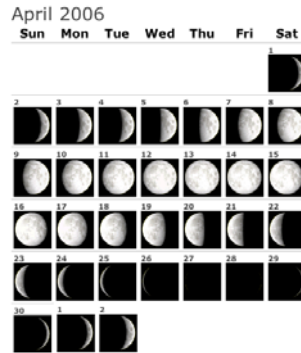


Class 13: Venus Overview

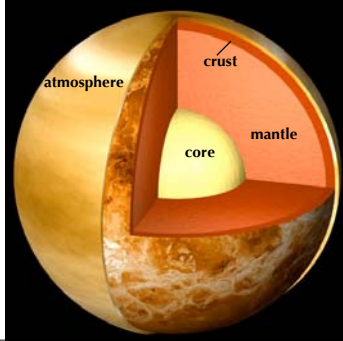
• Homework #3 due Friday

• Midterm Question #50



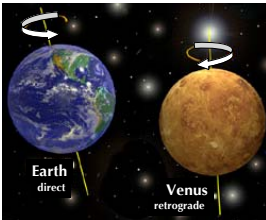
Composition & Atmosphere

- **Atmosphere**
 - 80km thick; 68km clouds
 - 97% CO₂ + sulfuric acid
- **Crust**
 - 20-60 km thick
 - density ~ Earth
- **Mantle**
 - size ~ Earth
 - density ~ Earth
- **Core**
 - size ~ Earth
 - density ~ Earth
 - (partially) liquid?

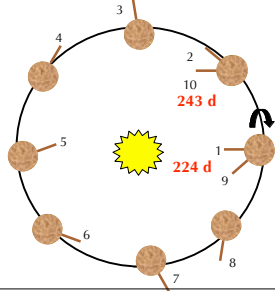


Rotation & Orbit

- **Retrograde Rotation**
(reverse of orbit direction)



- **Rotation: 243 days**
- **Revolution: 224 days**



Exploration of Venus



- | | | | |
|-------------------------|---|---------------------|------|
| • Venera | 16 missions
<i>(9 landers, 3 probes, 4 orbiters)</i> | 1961-1983 | USSR |
| • Mariner 2,5,10 | Flyby | 1962, 1967, 1973-75 | US |
| • Pioneer Venus | Orbiter/Probes | 1978-1992 | US |
| • Vega 1, 2 | Venus flyby | 1985 | USSR |
| • Magellan | Mapping Mission | 1989-1994 | US |
| • Galileo | Flyby | 1990 | US |



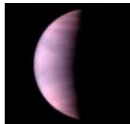
Mariner 10



Pioneer Venus



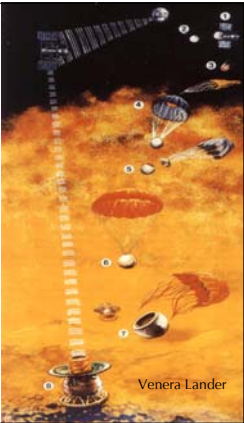

Galileo



Hubble

Venera Landers

- Venera 4 failed (<25 km)
- Venera 7 $T_s = 720\text{ K}$
 $P_s = 90\text{ atm}$
- Venera 9, 10 1 Photograph
- Venera 13, 14 Photographs
- Venera 13,14,18 Ur, Tr, K
- Venera 14, 18 drilled samples & X-ray analyses

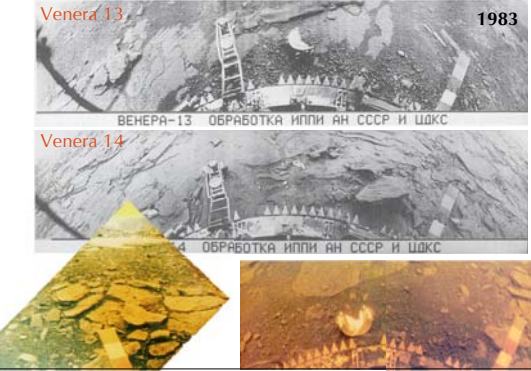



surface composition
↓
basaltic

Venera: View of the Surface

Venera 13 1983
ВЕНЕРА-13 ОБРАБОТКА ИЛПИ АН СССР И ЦДКС

Venera 14
4 ОБРАБОТКА ИЛПИ АН СССР И ЦДКС



Magellan Mission

(1989 - 1994)

global mapping

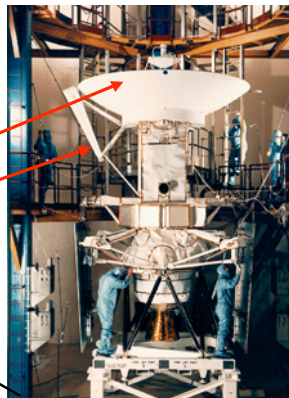
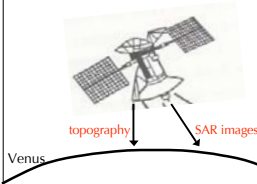


Magellan Mapping of Venus



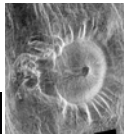
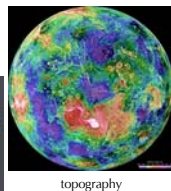
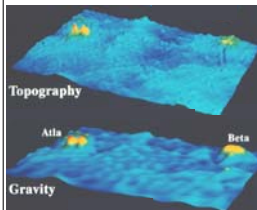
Magellan Spacecraft

- 1st spacecraft launched from Space Shuttle
- 2 antennae
 - imaging antenna: points to side
 - altimeter: points downwards



Magellan Mapping of Venus

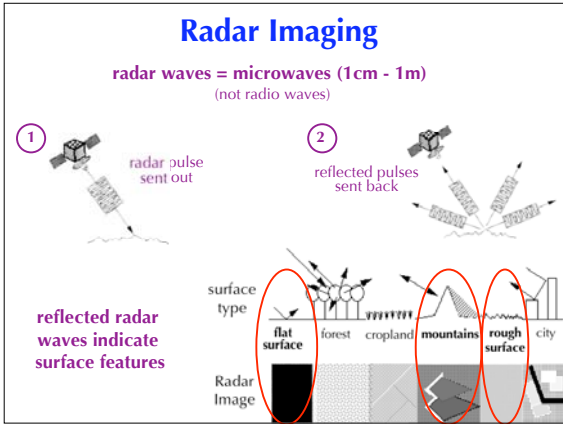
- Synthetic Aperture Radar (SAR) - reflectivity
- Altimetry - topography
- Gravity

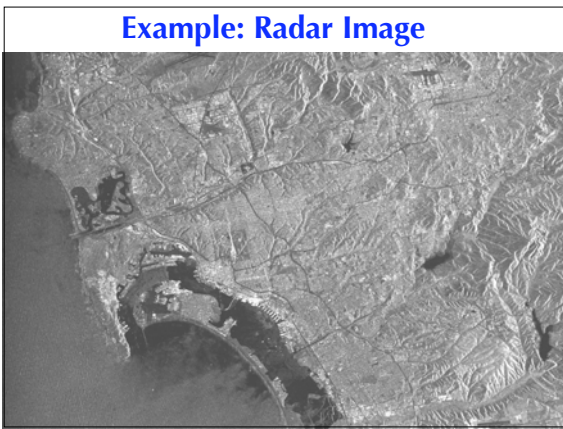


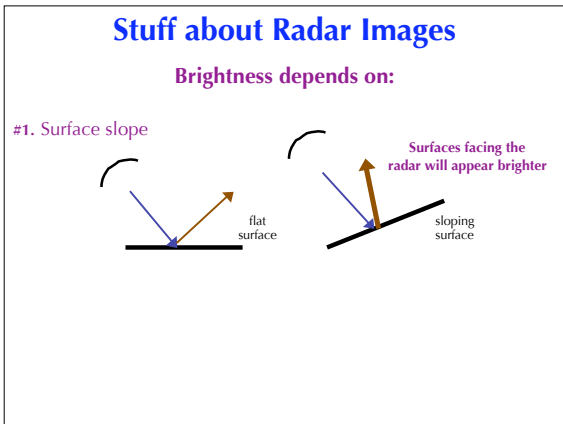
gravity

topography

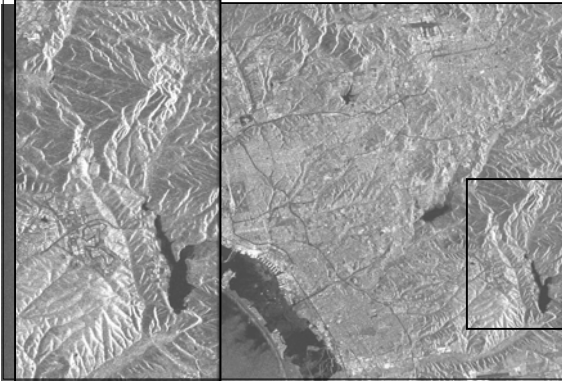
SAR image



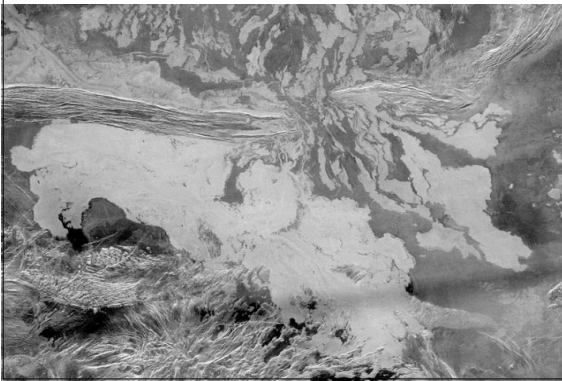




Example: Radar Image

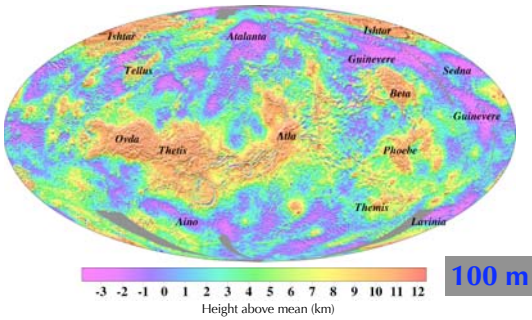


Example: Radar Image



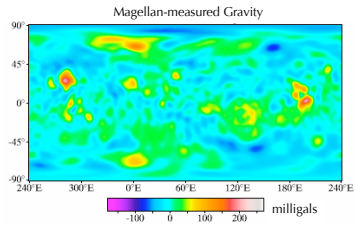
Resolution & Topography

What is the smallest size feature we can see in our data set?



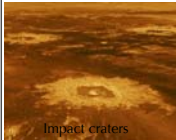
Magellan Gravity Data

- When spacecraft flies over a mountain there are **TINY** changes (perturbations) in its orbit
- Orbit changes measure planet's gravity field

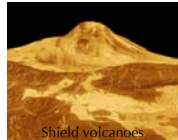


Venus: Important Processes

- Cratering
- Volcanism
- Tectonism
- Links between climate, volcanism, and tectonism



Impact craters



Shield volcanoes



Pancake domes
