



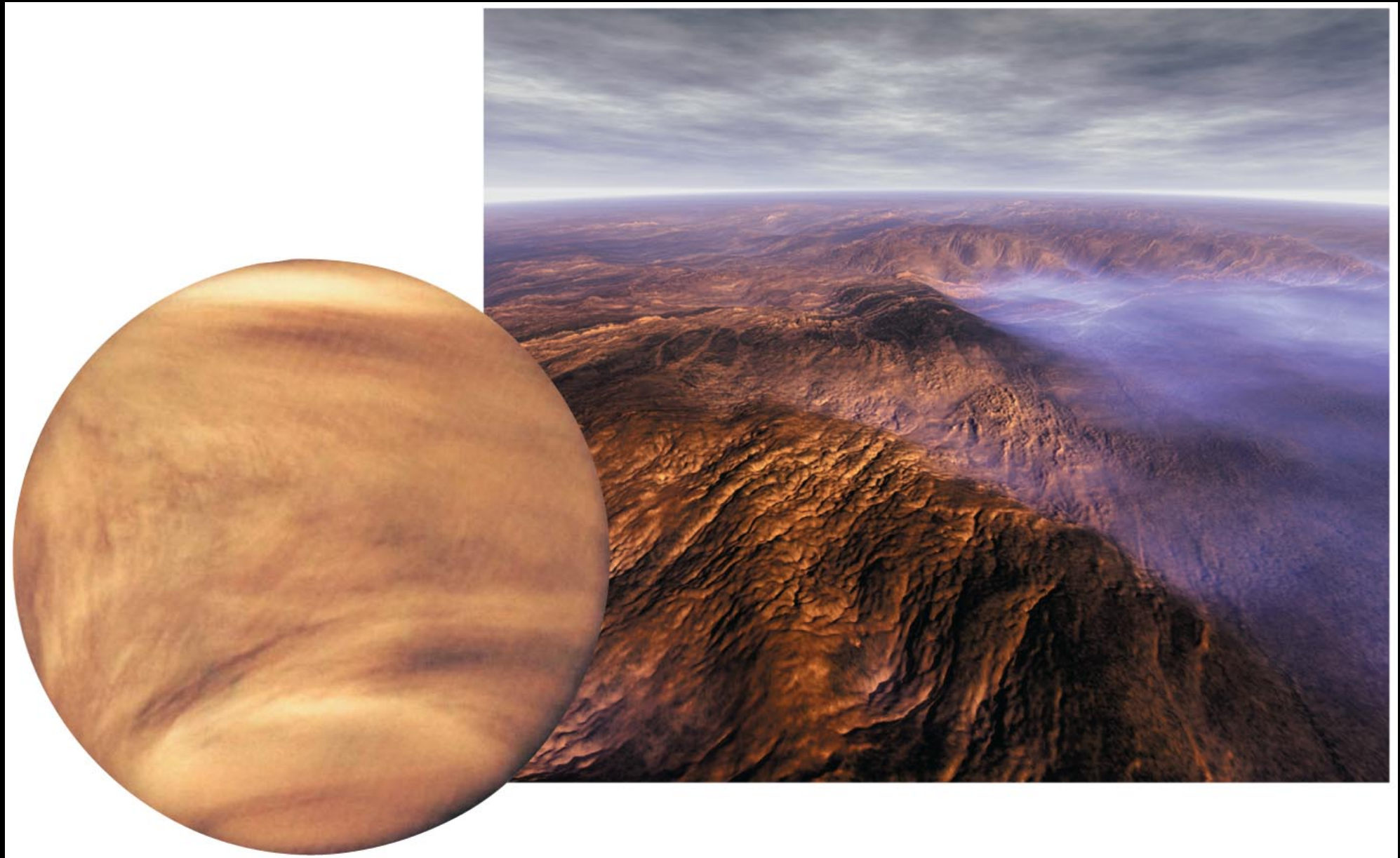
Venus

When did THIS

Mercury

...become hotter than THIS?

Venus



- Nearly identical in size to Earth
- Hellish conditions due to an extreme **greenhouse effect**
- Even hotter than Mercury: 470°C, day and night



Venus

Pacific Ocean

Which of the following appear to have a Greenhouse Effect?

Planet	Satellite Temperature	Surface Temperature
Venus	232K	740K
Earth	255K	288K
Mars	210K	210K
Titan	82K	94K

Which of the following best describes the function of a greenhouse gas?

- A. They protect the ozone layer
- B. They trap sunlight within Earth's atmosphere
- C. They absorb some forms of light and allow other forms of light to pass through
- D. They concentrate sunlight as it passes through Earth's atmosphere

Which of the following is
an effective greenhouse gas?

A. Water

B. Oxygen

C. Ozone

D. Nitrogen

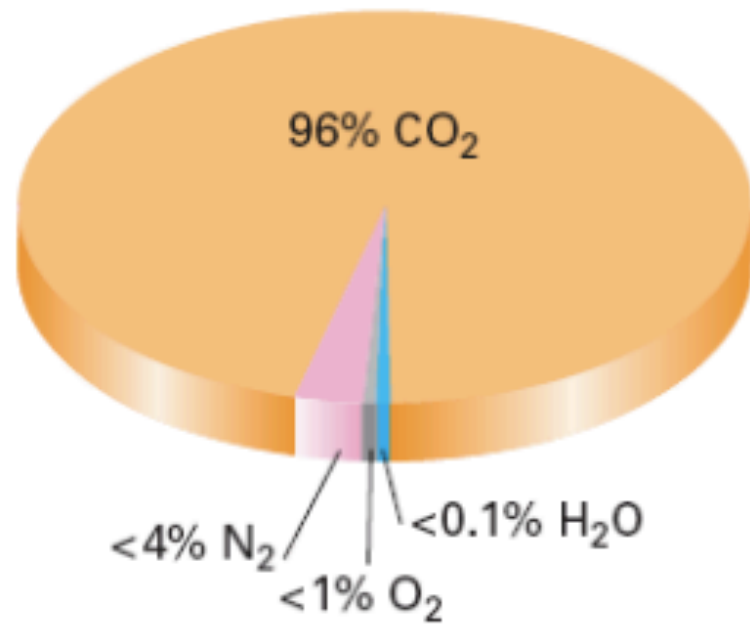
If you view the blackbody curve of Earth,
what form of light would it peak in?

- A. Visible
- B. IR
- C. UV
- D. None of the above

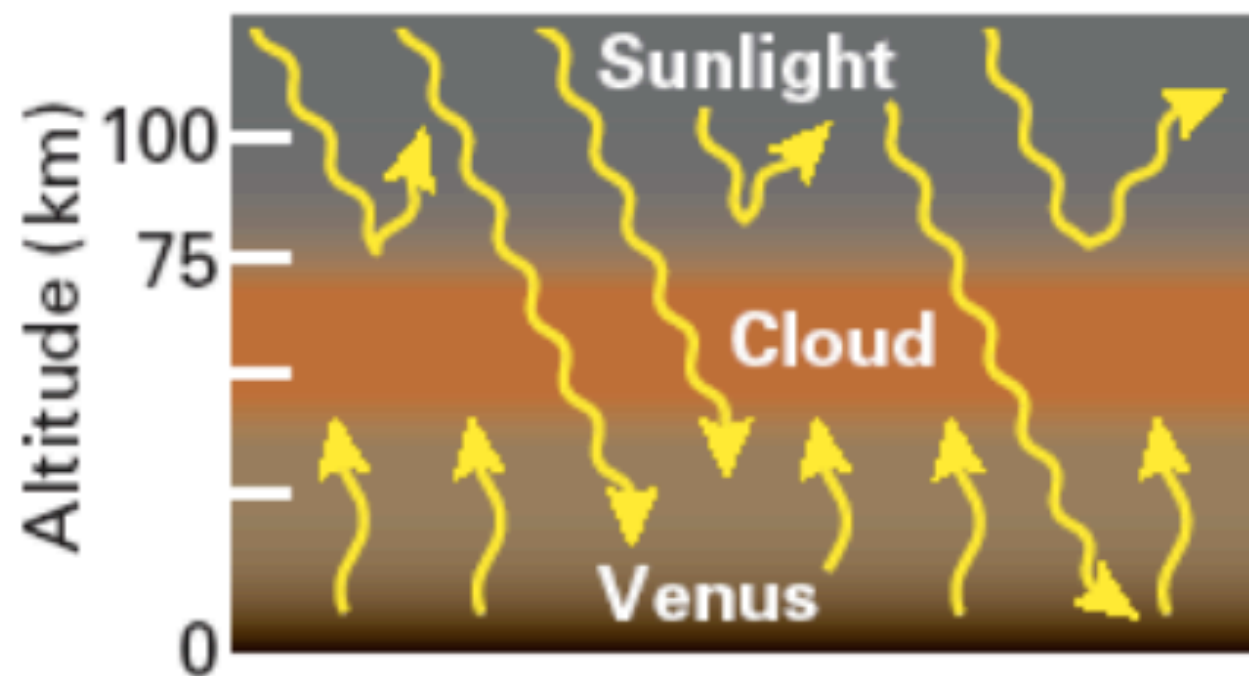
If Earth didn't have an atmosphere, what would happen to its temperature?

- A. It would go up a little (less than 10°C)
- B. It would up a lot (more than 10°C)
- C. It would go down a little (less than 10°C)
- D. It would go down a lot (more than 10°C)
- E. It would stay the same

The Atmosphere of Venus



- Is 96 % CO₂
- Which creates a powerful **greenhouse effect**, trapping sunlight
- Temperatures are above 900 °F
- This would kill any life on Venus.

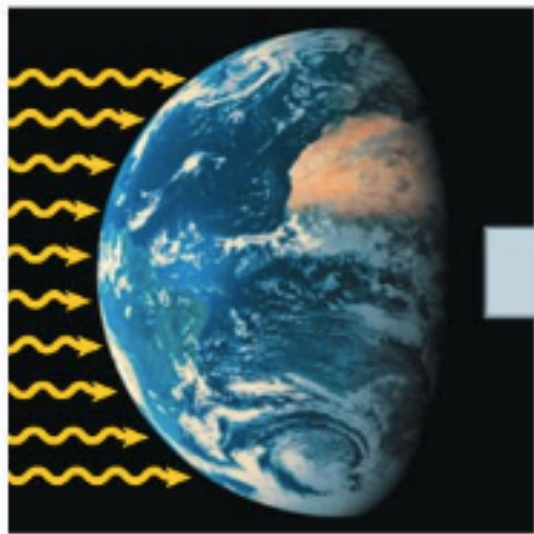


Warning: This could happen to your home planet!!!

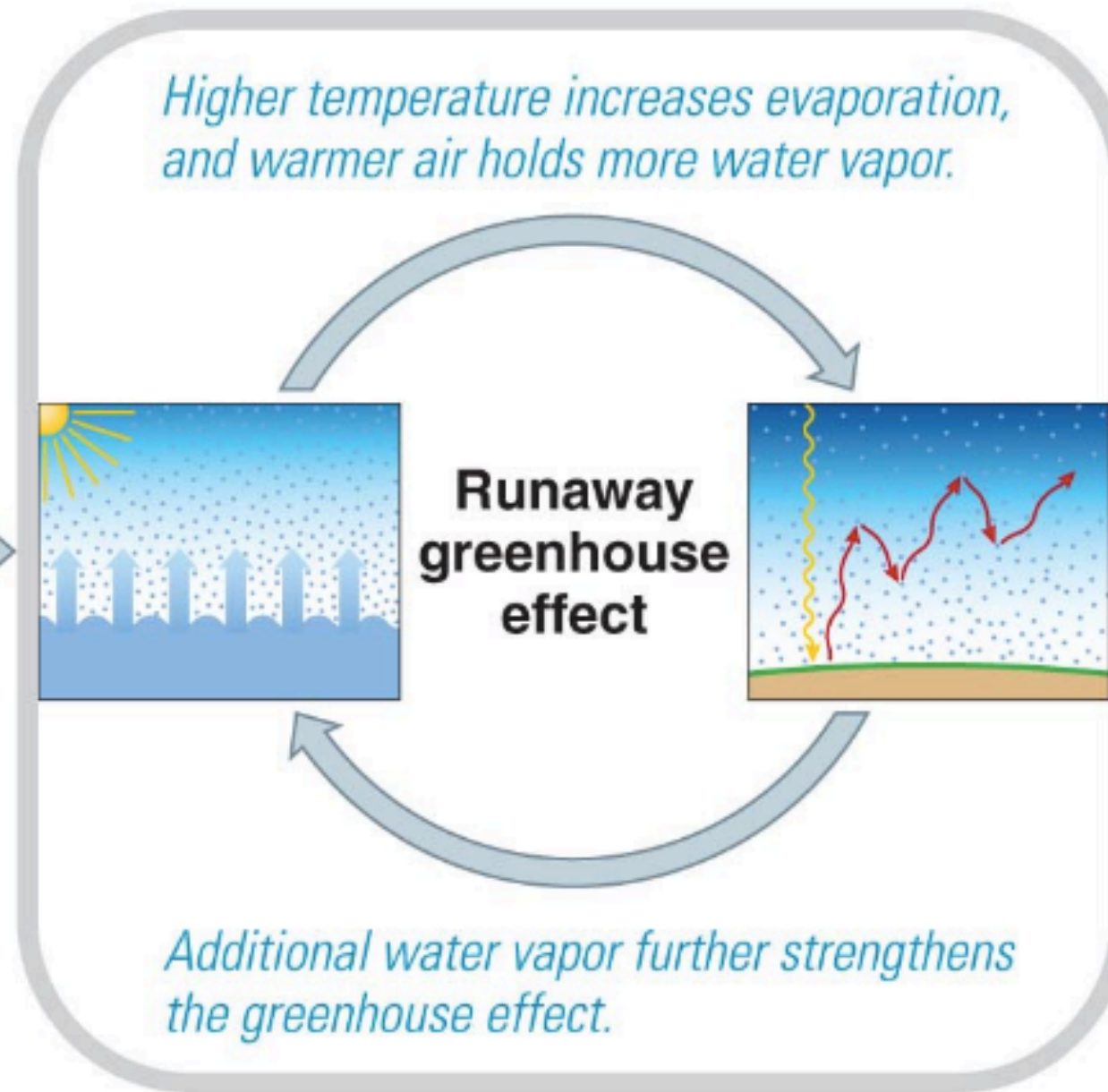
Runaway Greenhouse Effect

If Earth moved to Venus's orbit

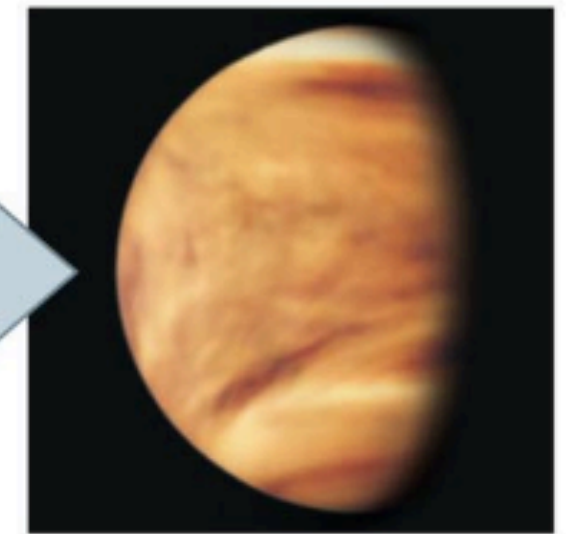
More intense sunlight...



...would raise surface temperature by about 30°C.



Result: Oceans evaporate and carbonate rocks decompose, releasing CO₂...



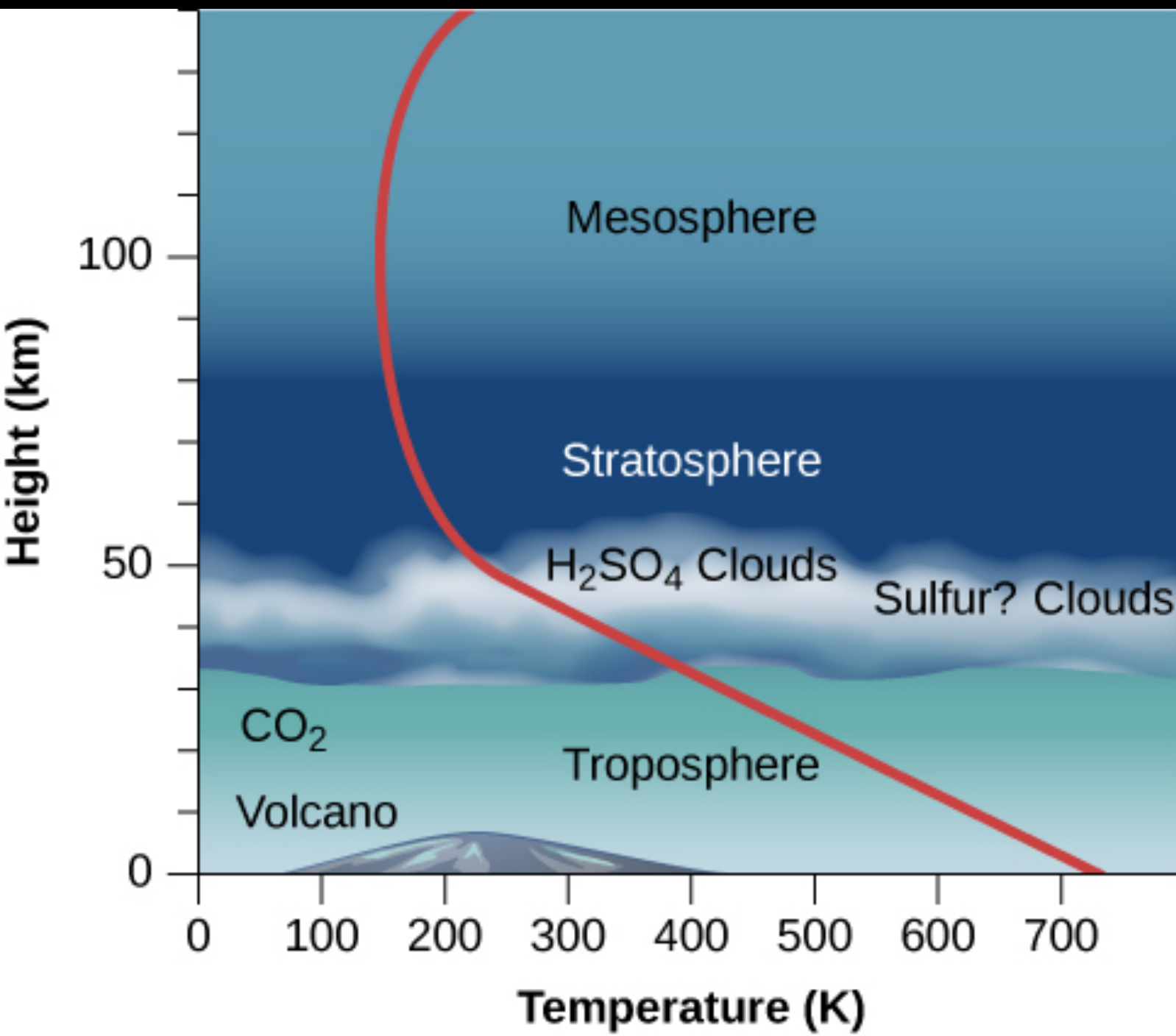
...making Earth hotter than Venus.

- Runaway greenhouse effect would account for why Venus has so little water



The surface of
Venus is
completely
hidden beneath
permanent cloud
cover

While most of the atmosphere is CO_2 , there is also a small amount of nitrogen. There is very little water- Venus' atmosphere is quite dry.

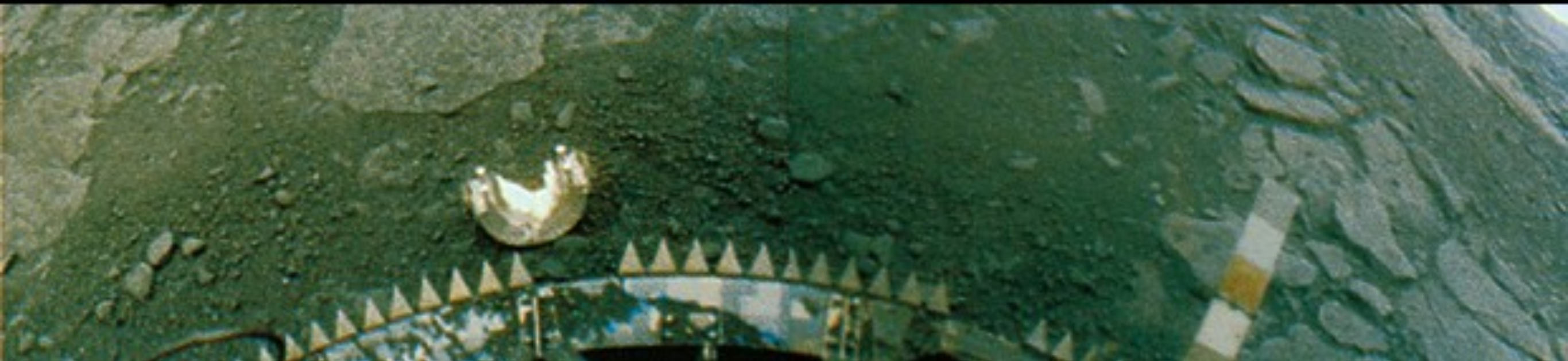
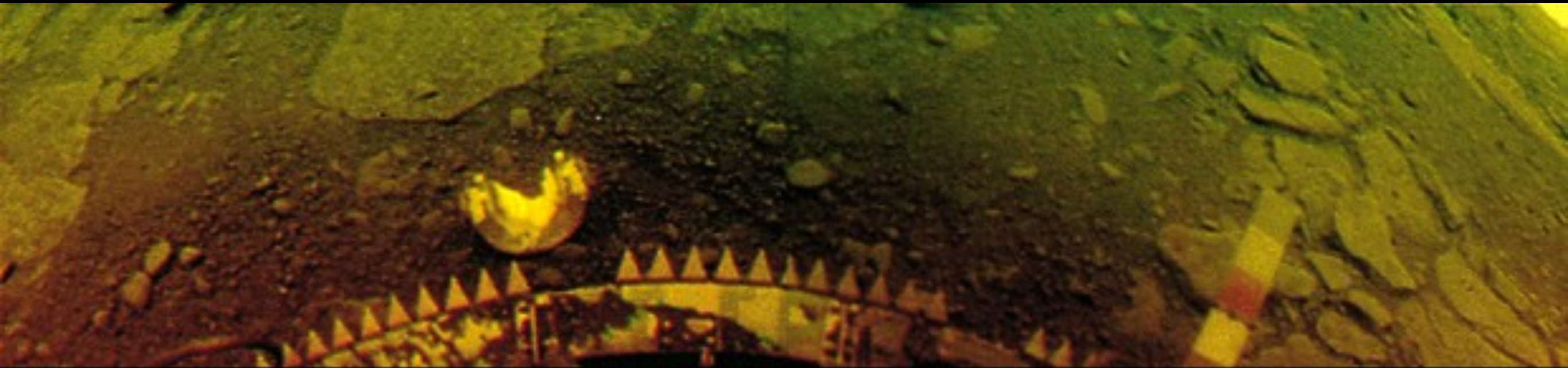


Pressure is 90x
what we have on
Earth!

} Sulfuric acid

} Clear; very little
weather here!

The Venusian Surface

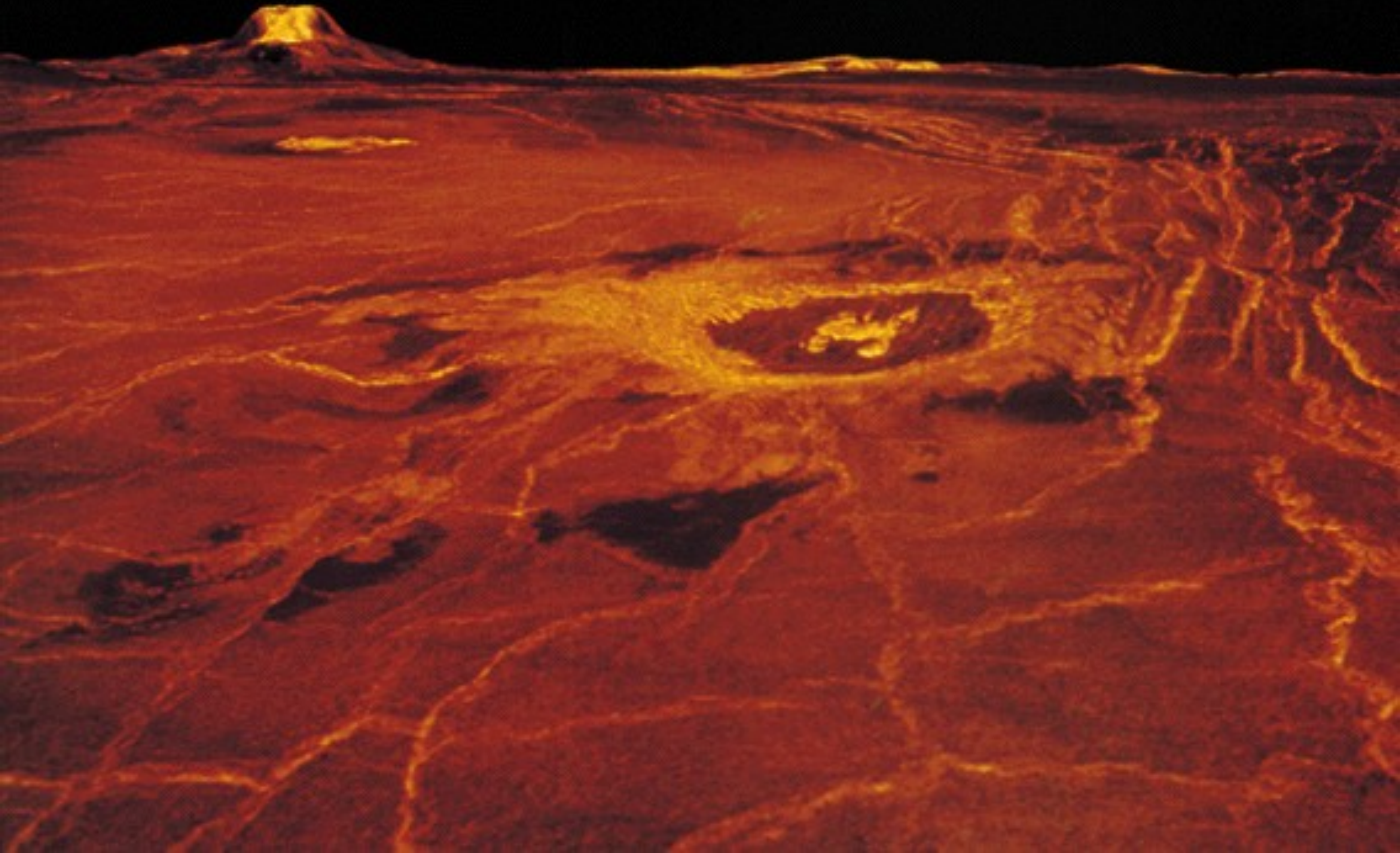


View from the Venera 13 lander on Venus – our last visit there

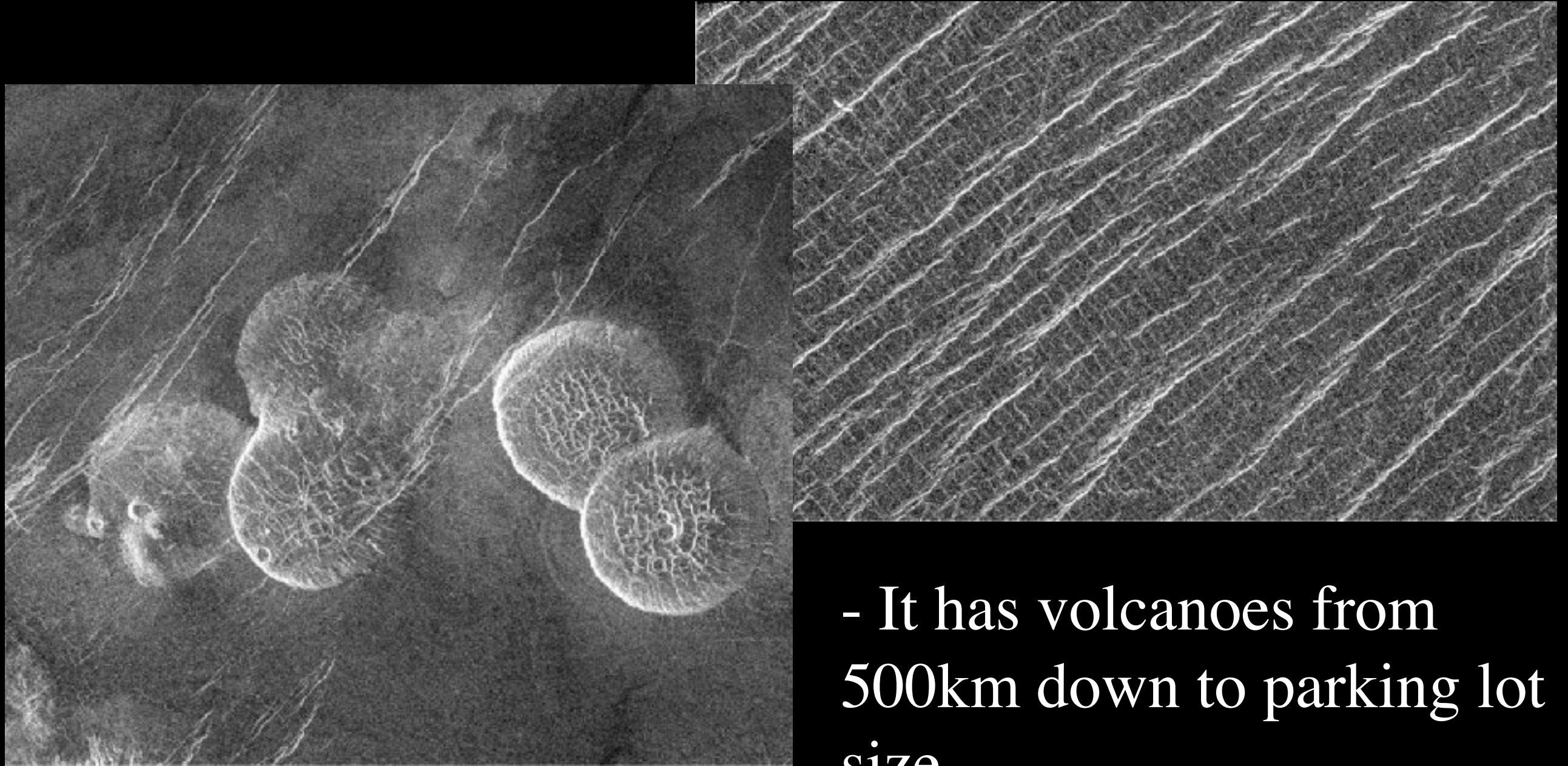
Radar image of Venus



Venus is covered with gently rolling hills and numerous volcanoes



Effects of upwelling magma on Venus

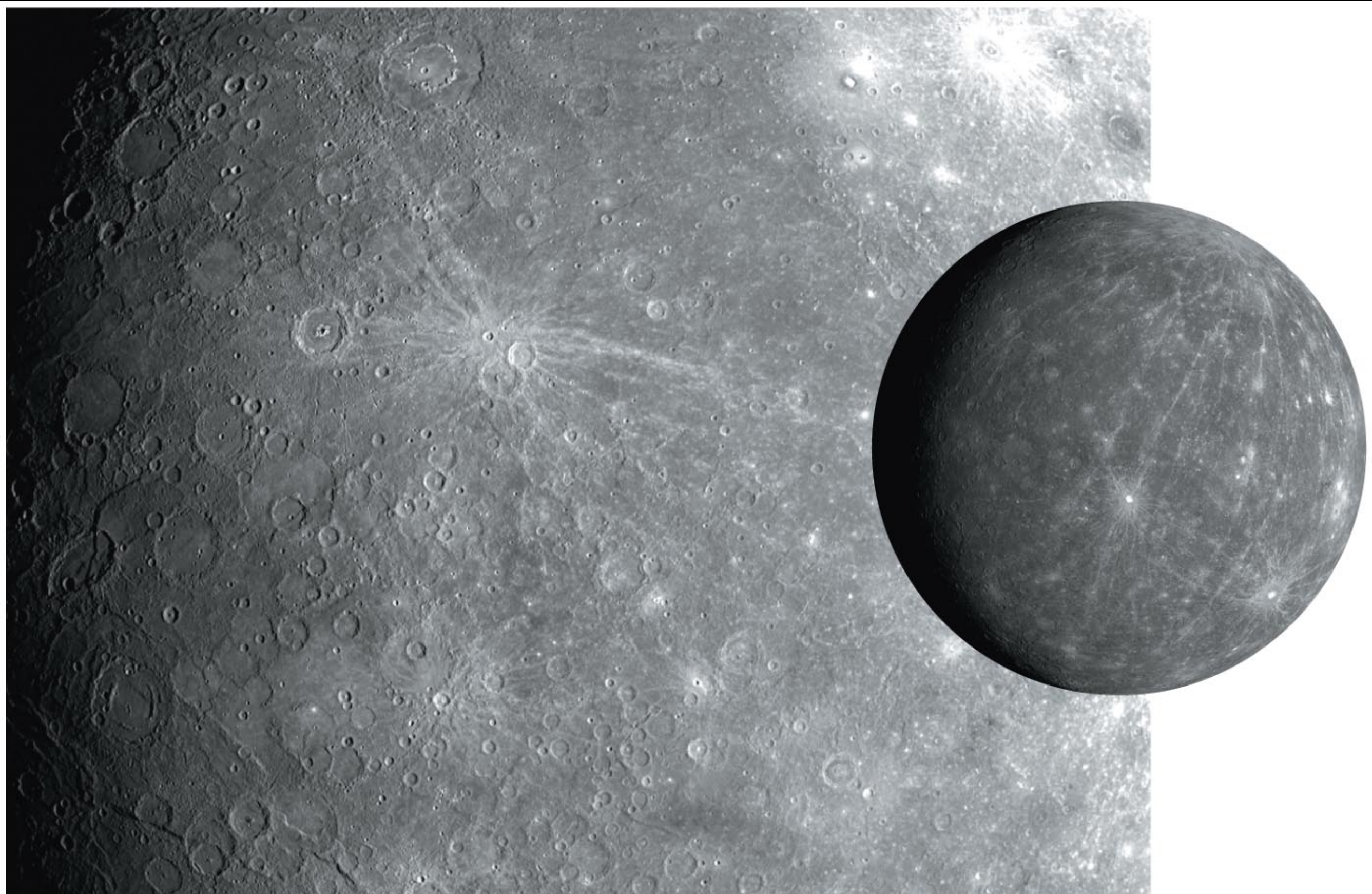


- It has volcanoes from 500km down to parking lot size.
- It has tectonic features but no large-scale plates

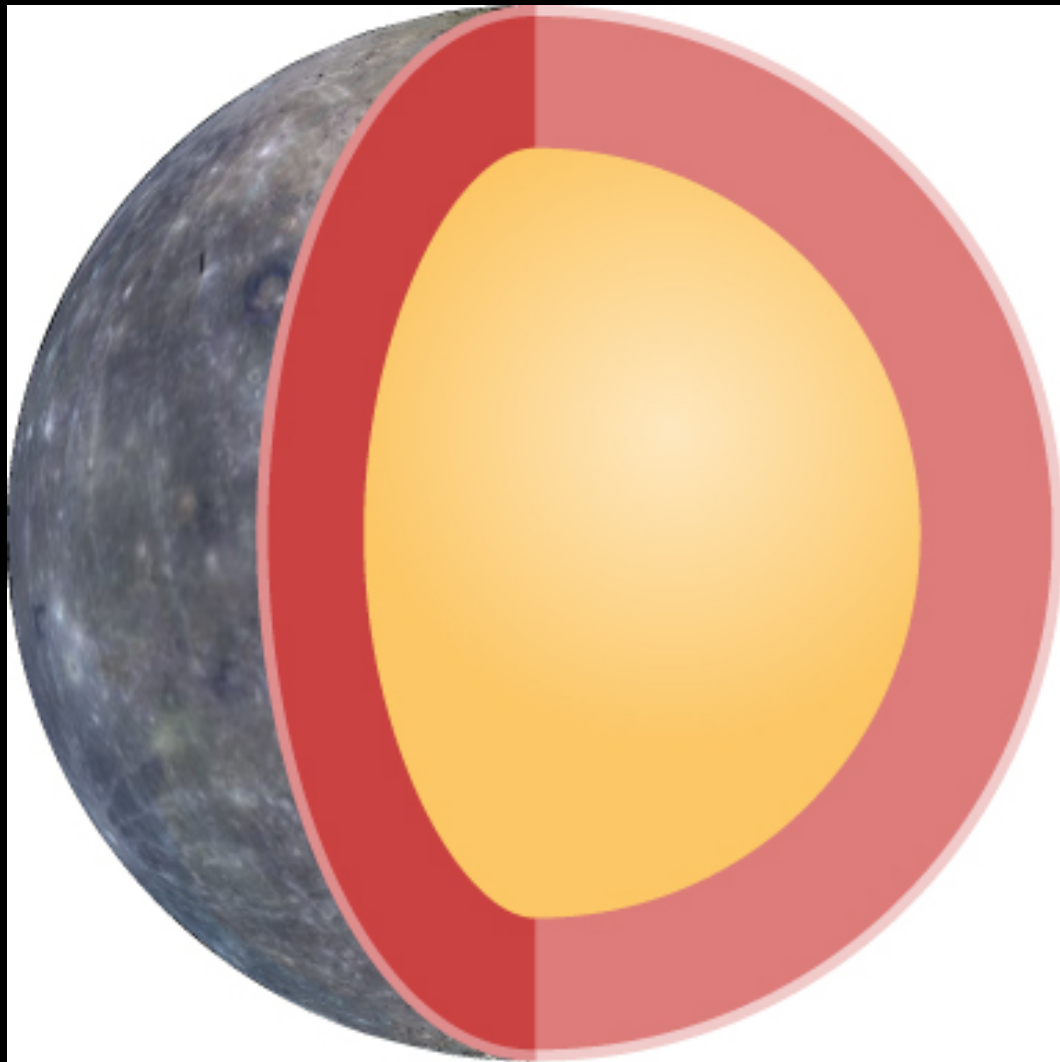
Top 6 things to know about Venus

- 1) Nearly identical in size to Earth; surface hidden by clouds
- 2) Hellish conditions due to an extreme, runaway **greenhouse effect**
- 3) Even hotter than Mercury: 878F, day and night
- 4) Visited by Soviet Venera 13 which lasted a few hours and Magellan
- 5) It ROTATES BACKWARDS (and slowly!) compared to other planets
- 6) Its atmosphere is 96% CO₂ with trace elements of N₂, with some Ar, sulfur dioxide, and small amounts of sulfuric acid, hydrochloric acid, and hydrofluoric acid. It is 90 times MORE dense than Earth's.

Mercury

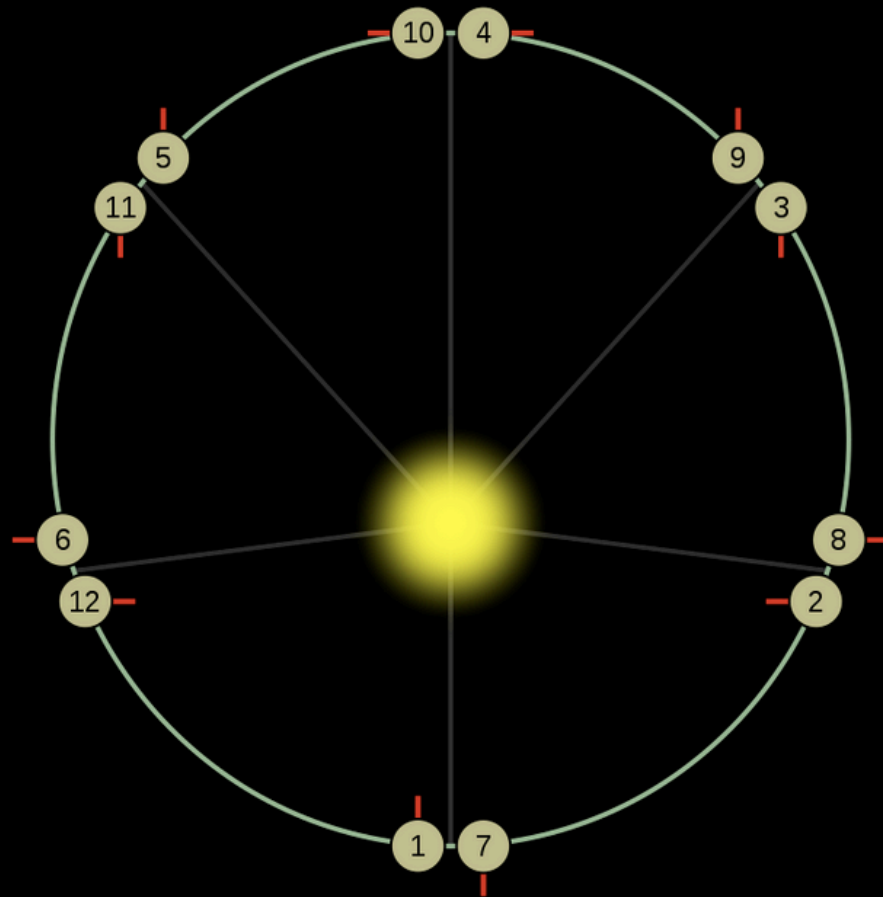


A high density planet



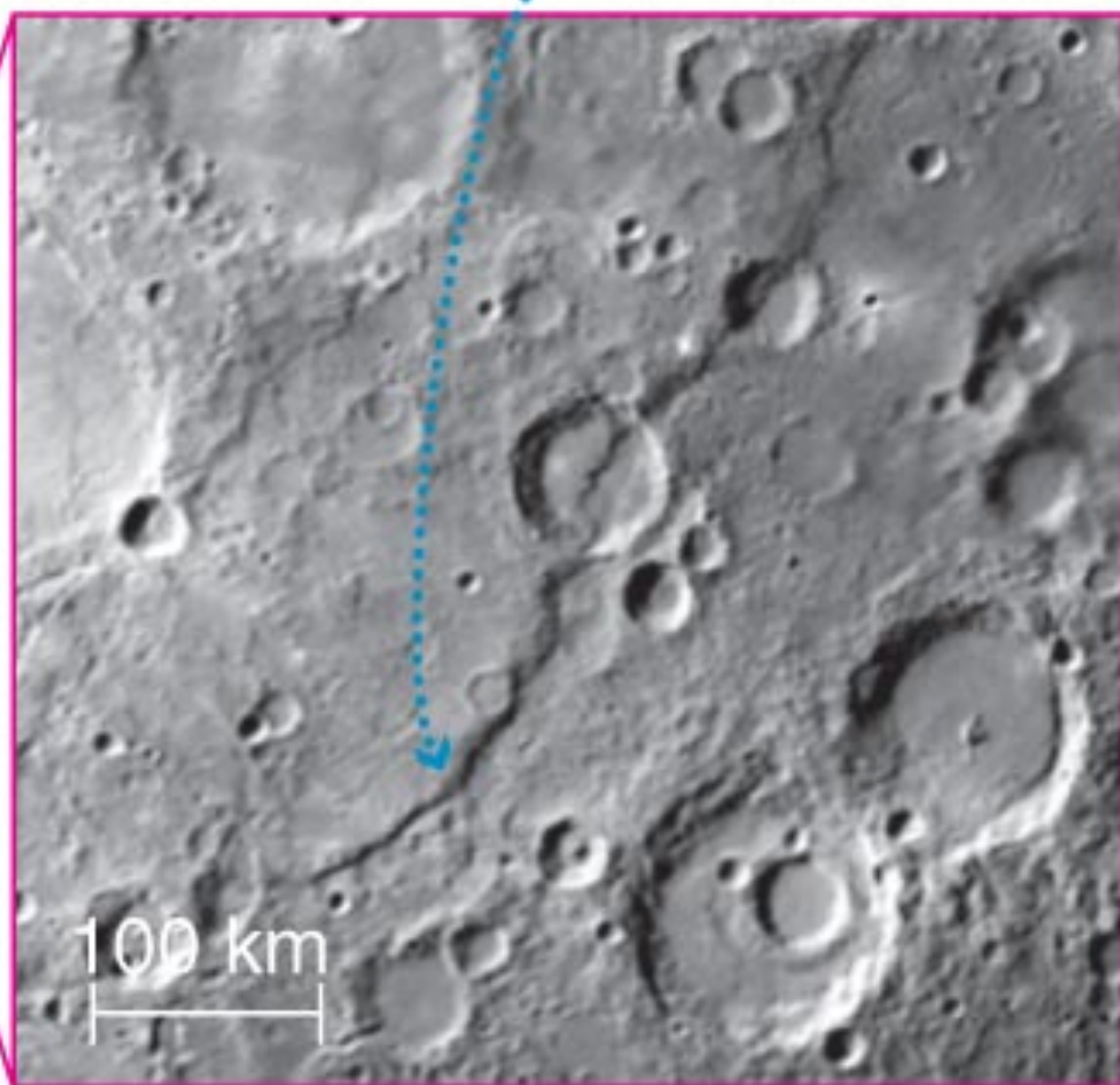
- About the size of Earth's moon but much heavier
- It must be made of mostly metals
- Very little atmosphere
- A weak magnetic field

Mercury's odd rotation



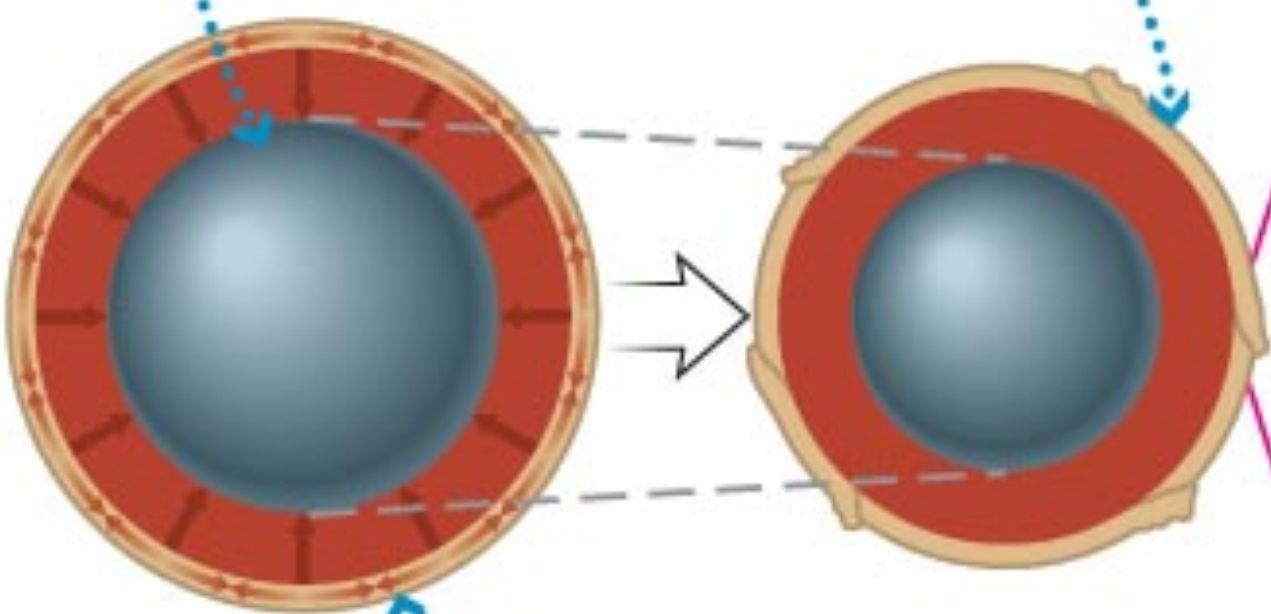
- After one orbit, Mercury has rotated 1.5 times
- VERY hot on the day side (700K/430C)
- Quite cold on the night side (100K/-170C)

Today we see long, steep cliffs created by this crustal movement.



Some portions of the crust were forced to slide under others.

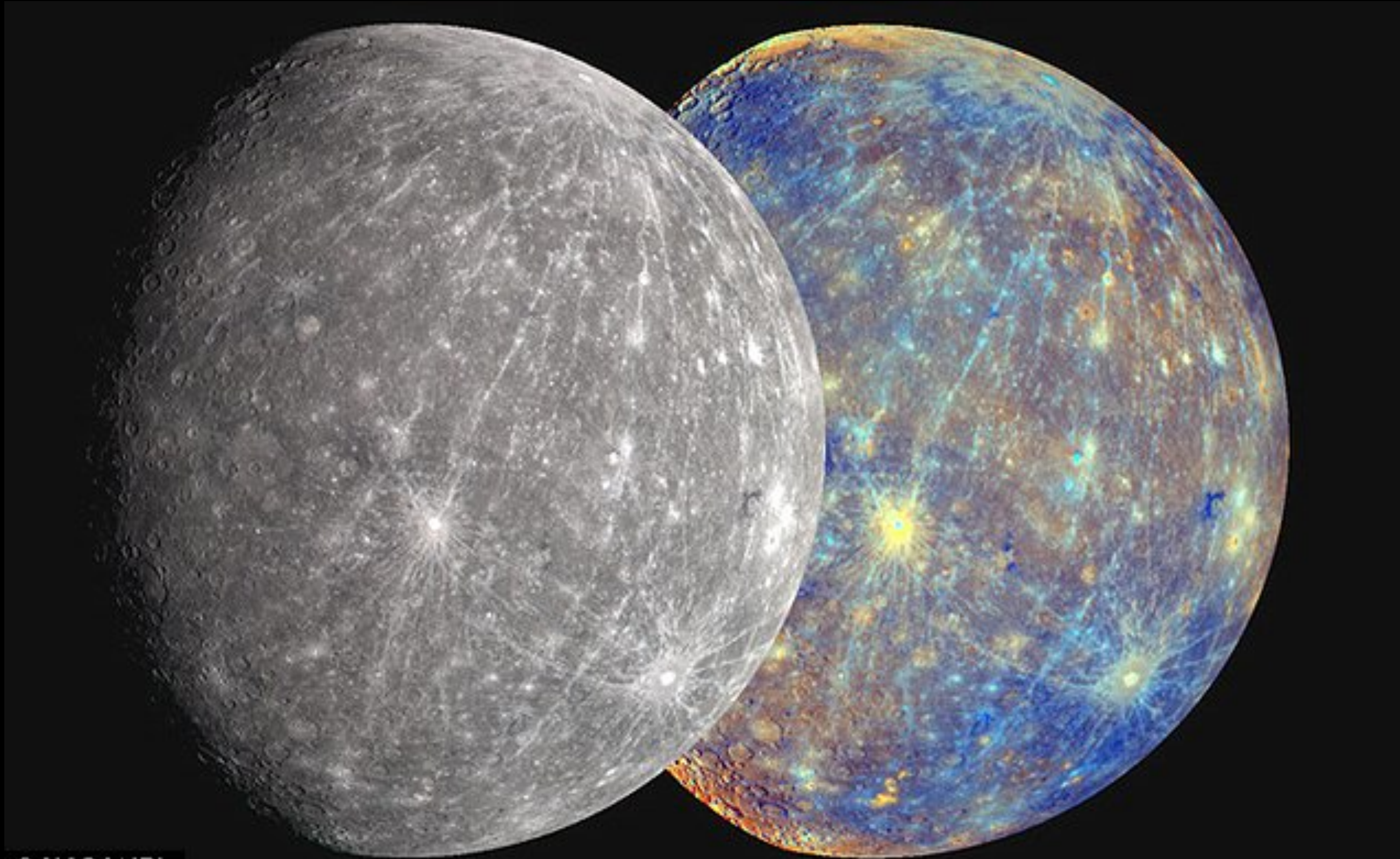
Mercury's core and mantle shrank...



Shrinkage not to scale!

... causing Mercury's crust to contract.

Messenger (2008)



Top 4 things to know about Mercury

- 1) Mercury is the smallest of the terrestrial planets and is the closest to the Sun
- 2) It is dead, airless and covered in craters - the absence of air results in a range of temperatures of 797°F (day) to 280°F (night)
- 3) It has been visited by the Mariner and Messenger space crafts
- 4) Its ridges and craters are due it cooling quickly after forming and no erosion