

### Temperature

Temperatures range from 800°F (425°C) on the side facing the Sun to -300°F (-185°C) on the side facing away from the Sun.

### Ice?

Mercury has no atmosphere to help keep its surface temperatures steady. As it spins on its axis, the part facing the Sun gets really hot and the part facing away gets really cold.

Because Mercury is not tilted very much on its axis, there are deep craters near the poles that never receive sunlight. They stay very cold and may have water ice!

# Mercury



The MESSENGER Mission will help us learn more about Mercury - and will tell us if there is water ice at Mercury's poles!

Image courtesy of MESSENGER Teams, JHU APL, NASA.

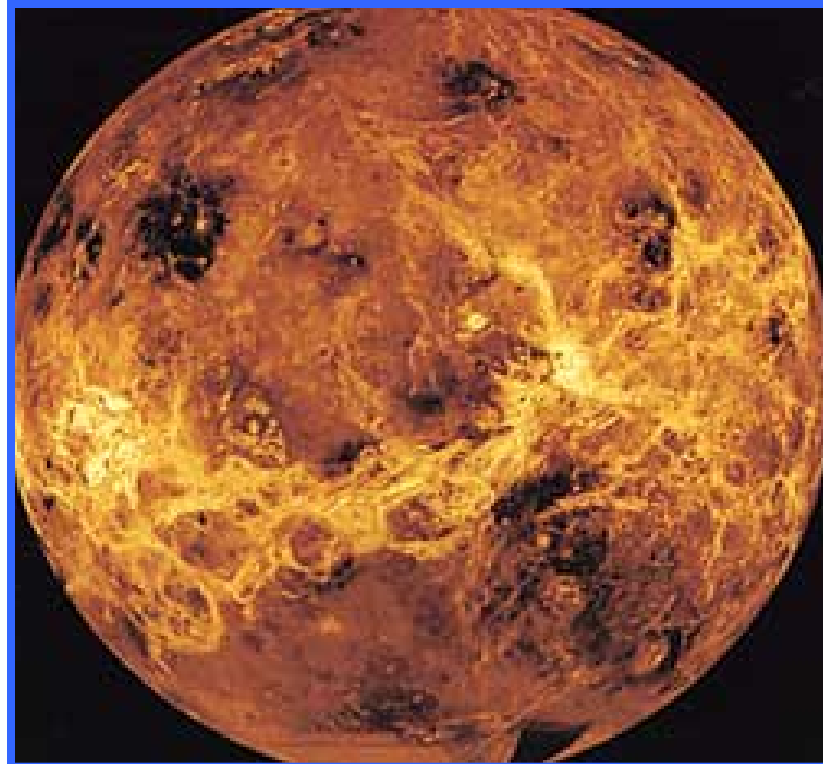
# Venus

## Temperature

The entire surface is about 855°F (457°C) - the surface of Venus is even hotter than Mercury's!

## Ice?

Venus' thick atmosphere traps solar radiation and keeps the planet very, very hot all over!  
Do you think there is ice there?



The surface temperatures on Venus are the hottest in our solar system!

Image courtesy of Magellan Project, JPL, NASA.

# Earth

## Temperature

Temperatures on Earth range from 136° F (57.7° C) in the hottest places to -128° F (-89° C) at the cold poles (brrrr!).

## Ice?

Hmmmm ... is there ice on Earth's surface?

What is most of the ice on Earth made of?



Earth's atmosphere serves as a blanket, keeping our temperatures stable and keeping us from baking or freezing in space!

Image courtesy of NASA, JPL, Doug Ellison.

# Earth's Moon

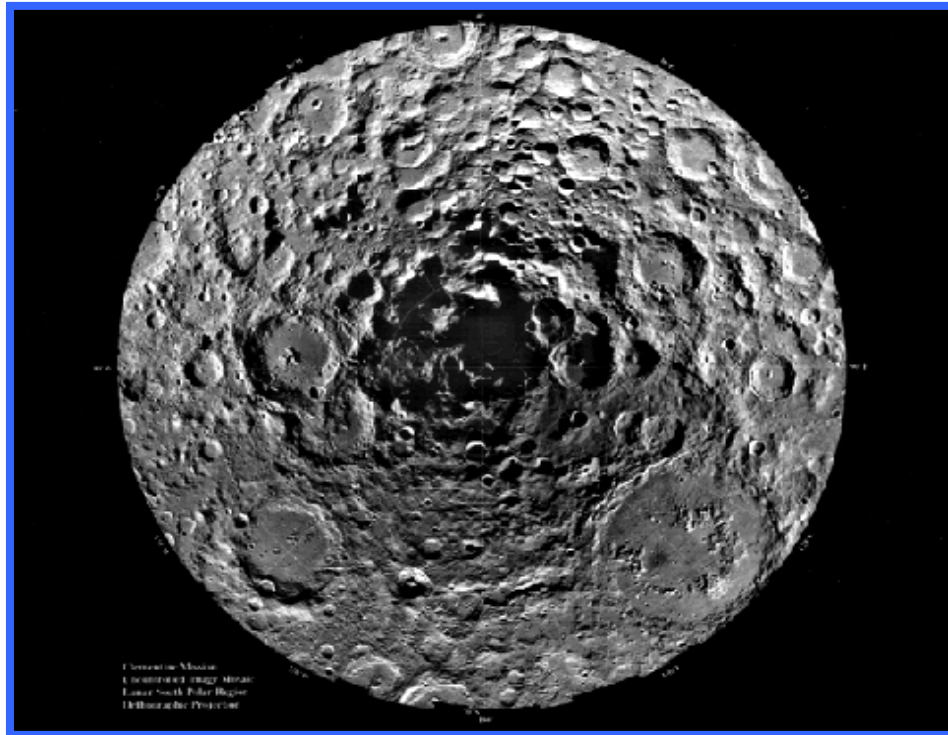
## Temperature

Temperatures range from a hot 221°F (100°C) during the lunar day to -280°F (-173°C) during the lunar night.

## Ice?

The surface is toooooo hot for ice. But because the Moon is not tilted very much on its axis, there are deep craters near the poles that never receive radiation from the Sun. These permanently dark, permanently cold craters may have ice that has been delivered by comets.

Observations from spacecraft suggest that there may be ice in these permanently shadowed areas.



This is a view of the Moon's south pole! The deep craters at the poles never get any sunlight. They stay very cold all the time and may contain water ice!

Image courtesy of NASA/JPL/USGS.

# Mars

## Temperature

Temperatures range from a chilly  $-200^{\circ}\text{F}$  ( $-129^{\circ}\text{C}$ ) to a "balmy"  $32^{\circ}\text{F}$  ( $0^{\circ}\text{C}$ ).

## Ice?

Mars has ice caps at its north and south poles, and there may be ice just under the surface across much of the red planet.

The north polar cap is mostly water ice and the south polar cap has water and carbon dioxide ice.



Sometimes the temperatures on Mars get cold enough that carbon dioxide in the atmosphere freezes and falls as carbon dioxide snow.

Image courtesy of NASA and the Hubble Heritage Team (STScI/AURA)

# Enceladus

## Temperature

The warmest temperature is  
-200°F (-128°C).

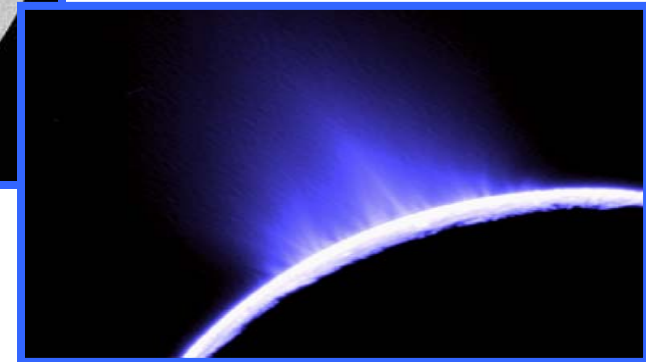
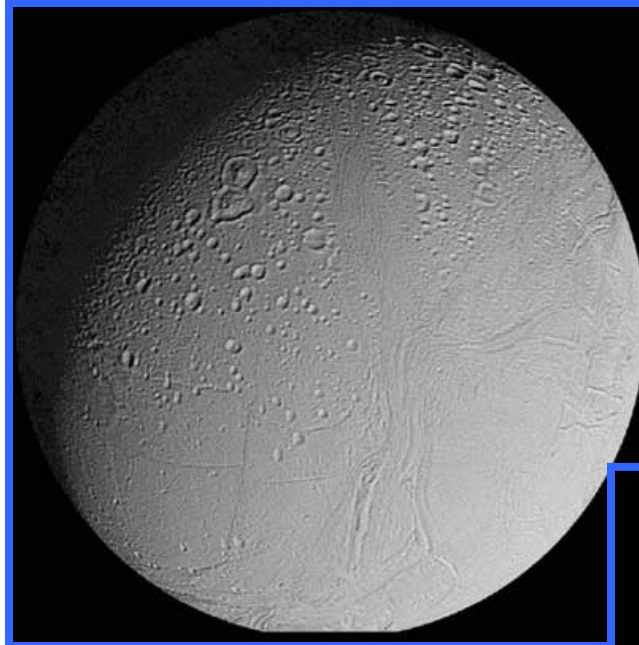
The coldest temperature is  
-400°F (-240°C).

## Ice?

Saturn's Moon, Enceladus, has  
a cover of ice on its surface.

The Cassini spacecraft took  
pictures of geysers of water  
vapor spewing out of cracks in  
the ice.

Because of the cold  
temperature of Enceladus,  
scientists think that the water  
has ammonia mixed in to keep  
the water from being frozen  
solid.



Its bright white surface makes Enceladus the most reflective planet in our solar system!

Images courtesy of NASA/JPL/USGS.

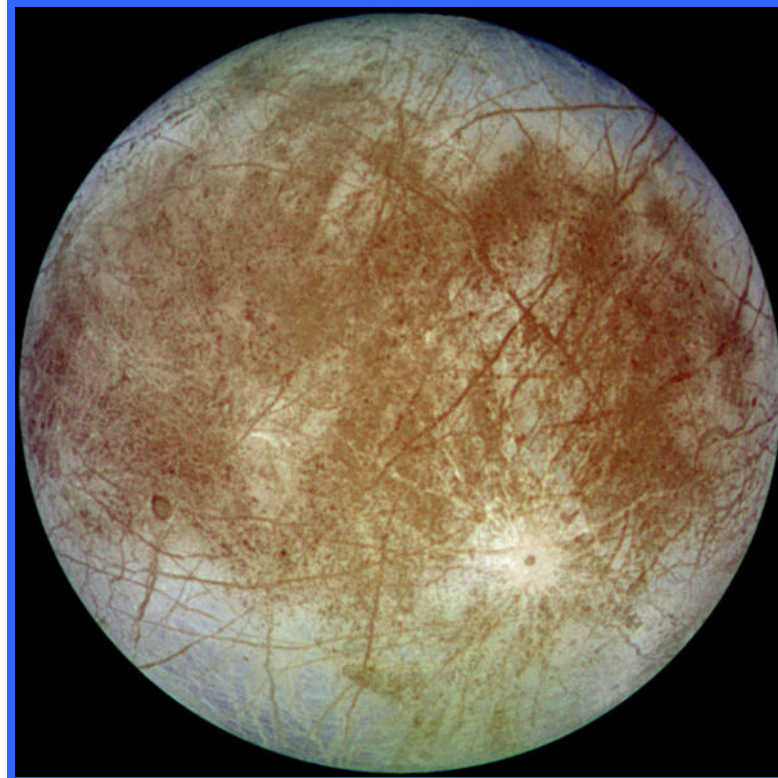
### **Temperature**

Temperatures range from a high of  $-235^{\circ}\text{F}$  ( $-148^{\circ}\text{C}$ ) to a low of  $-370^{\circ}\text{F}$  ( $-223^{\circ}\text{C}$ ).

### **Ice?**

Europa's surface is covered by an icy crust that floats on a salty ocean. Some scientists suggest that the icy crust is less than a mile thick, and others propose that it could be as thick as 20 miles (30 kilometers)! Most of the ice is water ice.

## **Europa**



Europa is covered by a floating crust of ice.

Image courtesy of Galileo Project, JPL, NASA.

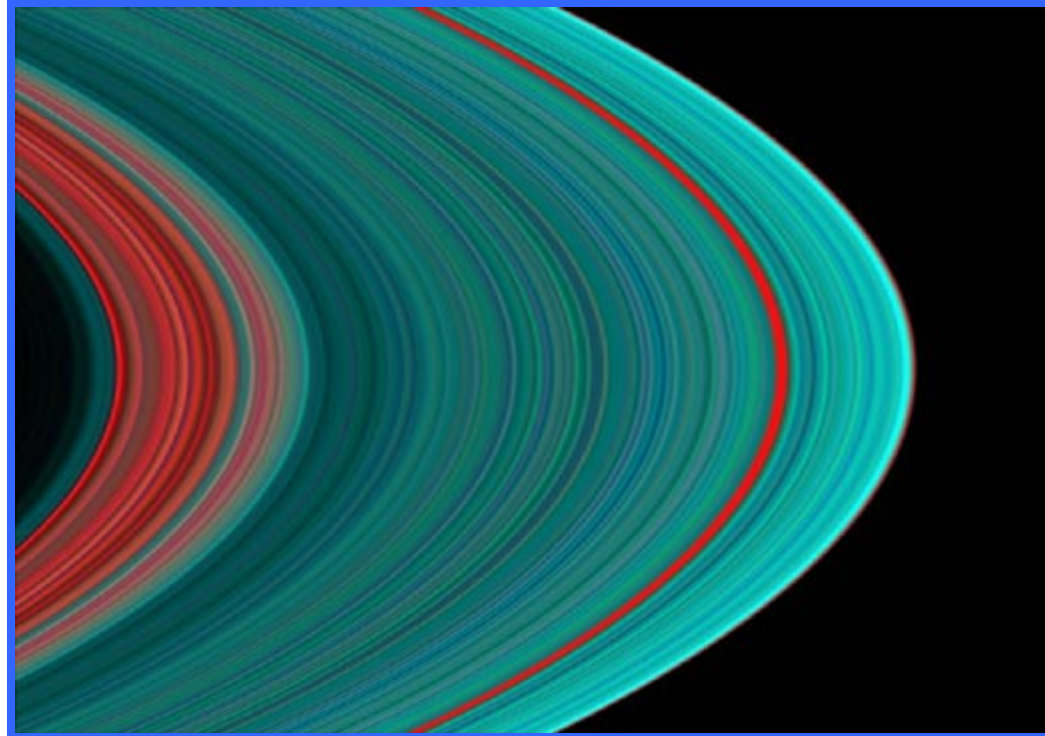
# Saturn's Rings

## Temperature

Ring temperatures range from  
-261°F (-163°C) to  
-333°F (-203°C).

## Ice?

Saturn's spectacular rings are  
made of countless particles,  
from the size of dust specs to  
small cars. These particles are  
almost entirely made of water  
ice.



Saturn's rings in ultraviolet, taken from the Cassini Spacecraft.

Image courtesy of NASA/JPL/University of Colorado.



## Ice?

Comets are called "icy dirt balls" or "dirty snow balls." Comets have a central body, called a nucleus, which can be 1/3 of a mile (1/2 kilometer) to 30 miles (50 kilometers) across. The nucleus contains lots of ice, dust, rock, and frozen gases.

Comets have lots of water ice, but they also have ammonia ice and methane ice, as well as other types of ices.

# Comets!



Comets may have delivered water ice to the planets and moons in our solar system.

Image courtesy of NASA.