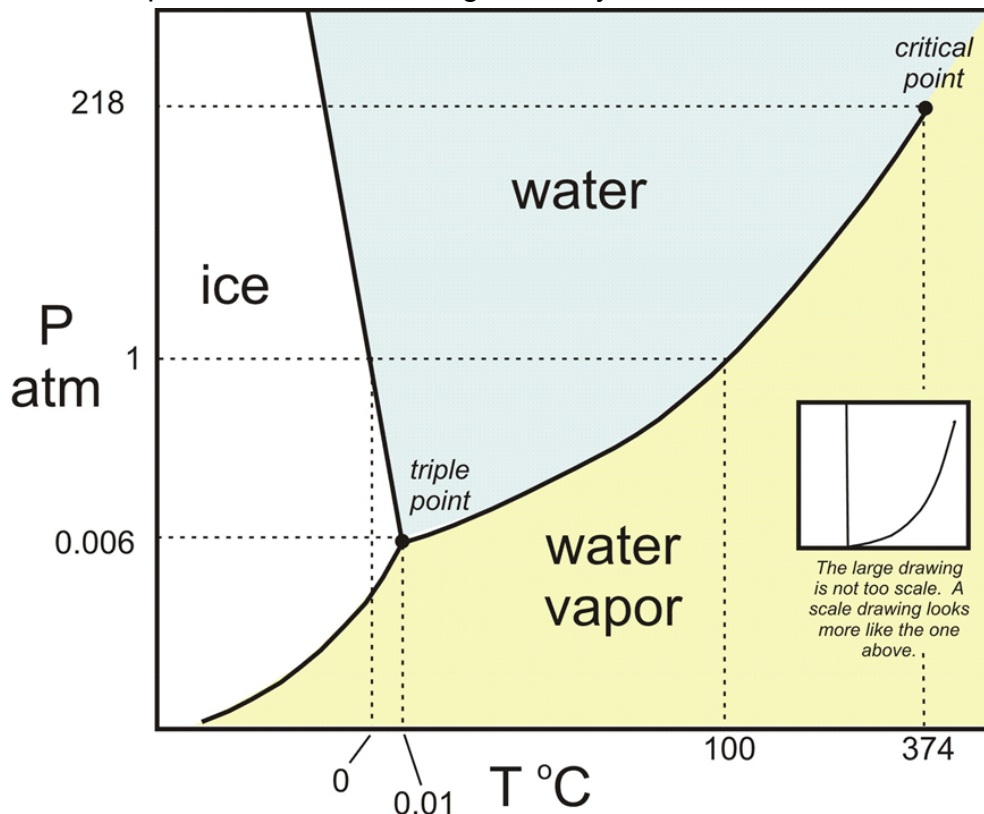


Introduction

Imagine taking a trip to Mars and finding water and other resources needed to support life. Water is essential to life. It allows our body to function, as well as providing a suitable environment for other organisms' bodies. Water on Mars could lead us to finding new life forms, or even areas we could settle at or travel to. Mars is not just an interest to us, but also to NASA, who have sent four rovers to Mars. These rovers have found that the Mars soil is 2% water, goethite near hematite, channels and other geologic features that indicate water. (MSIP) So far this has proven Mars is one of the most likely places to find life in our solar system. We are looking for liquid water on Mars because it is necessary to support life.

If ice caps at the South Pole on Mars melt into liquid water, then there should be signs of channels. If no channels are seen, then the ice caps are less likely to be made of liquid water. On Earth, ice caps melt into liquid water. Over time the melted water from the ice caps erodes the area around it, forming channels, or, after an extended period of the time, canyons. If this happens on Earth then there is a good chance that this could also happen on Mars. If channels do not form, then it will be more likely that the ice caps sublime, indicating that they are made of carbon dioxide.



This image is showing the temperature and at what pressure the atmosphere should be for water to become a liquid, water vapor, or ice. The conditions on Mars could be at the point where ice turns directly into water vapor.

NASA has four main goals involving Mars. The first goal is to determine whether life ever arose on Mars, the second is to characterize the climate of Mars, the third is to characterize the geology of Mars, and the fourth is to prepare for human exploration. Our research falls under all four. If the ice caps on Mars melt into liquid water than there is a greater chance that there was, or is, life on Mars. Ice caps can characterize the climate on Mars because if they melt then it can tell us the temperature around the ice caps. The ice caps melting can erode the ground creating channels and canyons, thus telling us about the geology of Mars. Therefore finding liquid water on Mars can inform us of the many aspects of Mars.

Background

On Earth, a channel is a length of water wider than a strait, joining two larger areas of water, especially two seas. (MSIP) Although, Mars's channels don't join two large areas of water, if the glaciers melt into large bodies of water they could create channels connecting the bodies of water. Therefore, if we find channels we can decide whether the ice caps are melting or not. To help us decide if the "channels" we are looking at are actually channels we compared them to pictures of channels formed by melting ice caps on Mount Rainier in Washington State. Just like on Earth, the Martian ice caps melt and recede if the temperature is correct. (MSIP)

On Earth, glaciers are formed by water freezing at mainly North and South Poles, they can also form in very cold places such as at high elevation. Sometimes they melt and form channels and canyons if they are made by frozen water and they melt. On Mars, glaciers are thought to form the same way but with carbon dioxide,(MSIP) when these glaciers disappear it is called sublimation. Sublimation is the transformation of a solid into a gas phase without first becoming a liquid. (MSIP)



This is a picture of one Mount Rainier's channels that have formed from glaciers melting. (Image Credit: Google Maps)

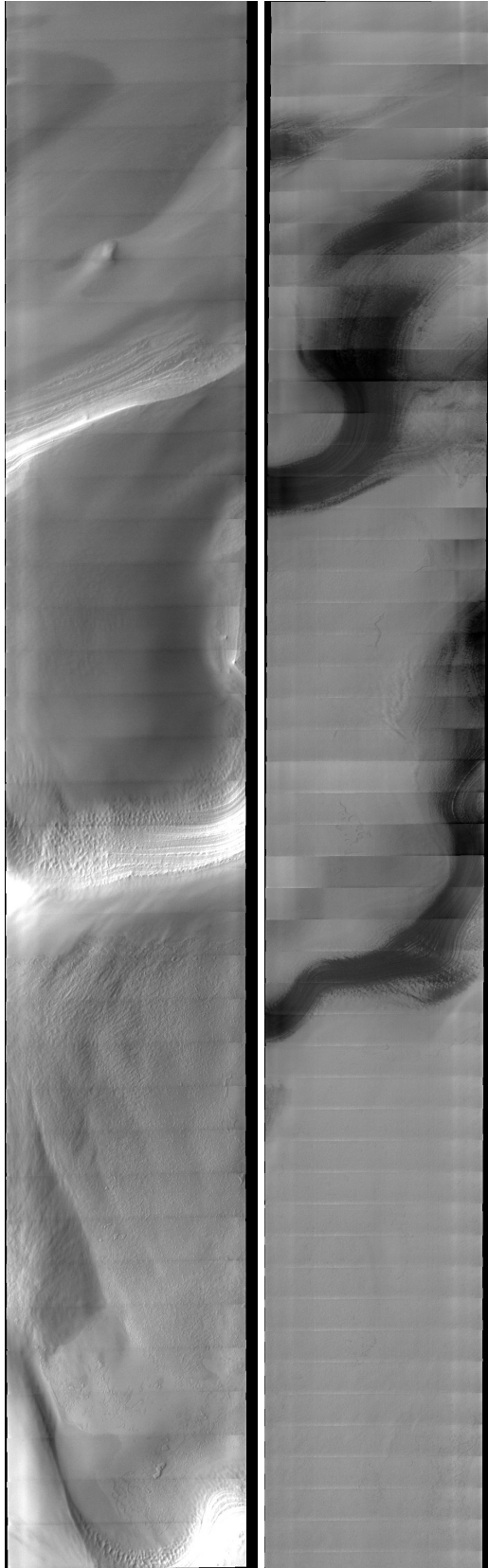
Methods

We looked at the ice caps at the south pole of Mars. We were trying to see if we could find any channels formed from liquid water melting off the southern Martian ice caps. The specific types of things we were looking for were if the ice caps melted and had channels, if the ice caps melted but didn't have channels, or if the ice caps did not melt at all. We used the J-Mars application and the THEMIS imagery gallery to collect our data. We used solar longitude to narrow down the images to the seasons we wanted to see. When we found two images, one during the Martian summer and one during the Martian Winter, of the same place on the south pole we layered them over each other to see if we saw melting. To find our pictures we used the J-Mars application to look at the surface of Mars. The layer in J-Mars we used was THEMIS, under imagery. Then we went to the Viewing Condition Parameters to enter the solar longitude to make sure we were looking at the correct season. The first season picture we looked at was a winter picture that had a glacier in it. Then we searched for a summer picture that overlapped the winter picture, to see if the glacier melted.

Data

During our data collection we looked at 14 pairs of summer and winter images, here is an example of our data table.

Image ID of Winter Picture	Image ID of Summer Picture	Latitude of Winter Picture	Longitude of Winter Picture	Solar Longitude of Winter Picture	Solar Longitude Summer Picture	Channels
V0612806	V07963015	-85.258	10.14136	178.3964	270.9948	The ice didn't appear to melt



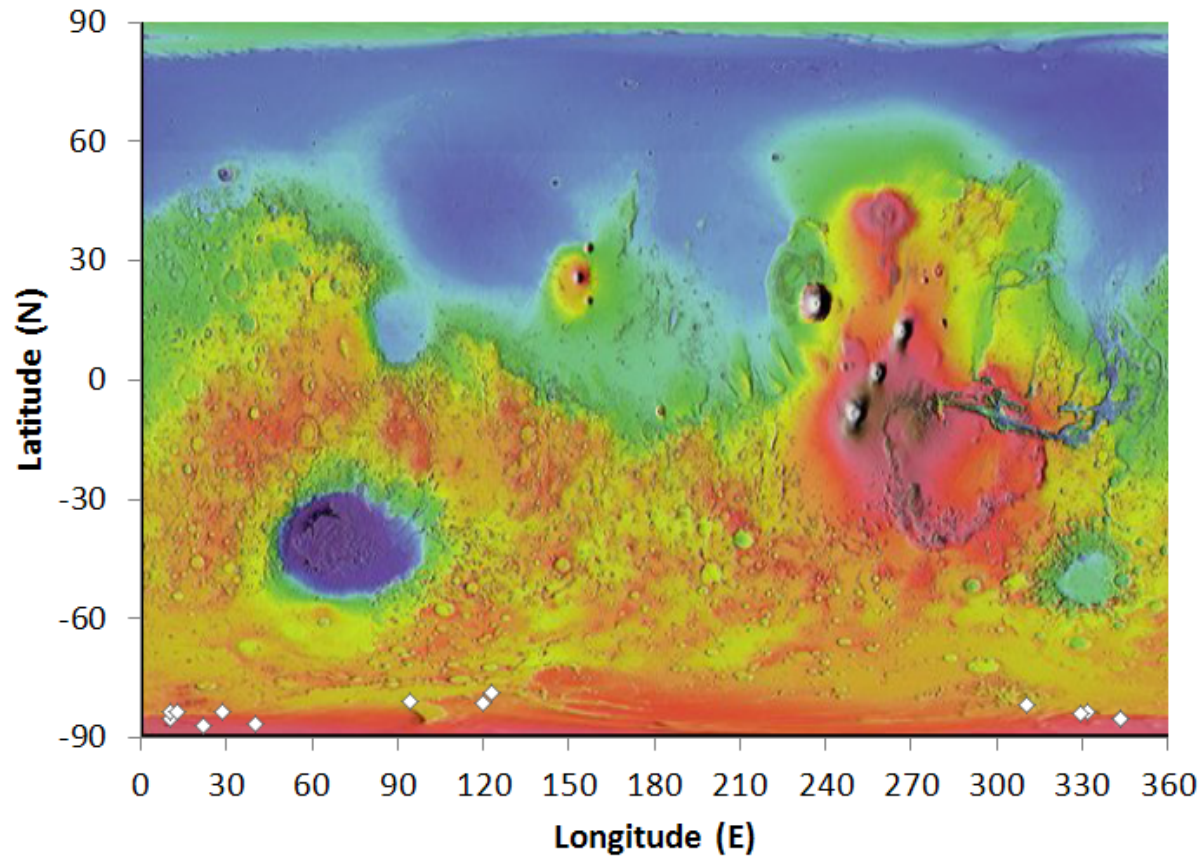
Example of Our Data:

Left image: Winter (THEMIS ID:
V06017001)

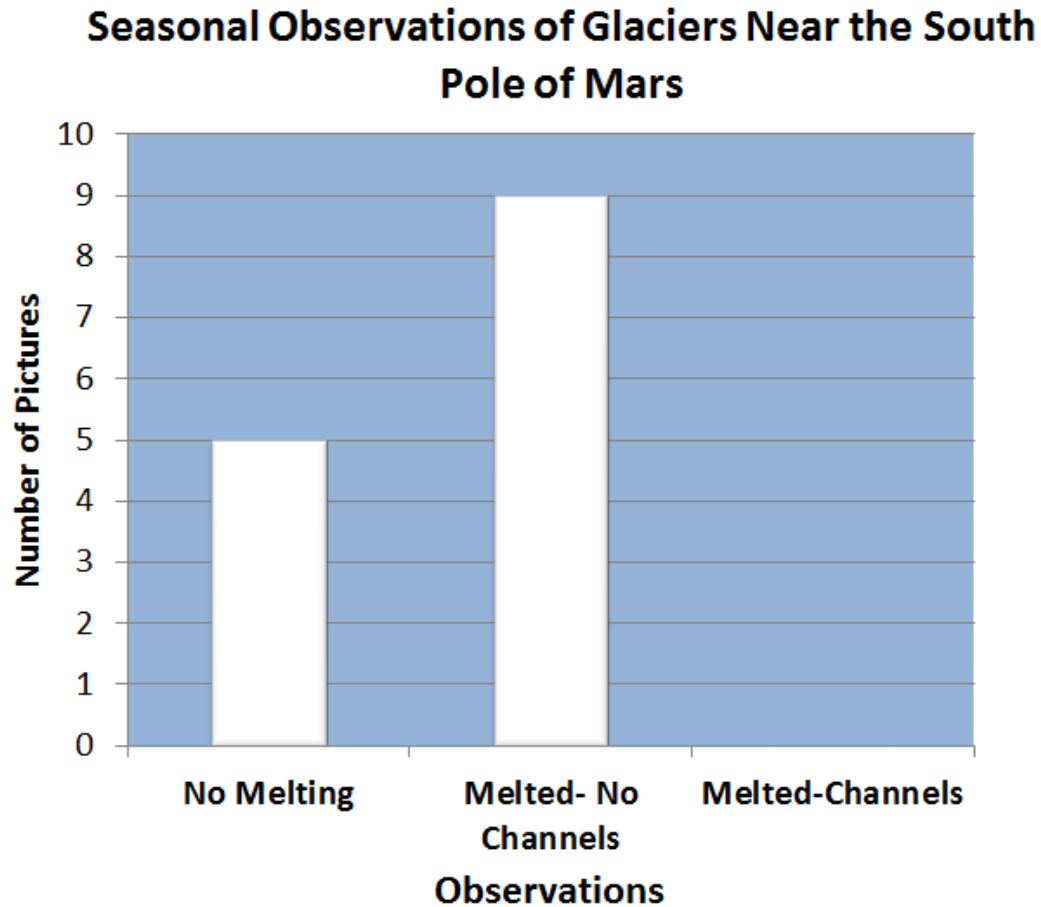
Right image: Summer (THEMIS ID:
V08214007)

Here is an example of a pair of images we looked at. There does not appear to be melting in this area.

Locations of Ice Caps We Observed



In this topographical map of Mars you can see where we collected data. It shows that this is the area that we did not find channels or signs of liquid water.



In five pairs of images the ice caps did not melt. In nine pairs of pictures the ice caps melted but did not have channels, and we saw no channels in any pairs of pictures.

Discussion

In our data we had nine glaciers that melted without any signs of channels and five glaciers that did not melt at all. This means that since no channels appeared that there is no liquid water near glaciers. Some experimental errors we encountered included not being able to tell if what we were looking at was actually a glacier and the pictures did not always perfectly overlap. We were unable to get see the glaciers up close and test the amount of melting because we are not able to actually go to Mars. Also, the water might not stay around long enough to form channels. The water might evaporate or absorb into the ground. We did not have the knowledge of what kind of soil or rock the south pole of Mars was made of. If the rock was super hard than the water would have to be there for an extended period time to provide enough evidence that the glaciers melt into liquid water. We only collected pictures of the South Pole so we are unaware of the situation at the North Pole.

Conclusion

Since we did not observe any channels next to glaciers, our data supports the claim that the glaciers at the south pole of Mars do not melt into liquid water. This means that the Martian glaciers are more likely to sublime, or turn into a gas directly from a solid. We think that the glaciers would sublime into carbon dioxide. Since we only observed near the south pole, to expand our research, we could look at the north pole for channels near the glaciers. This would also help us find out if there is liquid water on Mars. From our research, we have come to the conclusion that there is not liquid water at the South Pole.

Sources

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