

The Magellan spacecraft explores the surface of Venus

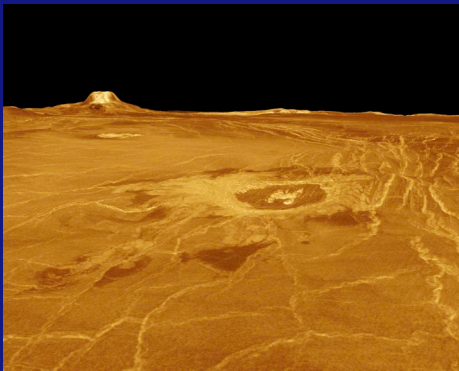


Radar signals (radio waves) transmitted from radars on Earth or the Magellan spacecraft travel unimpeded through the cloud layers of Venus, bounce off the surface, and come back to us. They can map the terrain. What do they see?

Radar signals can be used to measure the height of features on the surface of Venus, and the *radar reflectivity*. The radar reflectivity may be hard to interpret; it does not necessarily correlate with color, brightness or darkness, etc.

The Magellan spacecraft orbited Venus and carried out a radar mapping during the period 1990-1994. It is still the best overall view we have of the surface of "Earth's Twin"

What the surface of Venus looks like

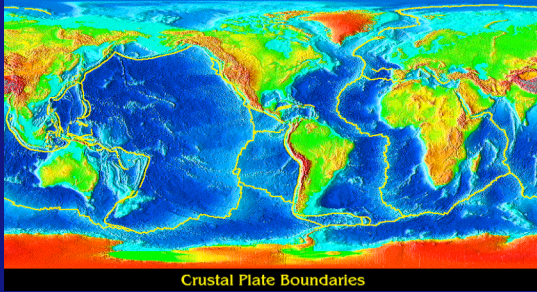


Let's begin with the Earth. What would it look like if your drained away the oceans?

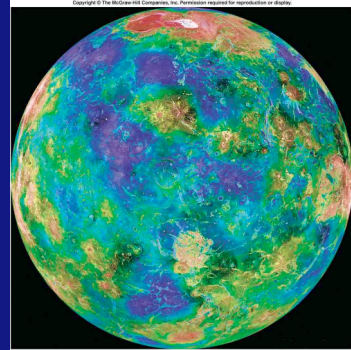
- High, thick parts of the Earth's crust are the continental parts of the tectonic plates
- Lower, thinner parts of the crust are the ocean bottoms
- A striking feature would be the plate boundaries, where the plates are coming together or pulling apart

➡ A picture is worth a thousand words

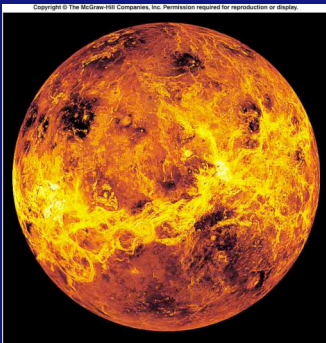
The surface of the Earth (with no water)



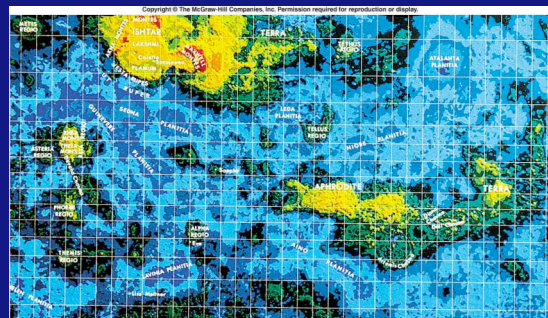
And now, a similar view of Venus, thanks to the Magellan orbiter



Radar reflectivity: the terrain of Venus



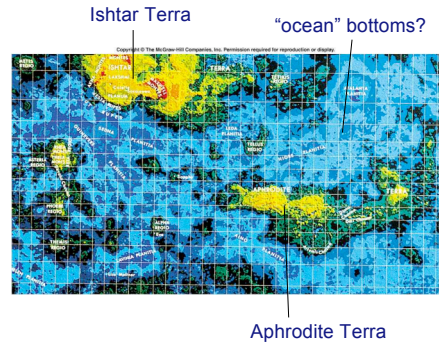
Another way to look at things: a topographical map of Venus



What have we learned from our exploration of the surface of Venus?

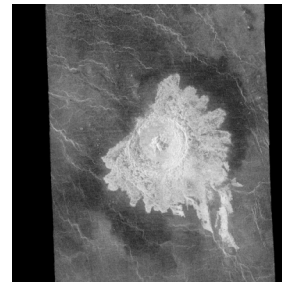
- Some similarities: low flat areas that resemble ocean floors on Earth
- Two higher areas of thicker crust that resemble the continental portions of the crust on Earth. These are called Ishtar and Aphrodite, and are about the size of Australia
- Strangely, no sign of tectonic plate boundaries (absence of continental drift on Venus?)

The Continents of Venus



What about craters? We have learned from the the Moon, the Earth, and Mercury that the presence (or absence) of craters is an important clue to the geological history of a planet.

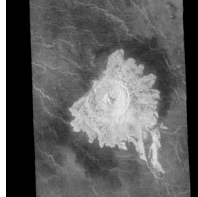
Craters are present on Venus (all discovered by Magellan radar)



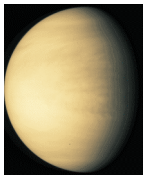
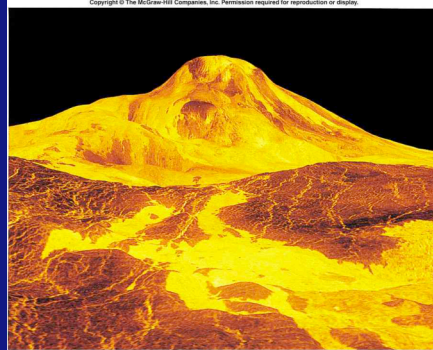
But *relatively* few in number. Consistent with an “exposure time” of about 500 million years rather than 3-4 billion years

500 million year old "surface exposure" of Venus may point to an enormous, planet-wide eruption of lava at that time. Quote from book: "to erase all preexisting impact craters, even large ones, the surface of Venus must have been covered with lava to a depth of several kilometers"

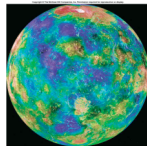
An event which *may* be similar is the lava eruptions which occurred at the end of the Permian Age on Earth (250 Myr ago). The end of the Permian was the largest mass extinction event in Earth's history



A hint of the volcanism of Venus: The shield volcanoes of Venus



Remaining questions about Venus



- Why is the surface temperature so high?
- Did Venus ever have oceans like the Earth?
- If it did have them, where did they go?
- **These questions may be related...tune in next time**