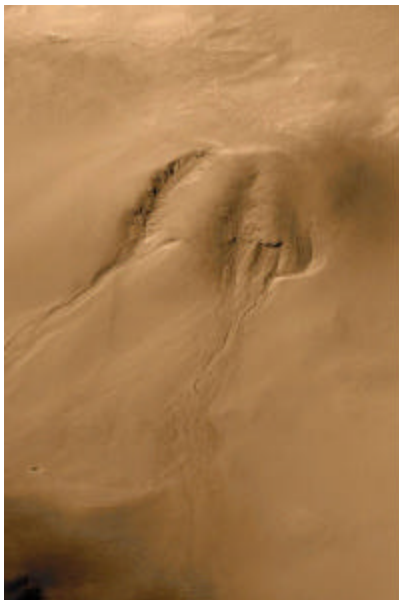
Water channels on Mars. NASA/JPL.

Surface Water

The sizes of the outflow channels indicate that there was once a great deal of water present on the surface of Mars. While some of it has frozen out into the northern residual ice cap, the majority of the water is trapped just below the surface in permafrost.



Soil composition on Mars. NASA/JPL.



Water channels on Mars. NASA/JPL.

The Benchmark Lessons were developed with the help of the following sources:

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