



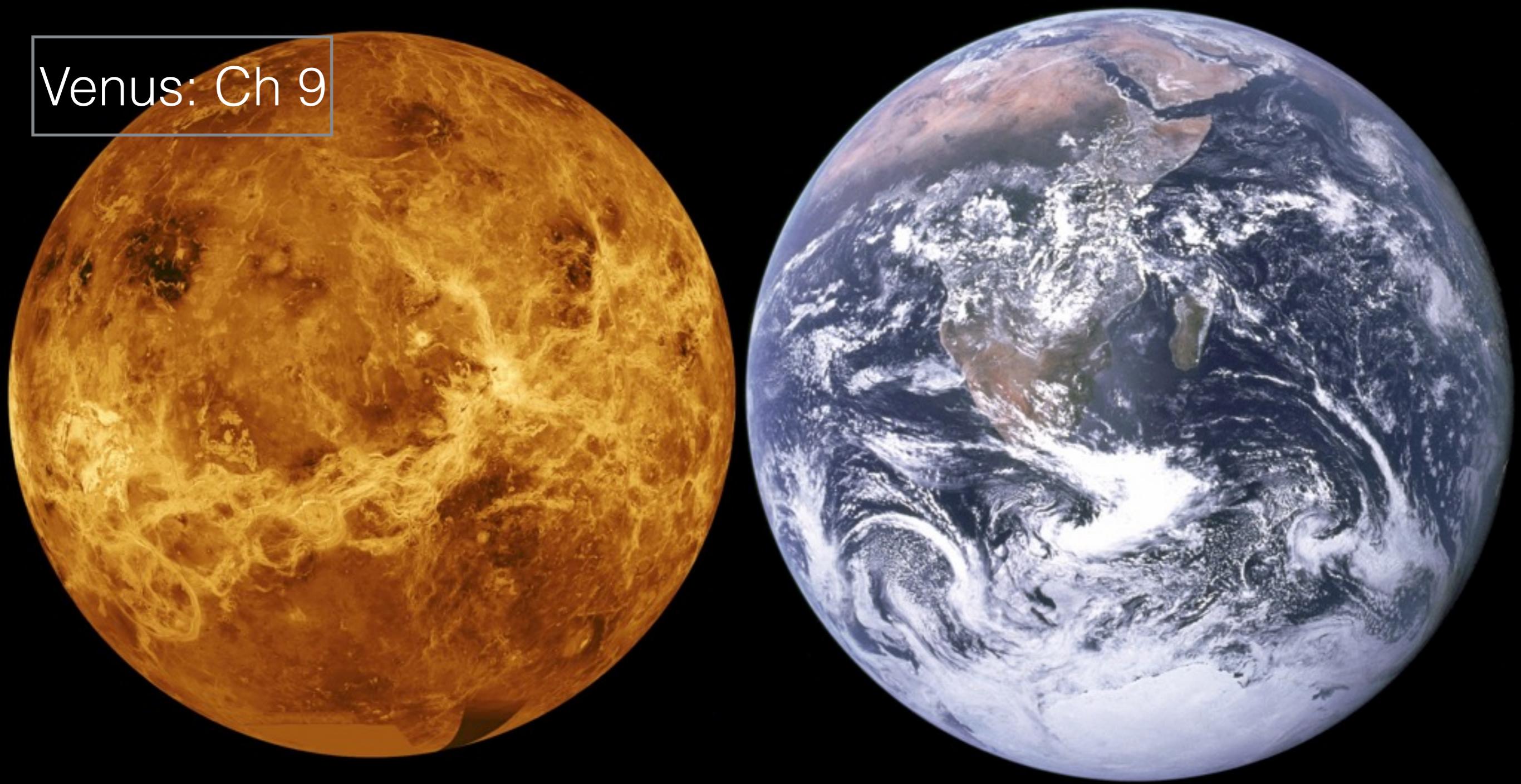
with your host:



Lecture 8: Venus

Coop

Venus: Ch 9



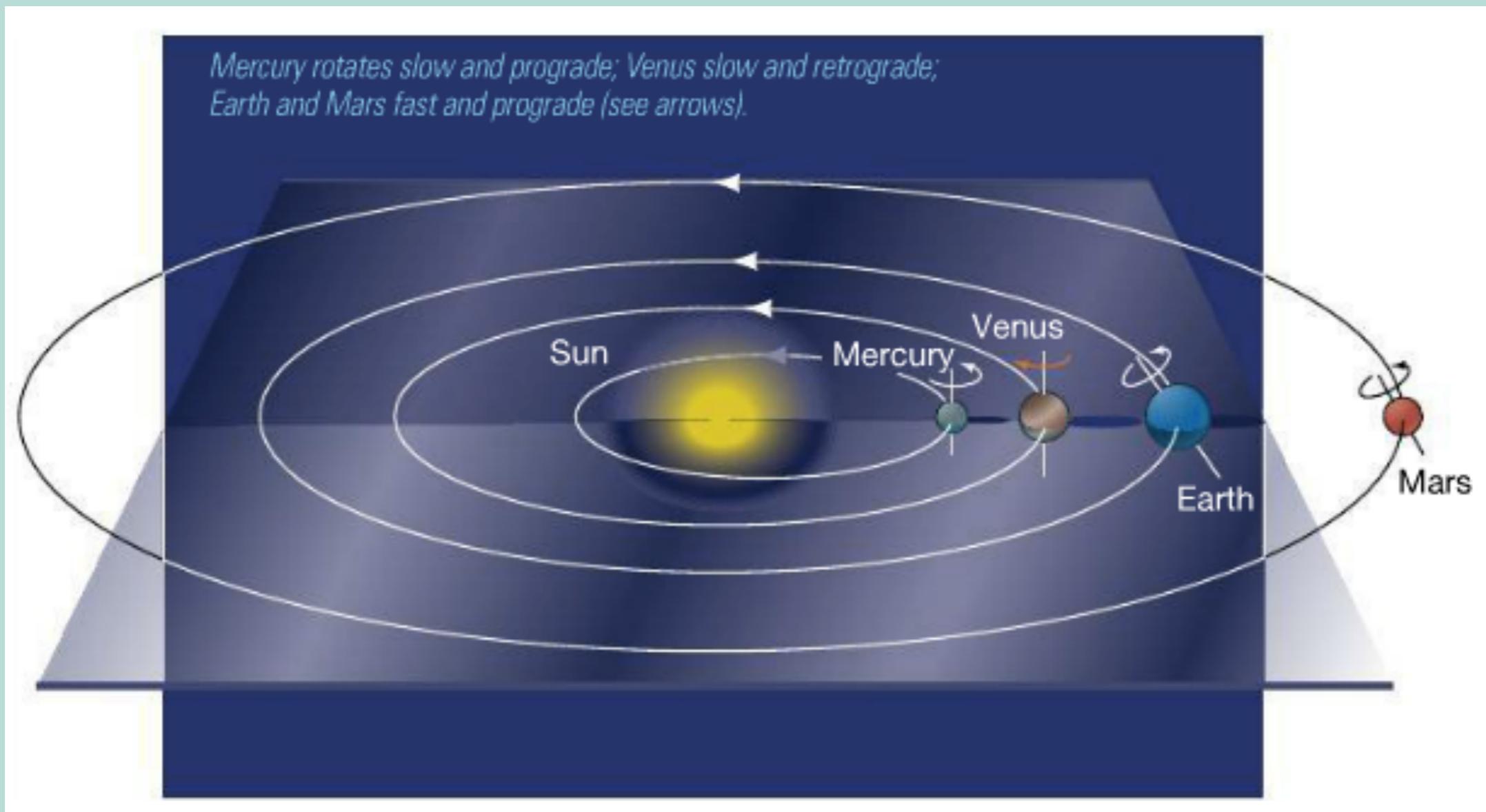
Venus

$m \sim 4.9 \times 10^{24}$ kg $\sim .815 m_e$

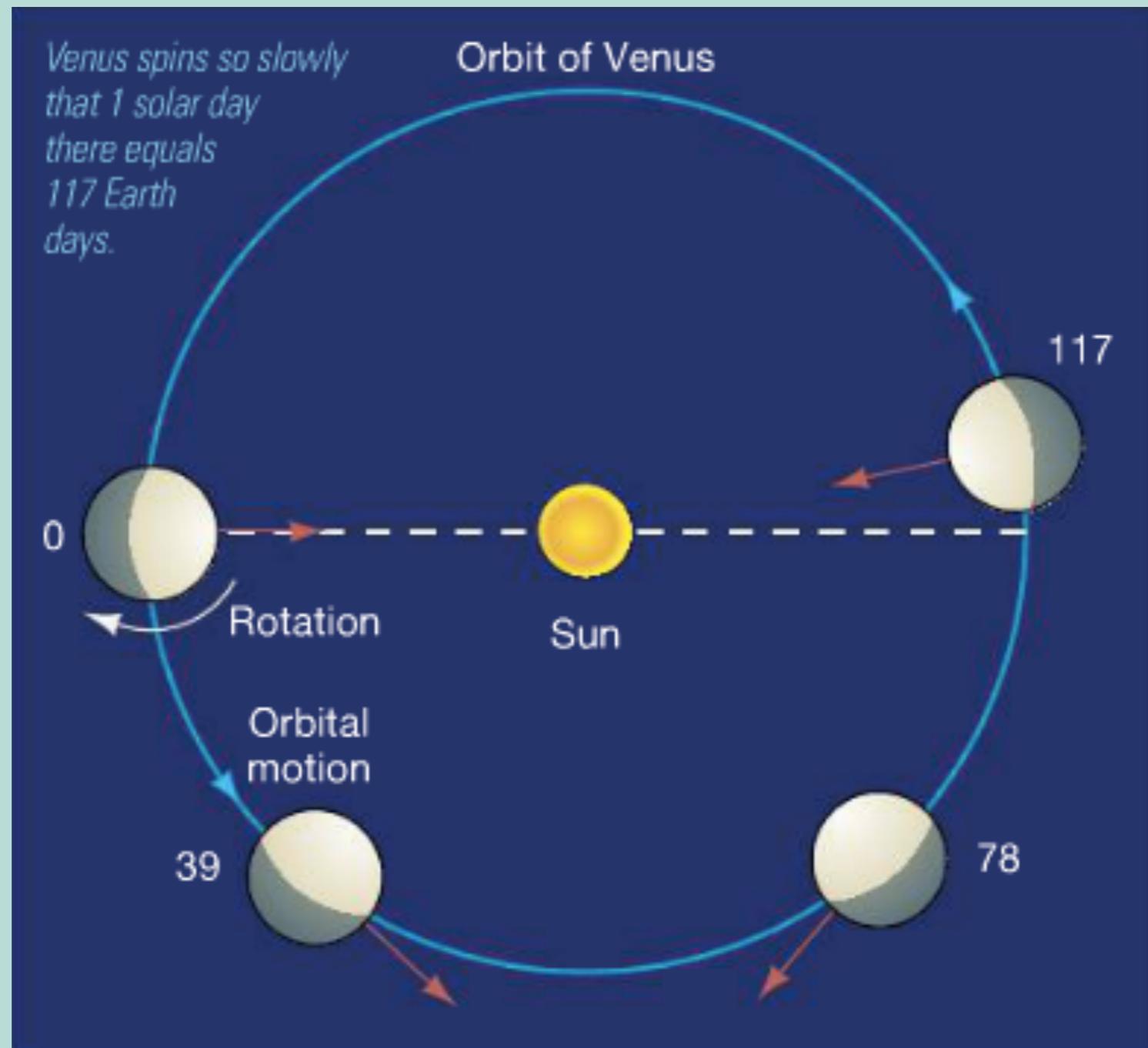
$r \sim 6000$ km $\sim .95 r_e$ $\sim .02$ s

$d_{\text{sun}} \sim 108,000$ km $\sim .72$ AU ~ 6 min

Rebel in Retrograde Motion

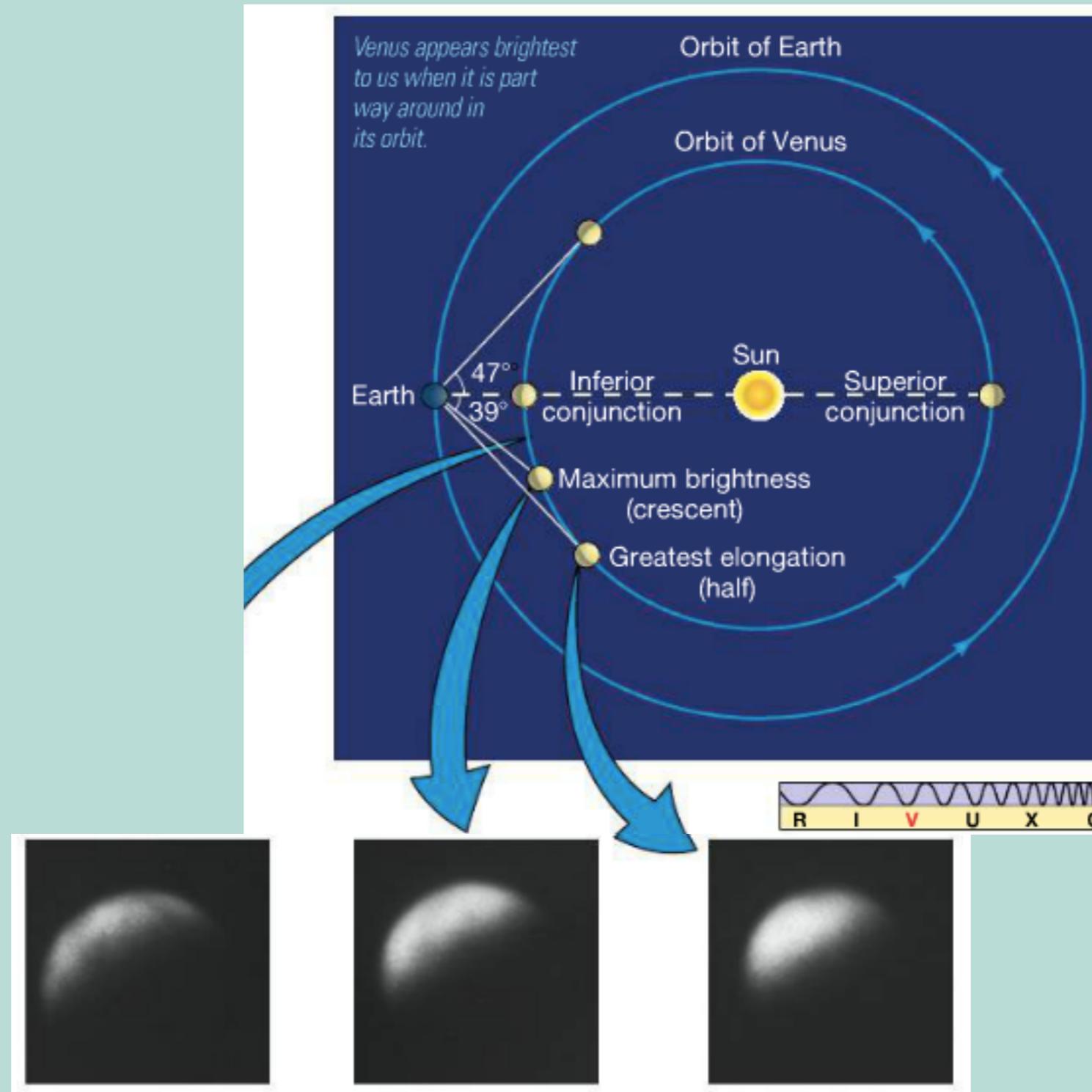


Slow Venusian Spin



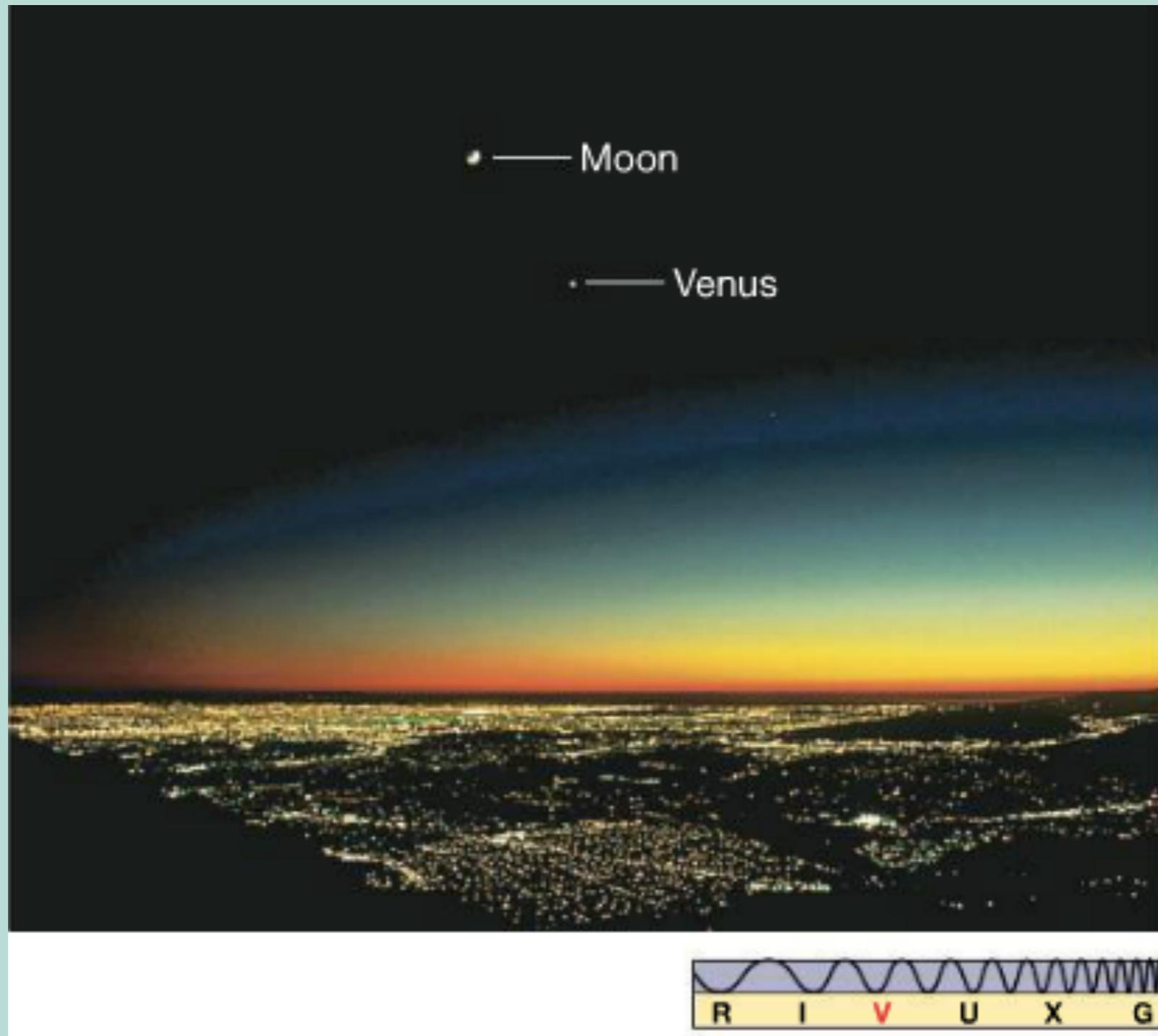
5 to 1 resonance facing us on fly-bys

Maximum Brightness



Venus: Ch 9

10x brighter than Sirius (the brightest star)



You can see it during the day and it casts a shadow!

Venus: Ch 9



Dense Yellow Haze Obstructs Views from Earth

Venus: Ch 9

Surface Temperature:

Day ~ 740 K

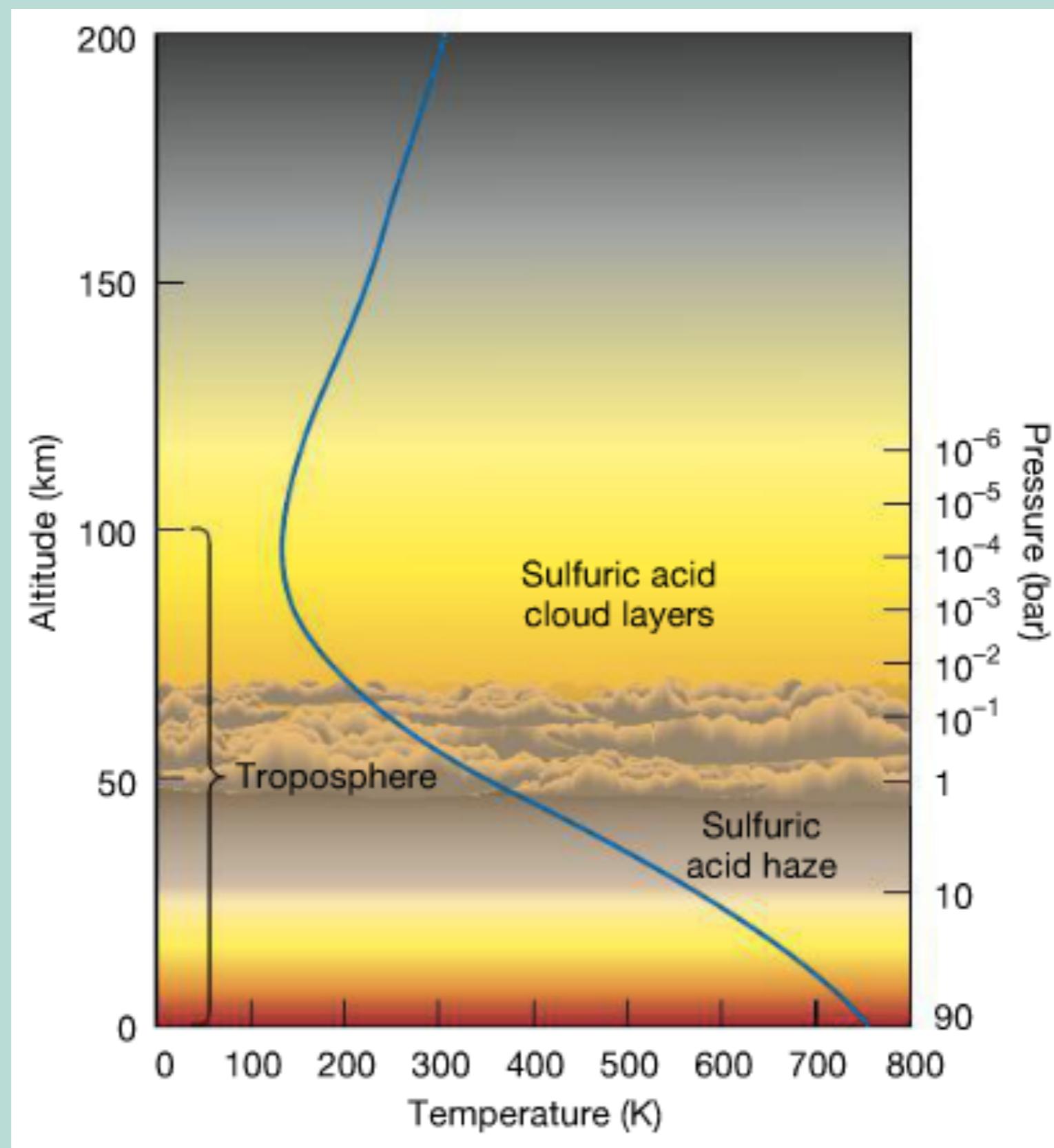
Night ~ 740 K

North Pole ~ 740 K

Melting point of lead:

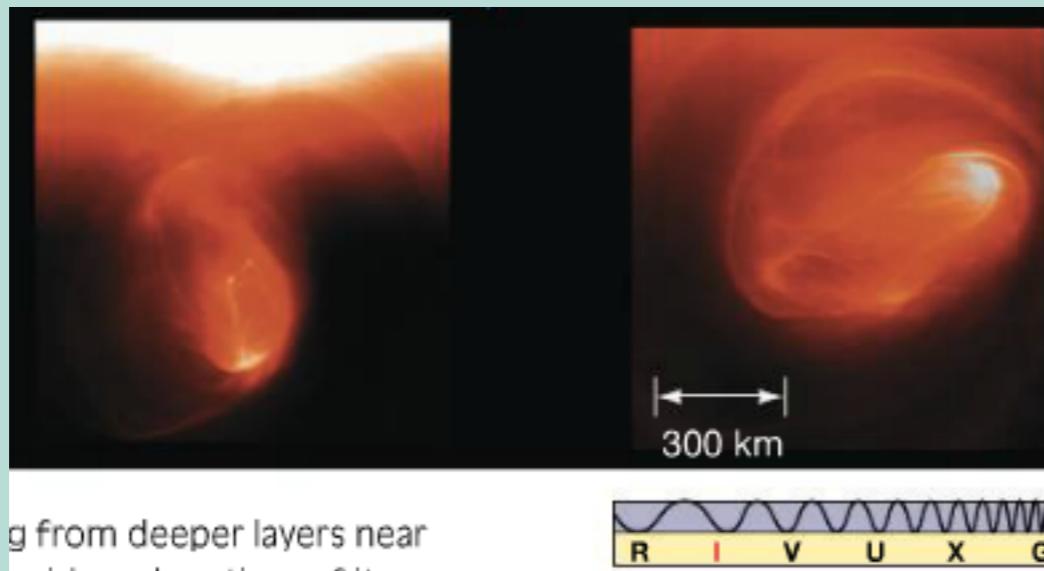
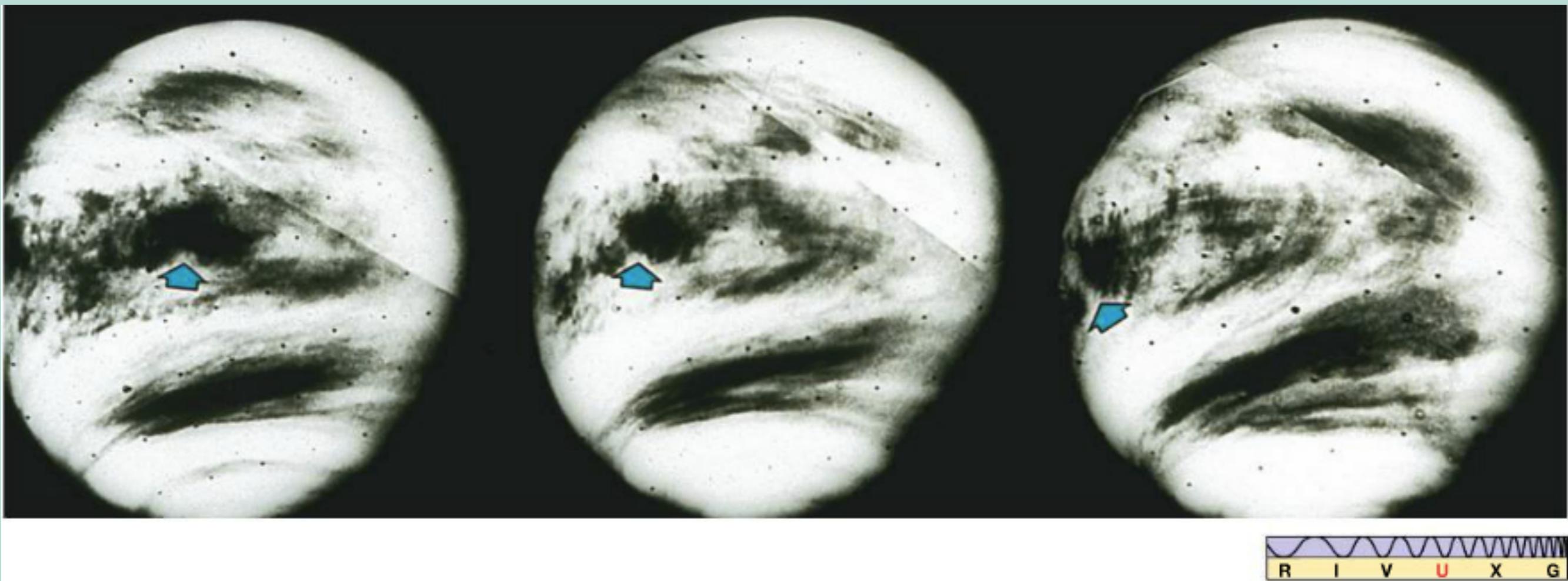
600 K

Venus: Ch 9

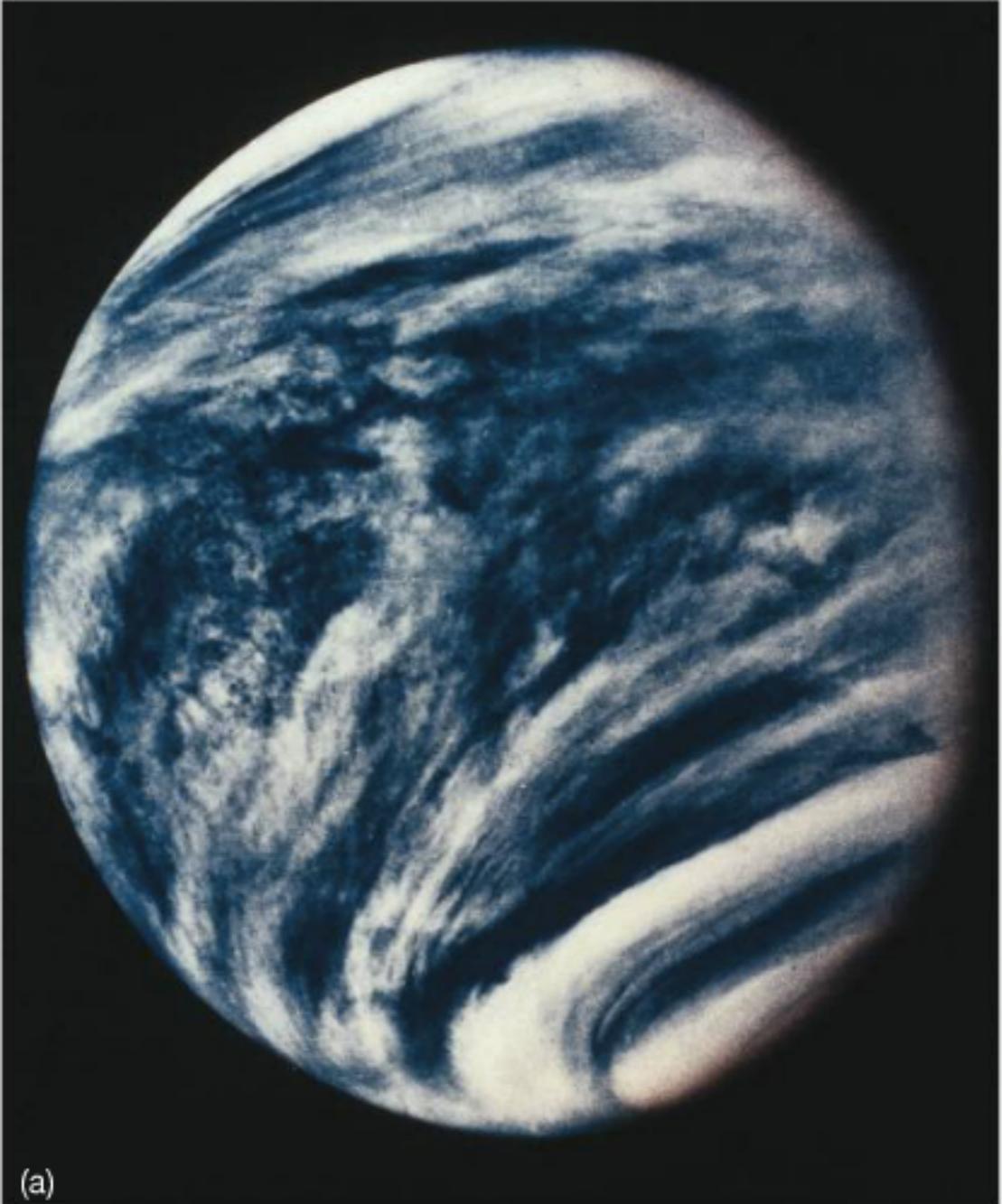


Venus: Ch 9

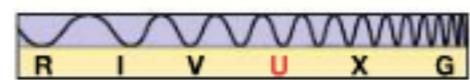
Sulfuric Acid Cloud Movement



Polar Vortex

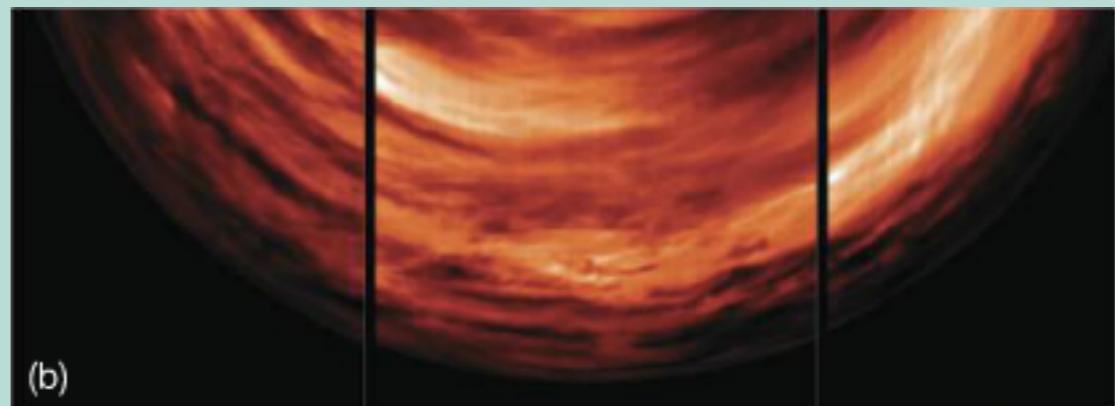


(a)



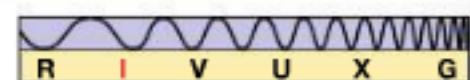
Venus in the UV

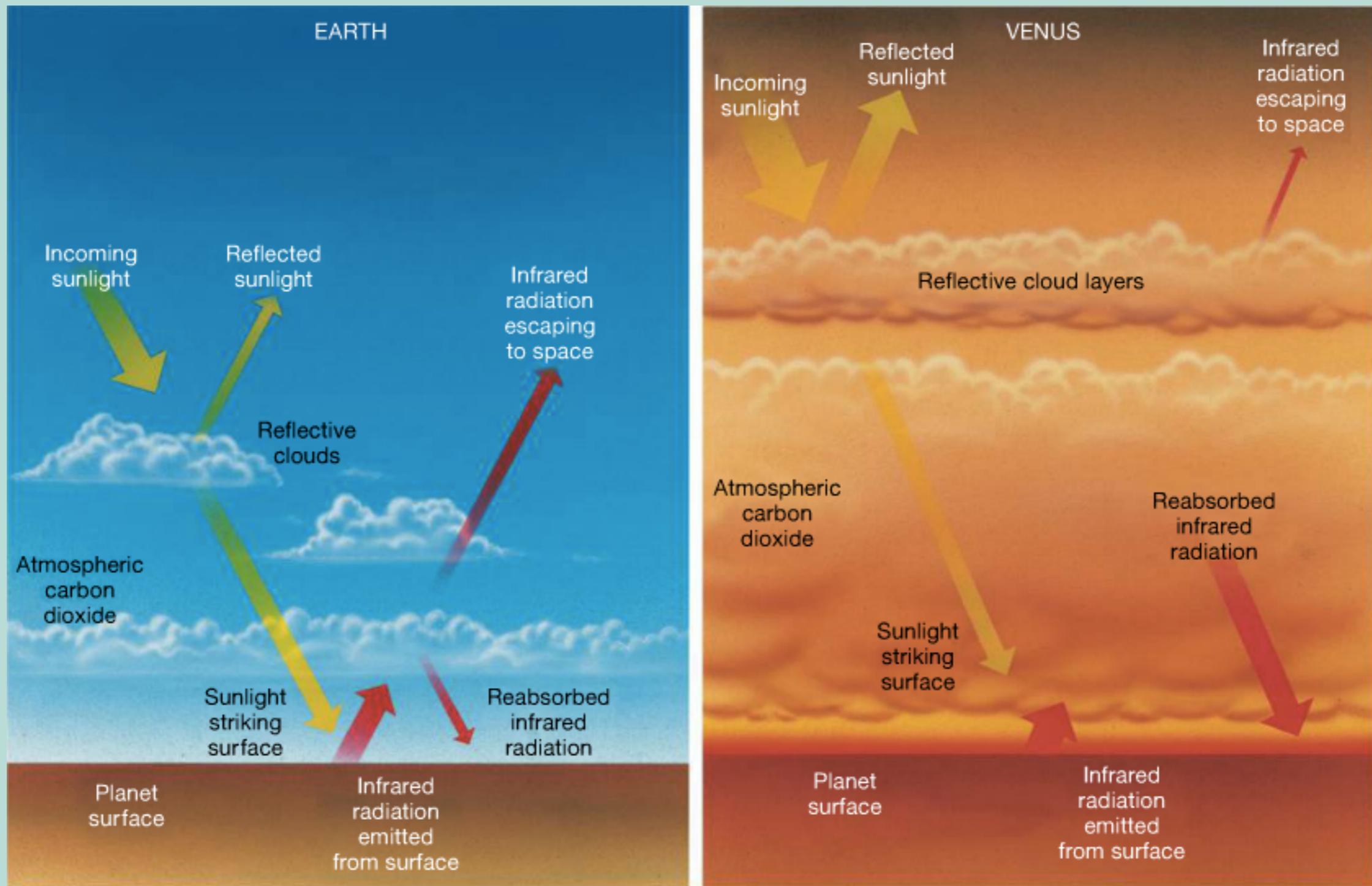
Venus: Ch 9

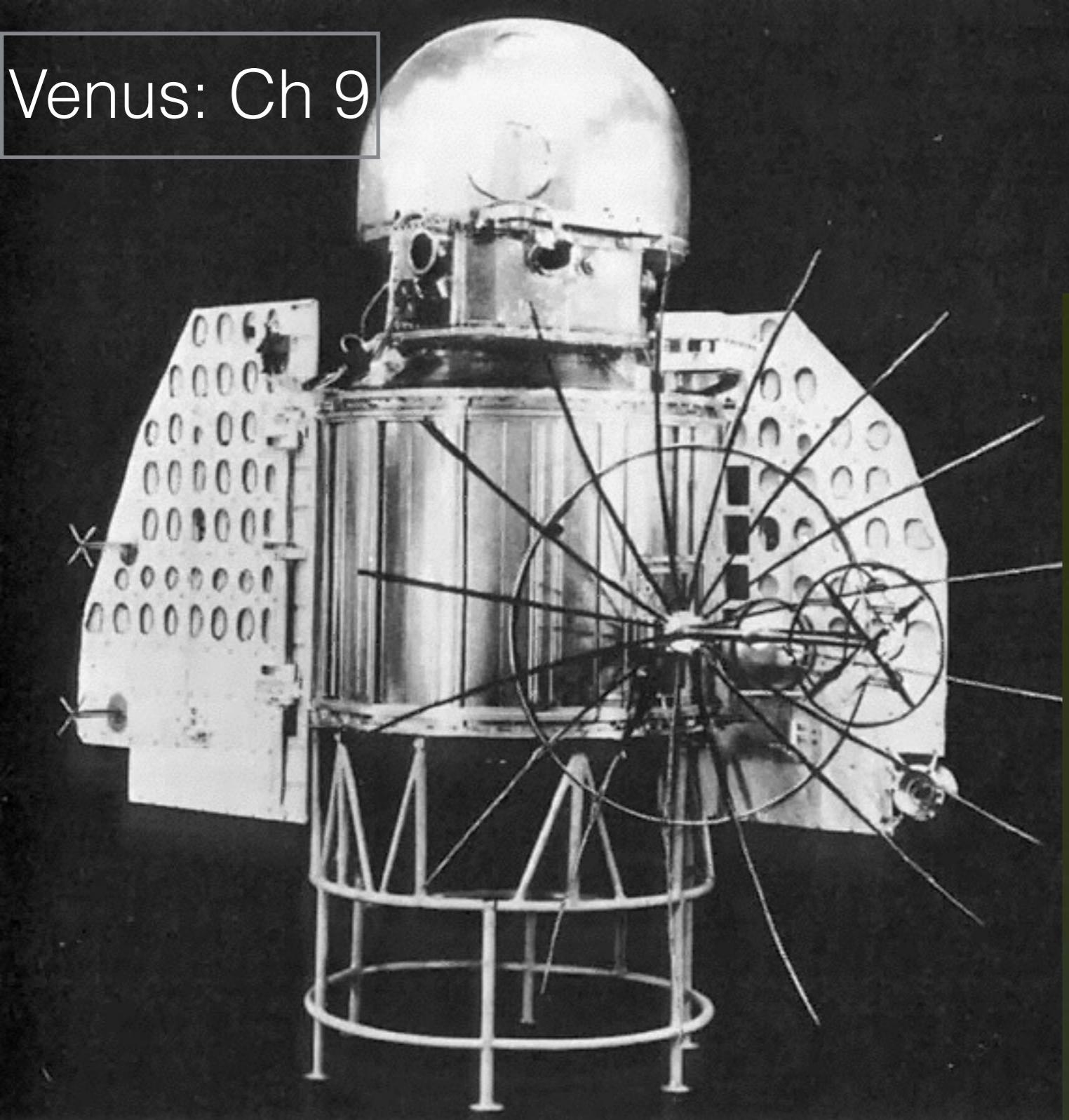


(b)

Venus in the IR







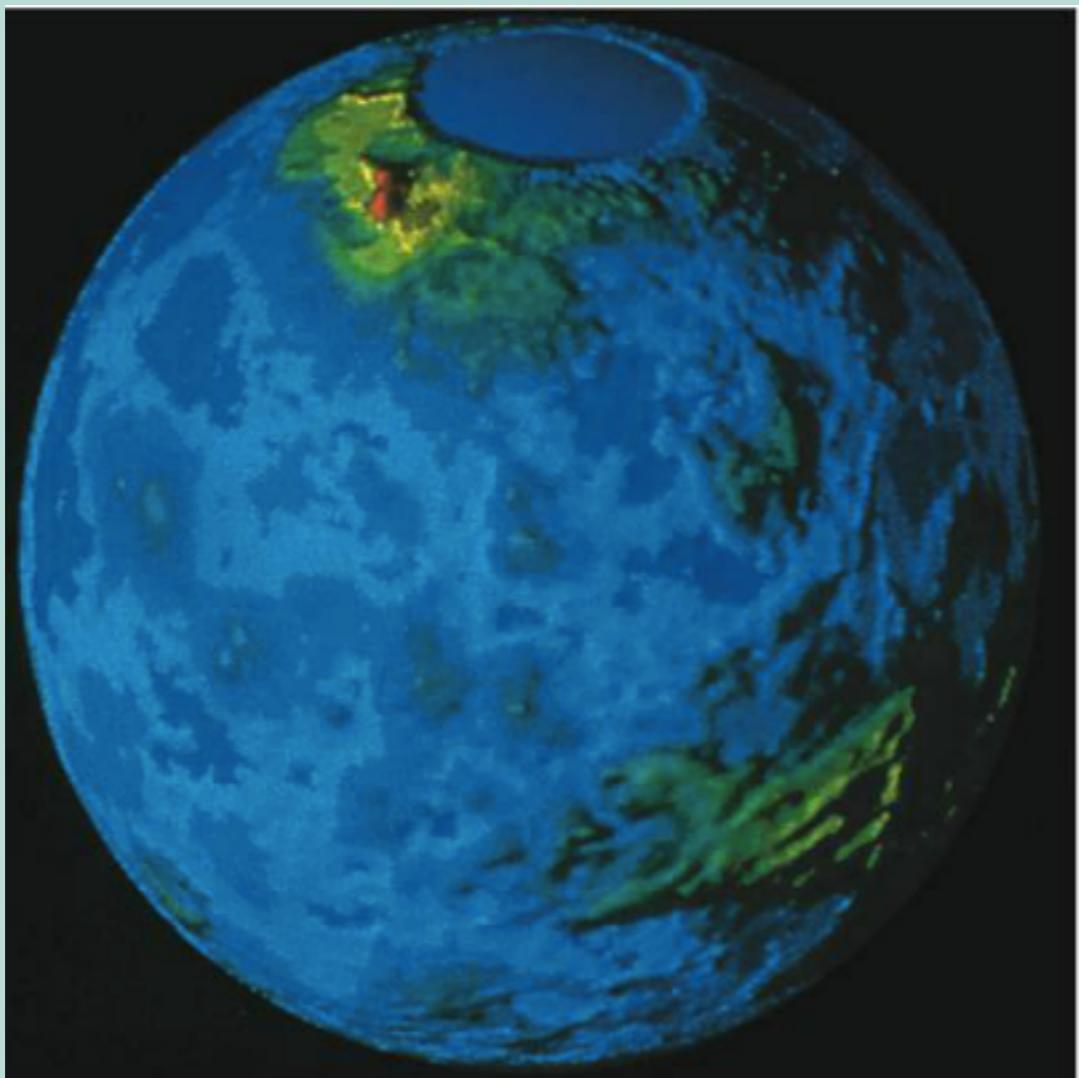
Venera 1



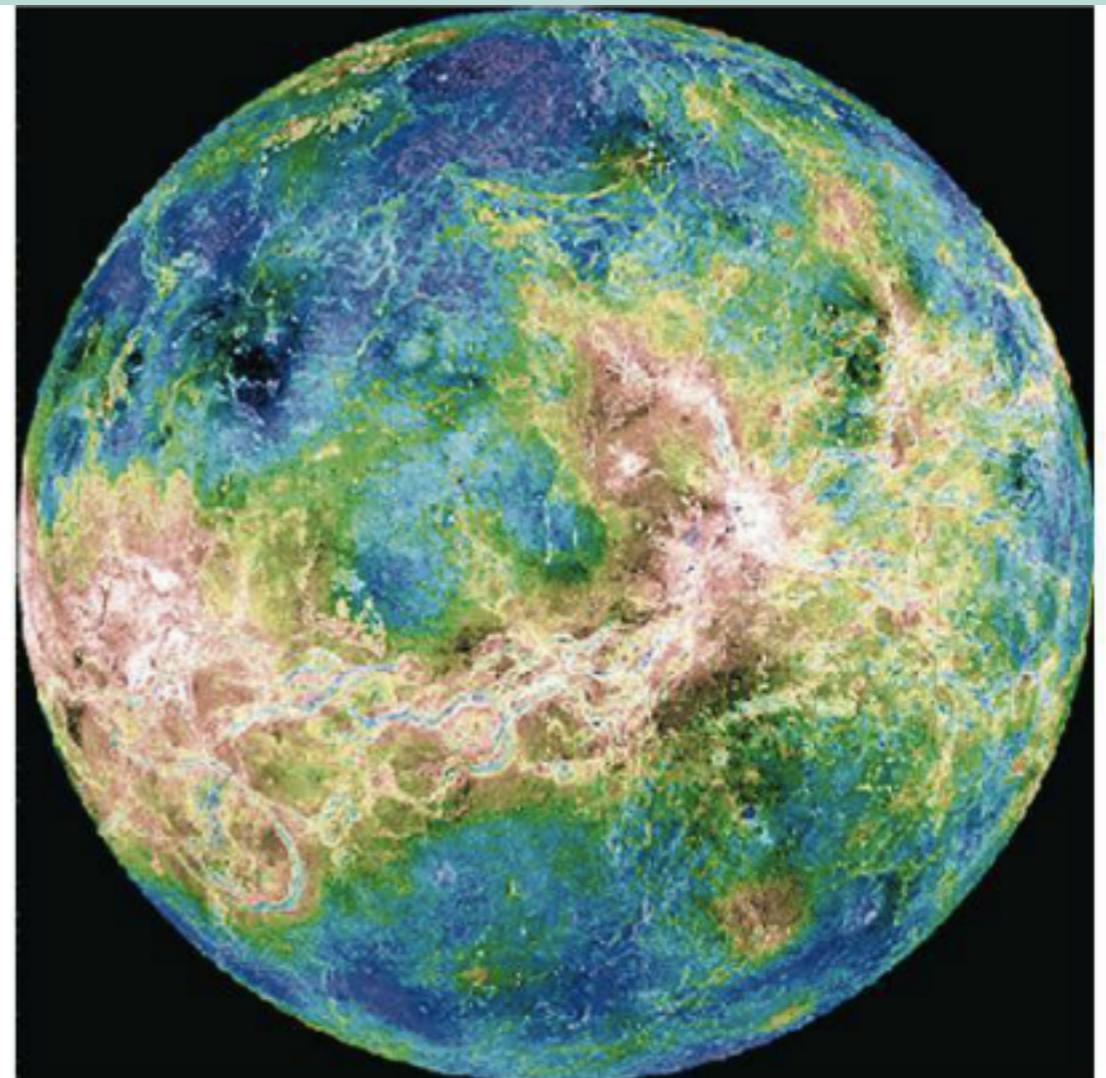
Pioneer 1

Venus: Ch 9

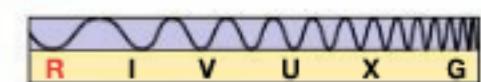
Pioneer Radargraph



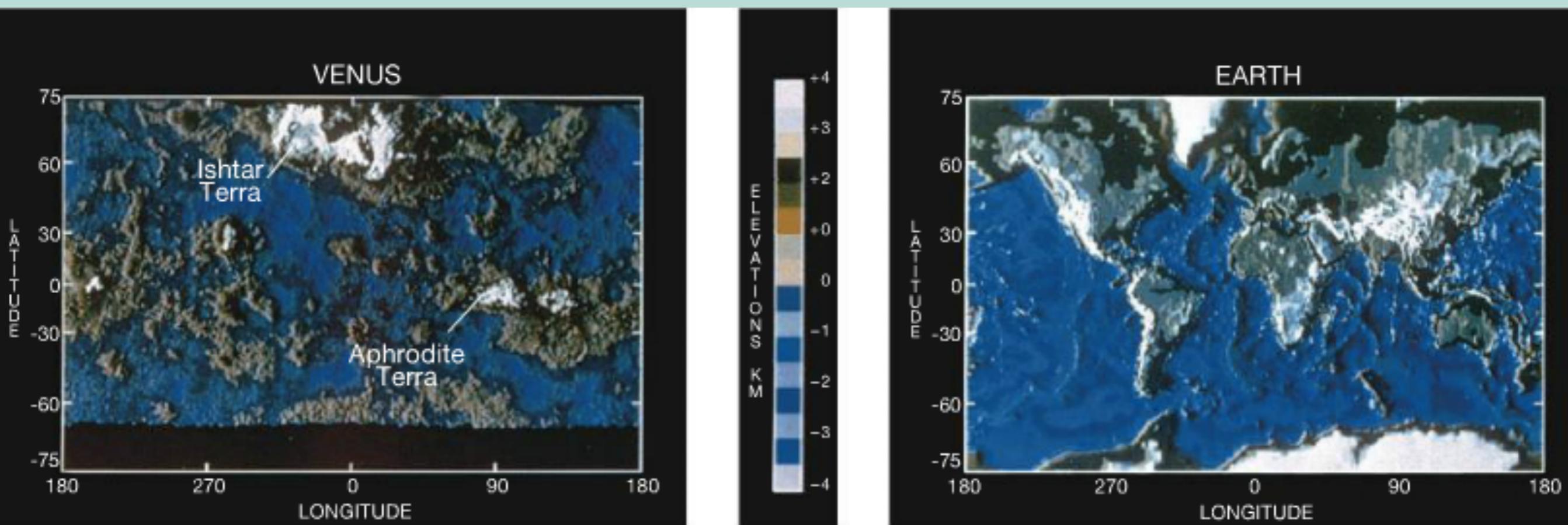
(a)

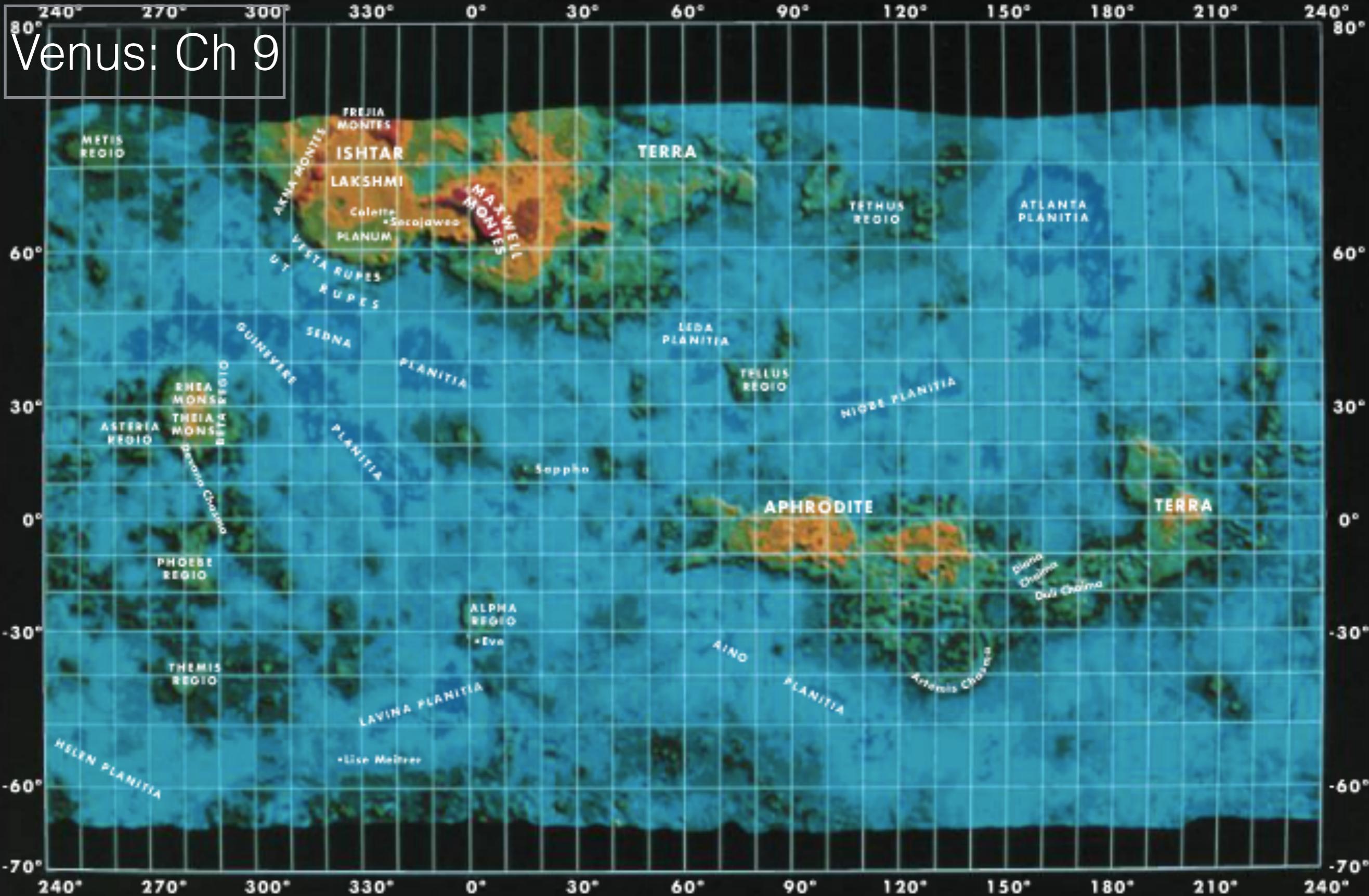


(b)

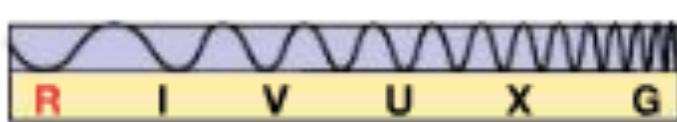


Topographical Comparison





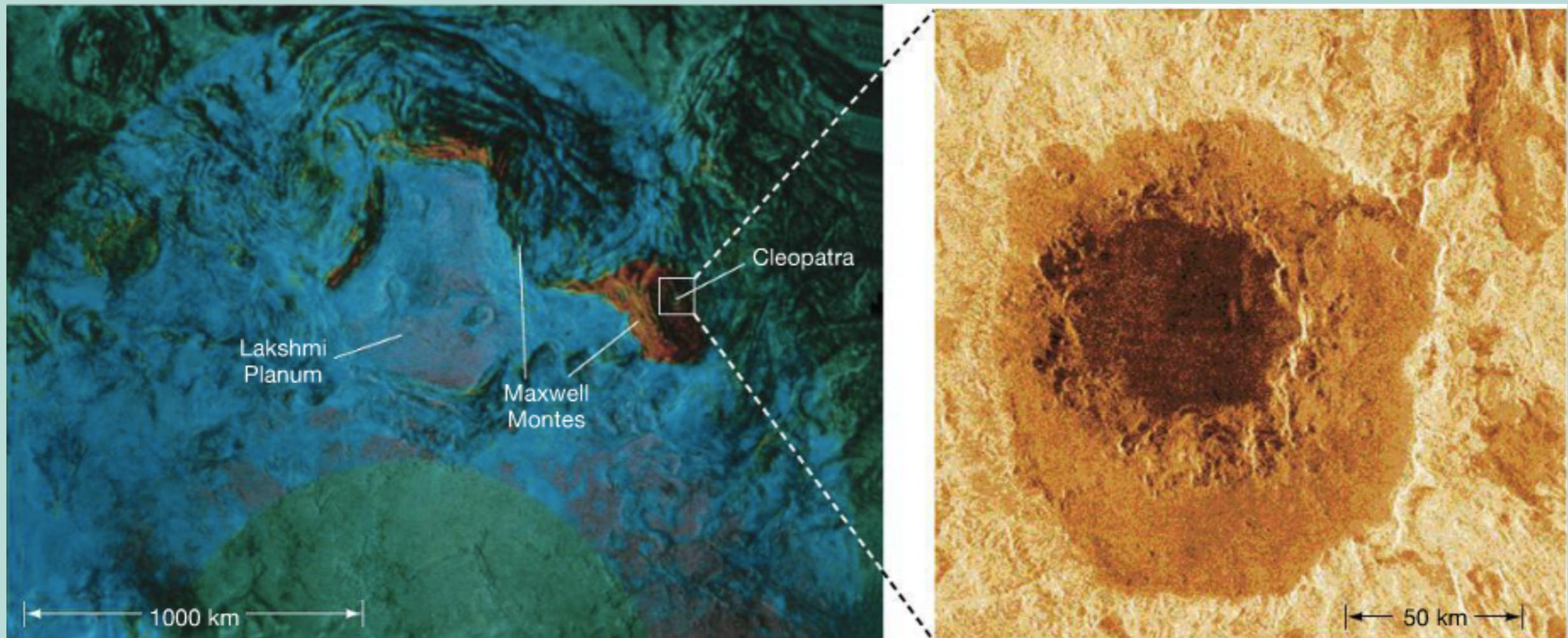
(C)



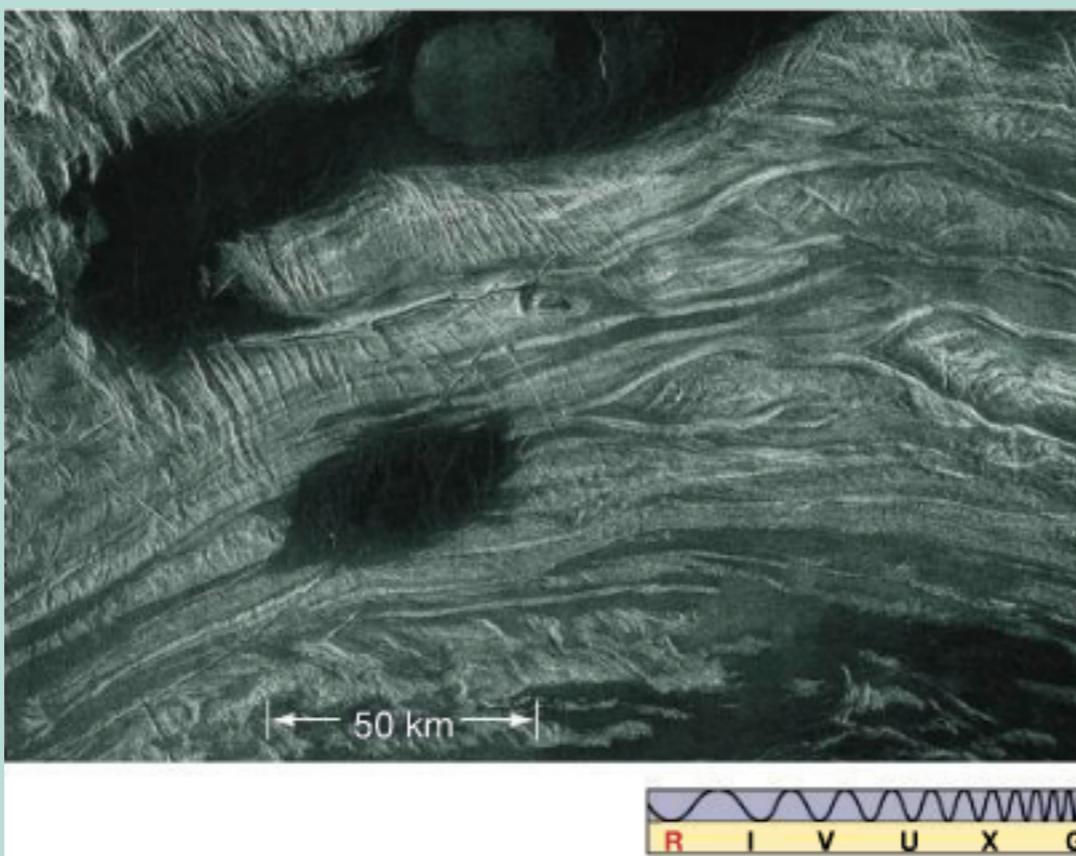


DISCUSSION

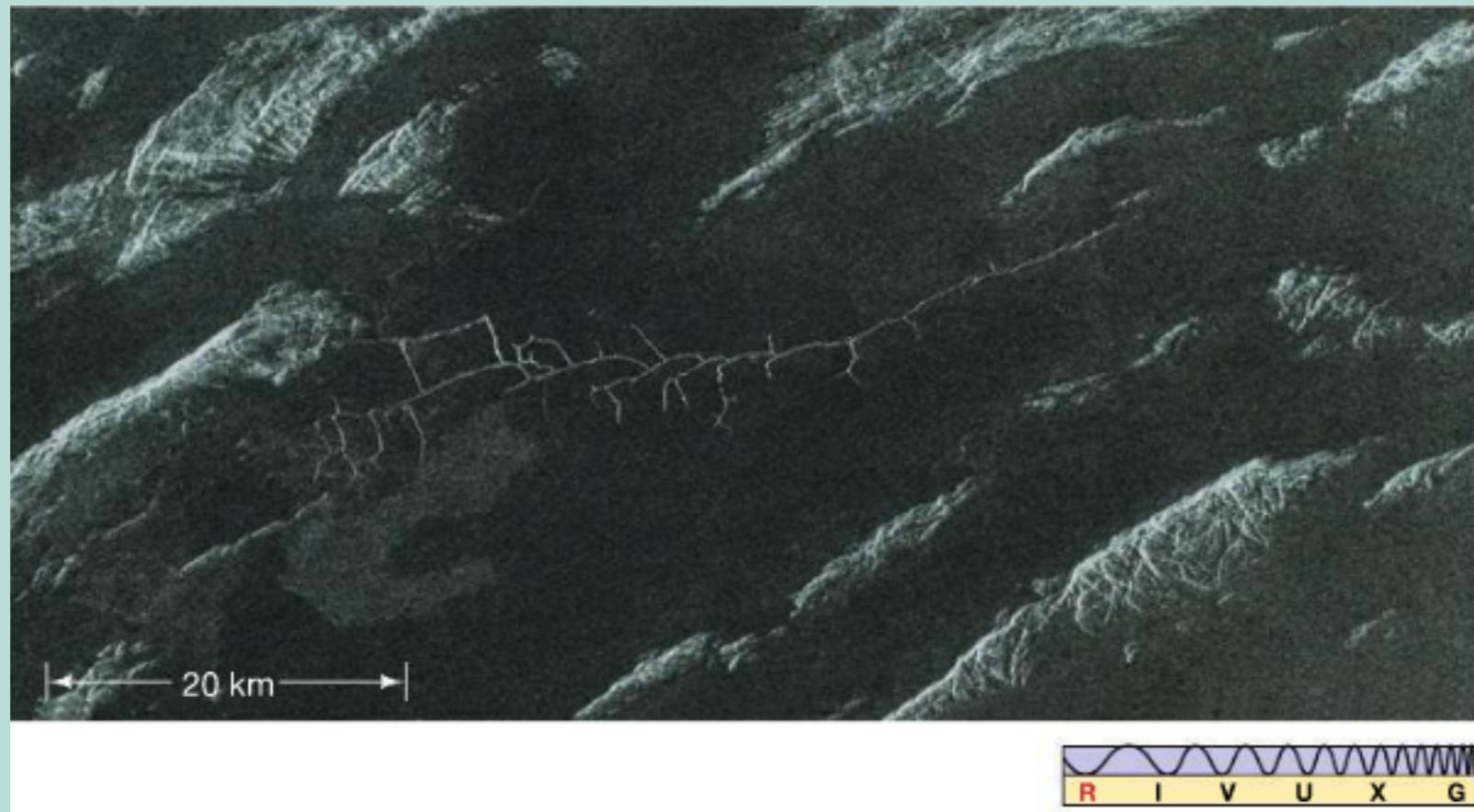
Evidence of Volcanism



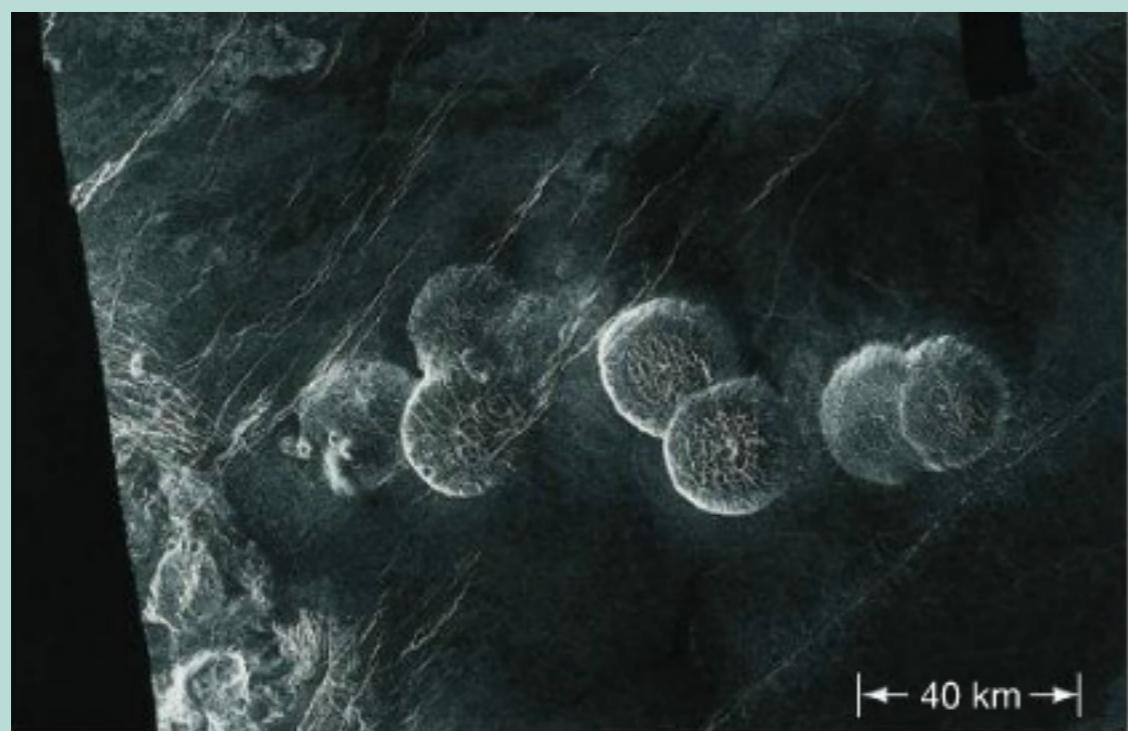
Lava Rivers



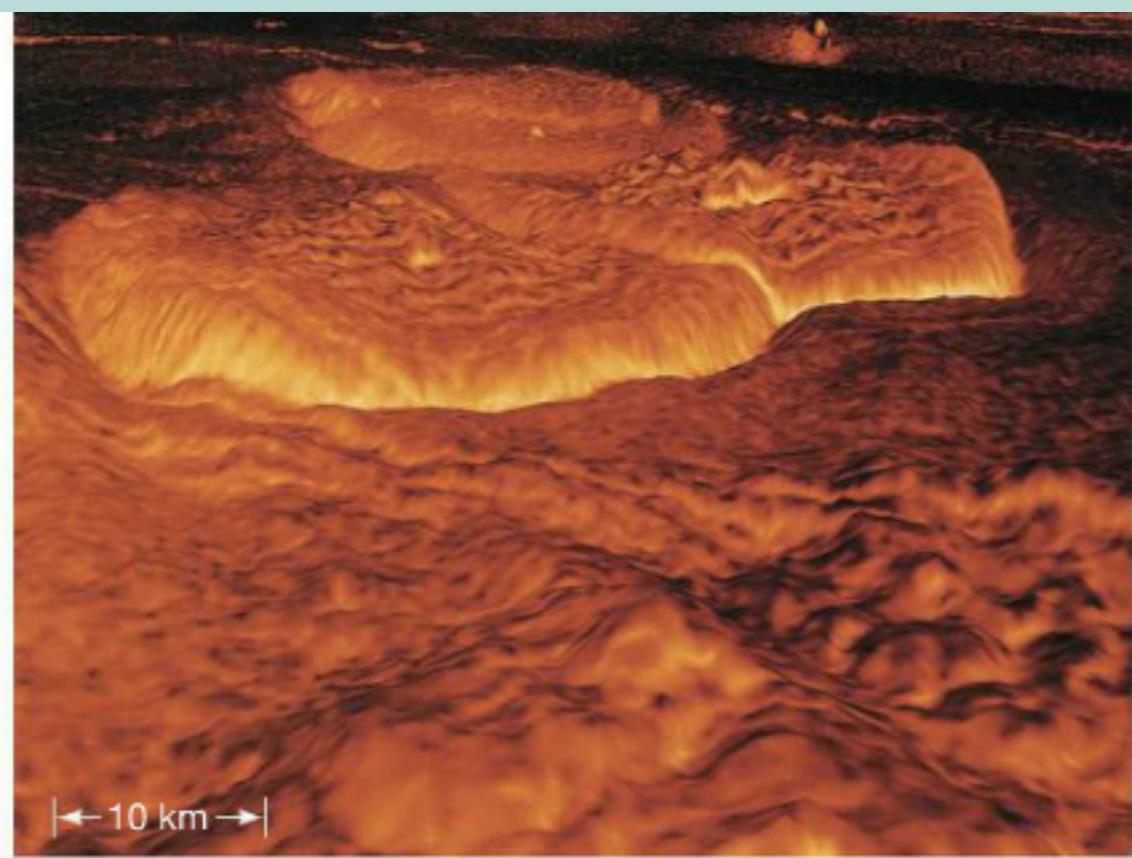
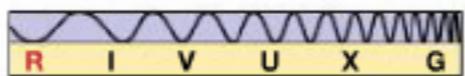
Lava Rivers



Lava Domes and Calderas

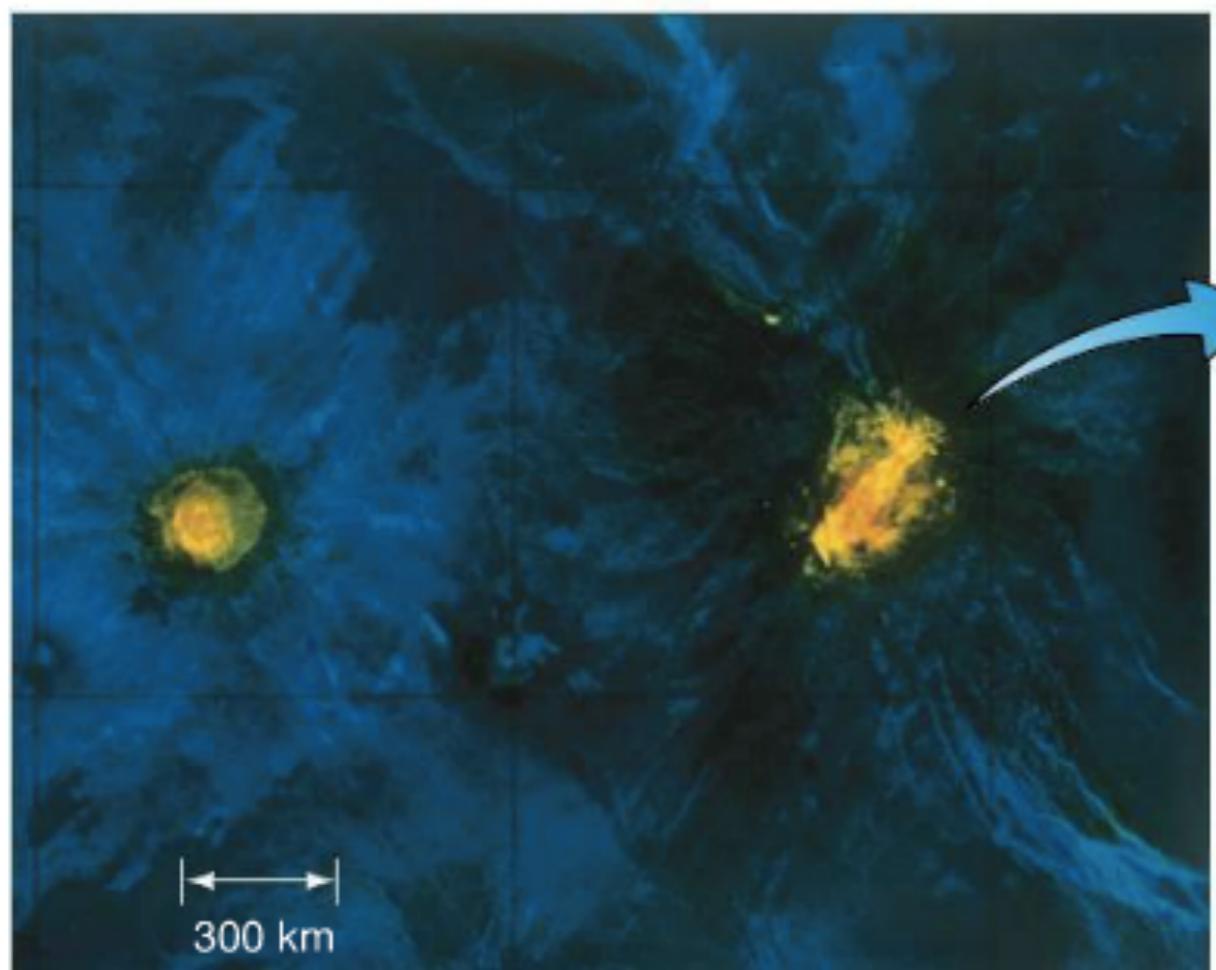


(a)

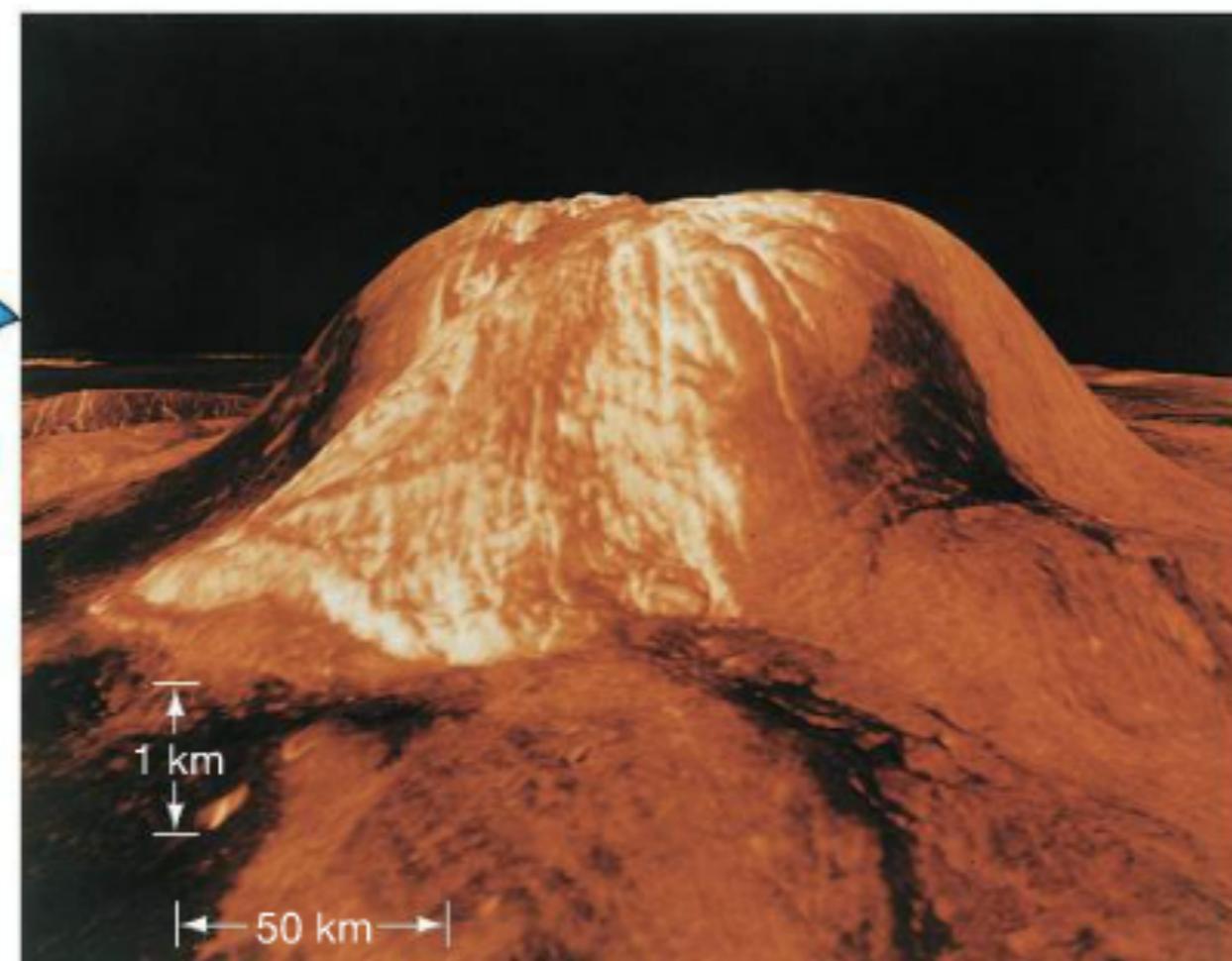


Lava Domes

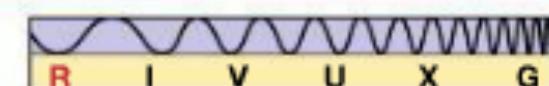
6056
6055
6054
6053
6052
6051
Radius (km)



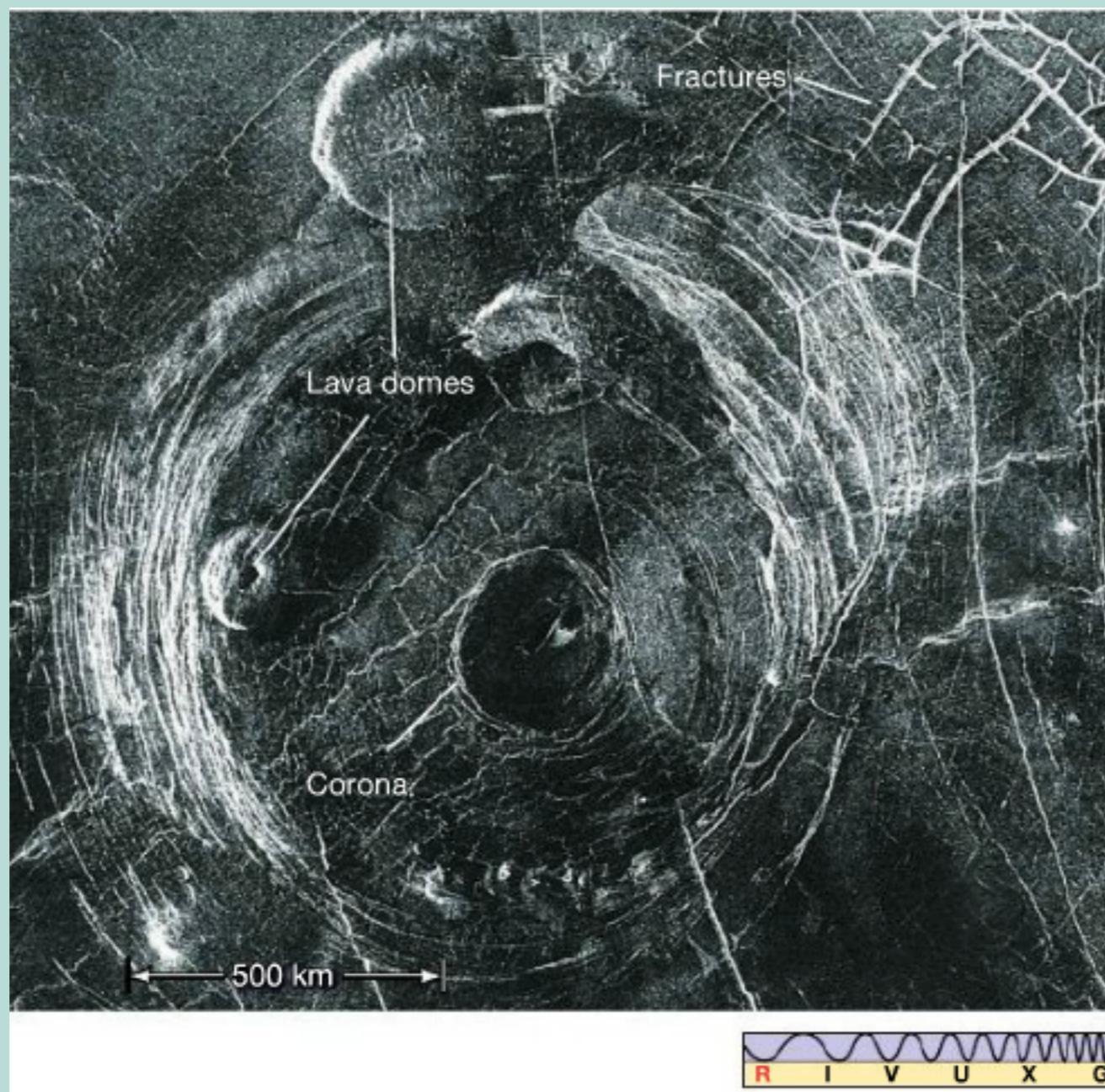
(a)



(b)

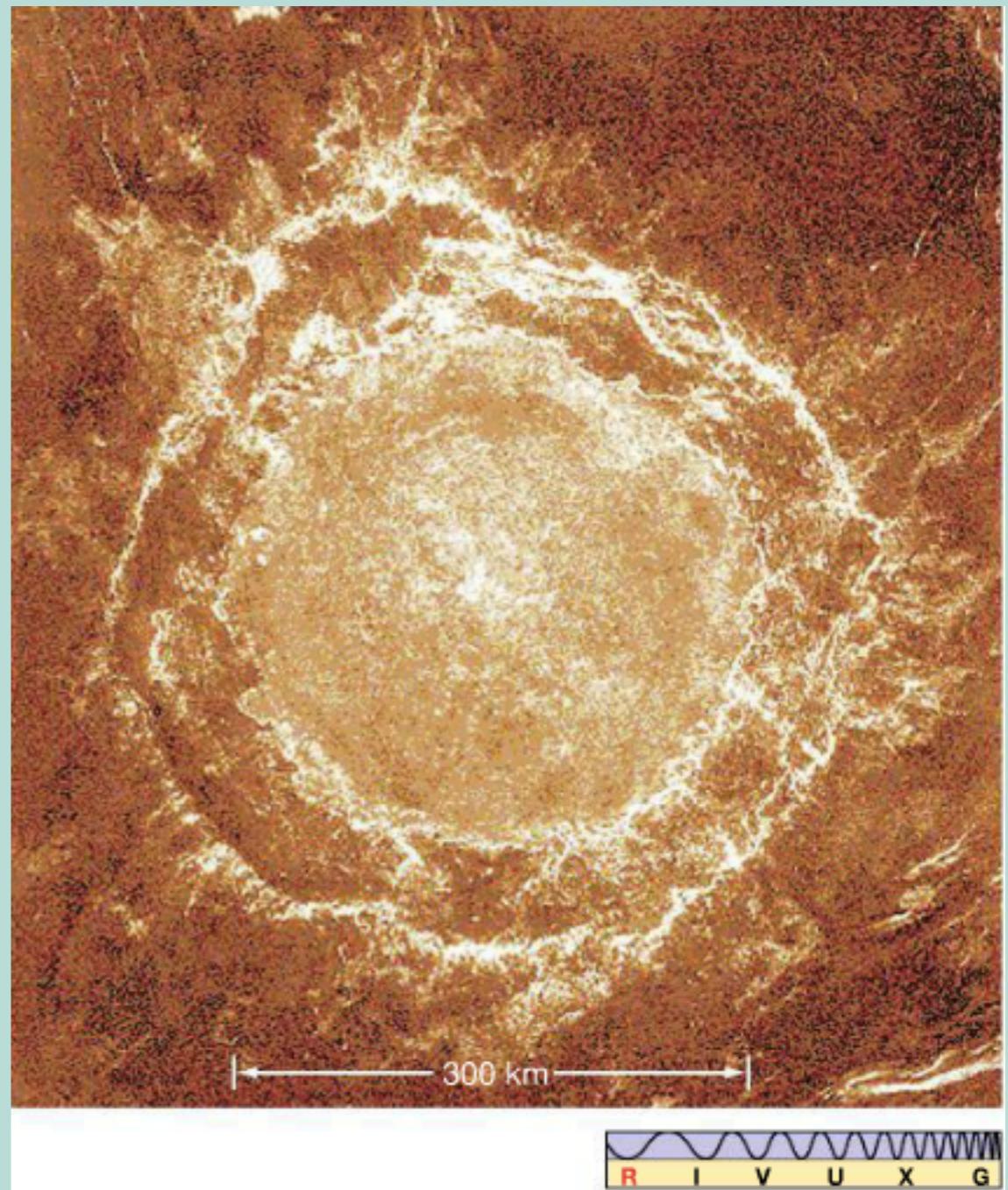
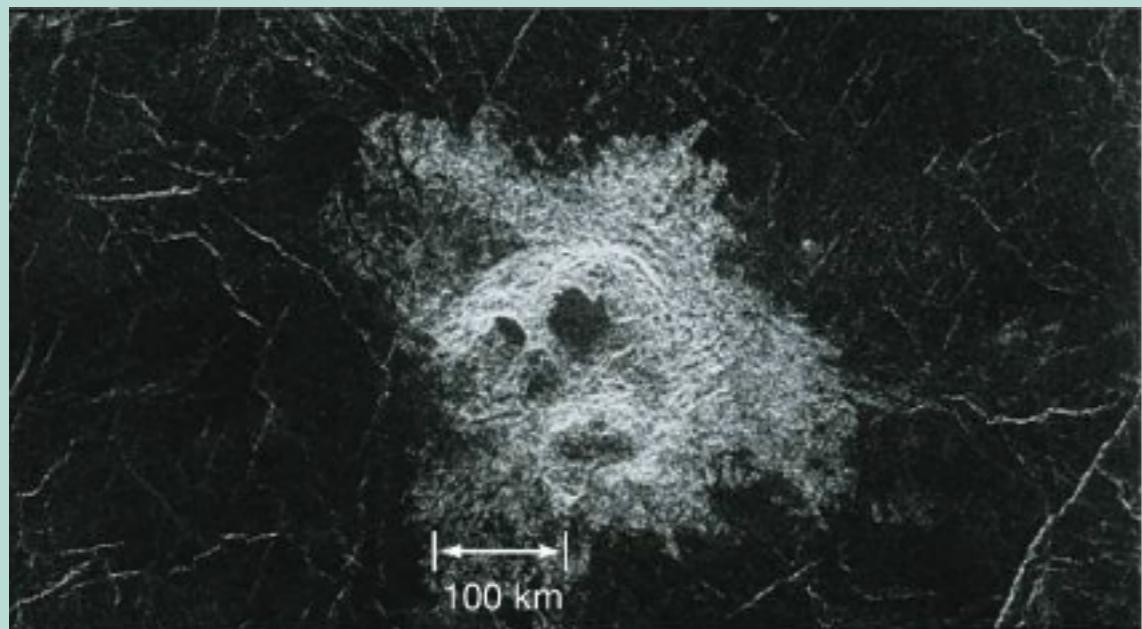


No plate tectonics, but plenty of surface activity



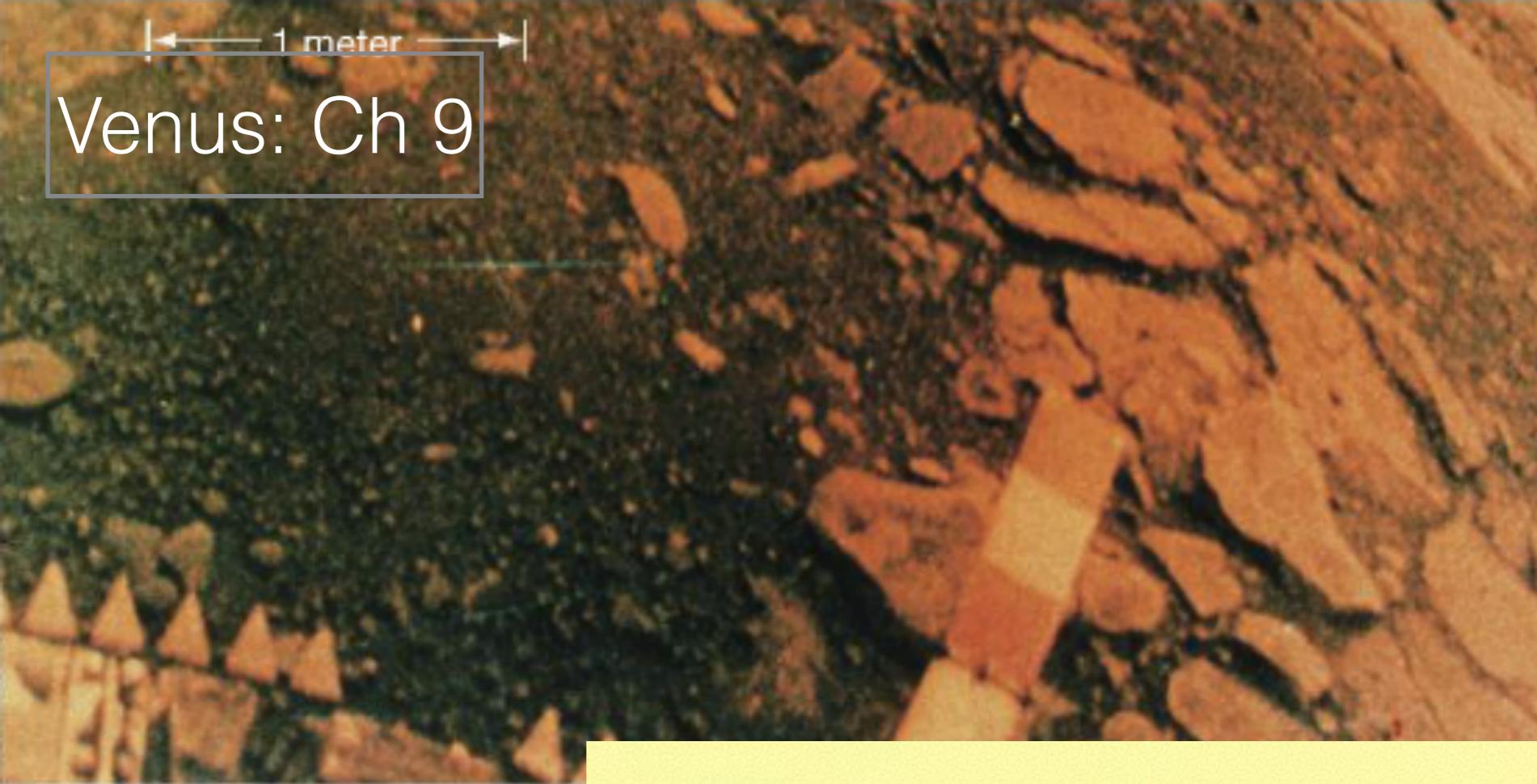
Venus: Ch 9

Impact Craters



1 meter

Venus: Ch 9



(b)



Don P. Mitchell

Why is Venus so different from Earth?

- The earth and venus had similar early atmospheres so how did they diverge?
- Earth: Sunlight splits nitrogen-rich compounds releasing N into the air. Meanwhile water condenses into oceans and CO₂ and SO₂ dissolve into the oceans. Remaining CO₂ combines with surface rocks.
- If this carbon were released, the atmosphere would be 98% CO₂, 2% N and atmospheric pressure would be 70 times larger, much like Venus.

Why is Venus so different from Earth?

- Venus on the other hand was just a little too hot and a runaway greenhouse effect begun, evaporating the oceans putting more GHGs into the atmosphere, further heating in the planet, and making it harder for oceans and rocks to absorb GHGs.
- Eventually water vapor became twice as hot in the atmosphere as it is on earth, floated to the top of the atmosphere and underwent photolysis, losing the hydrogen to atmospheric evaporation and the oxygen to other chemical compounds due to its high electronegativity, losing water on Venus forever.

Result?

Venus: Ch 9

