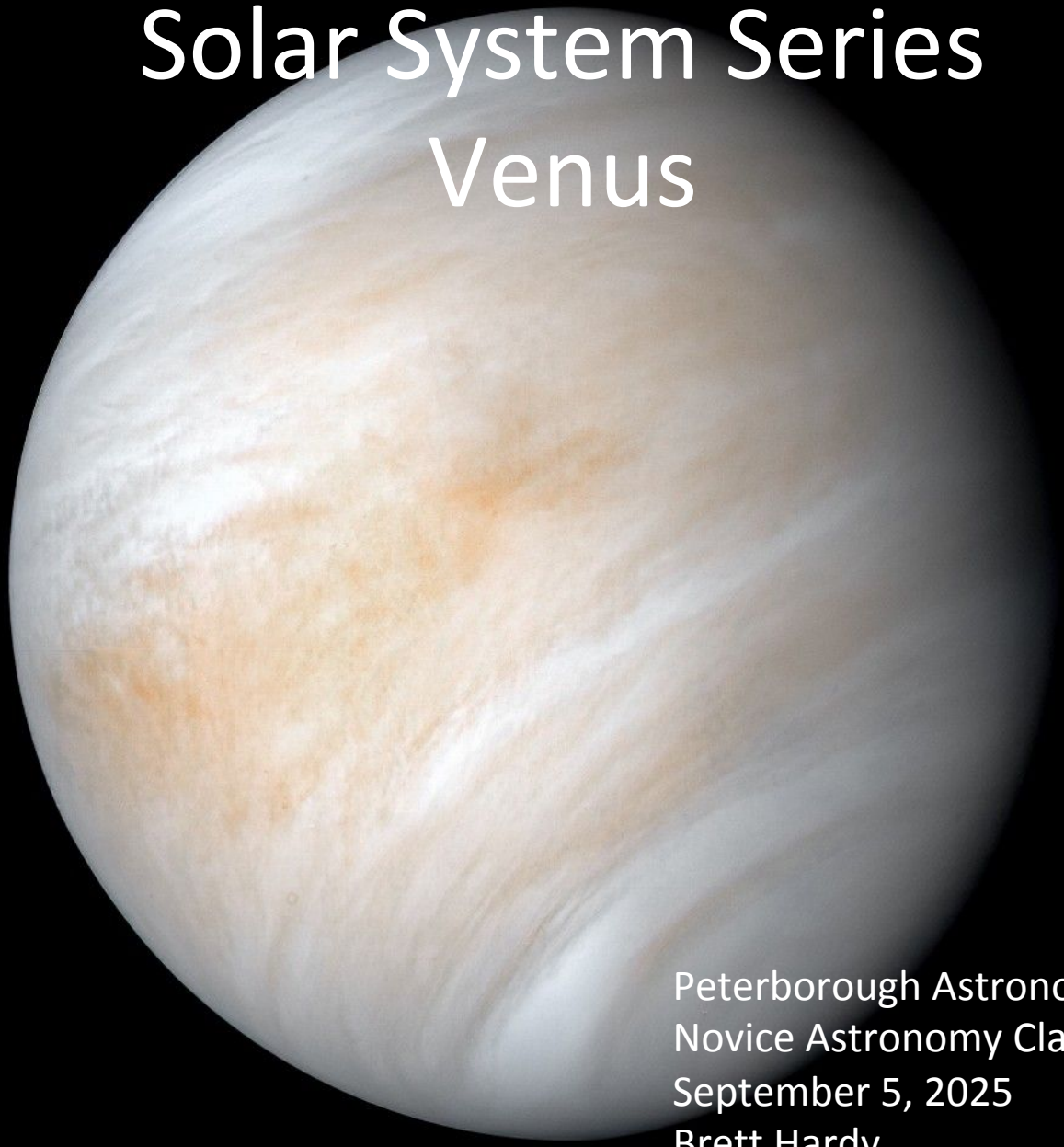
Solar System Series
Venus



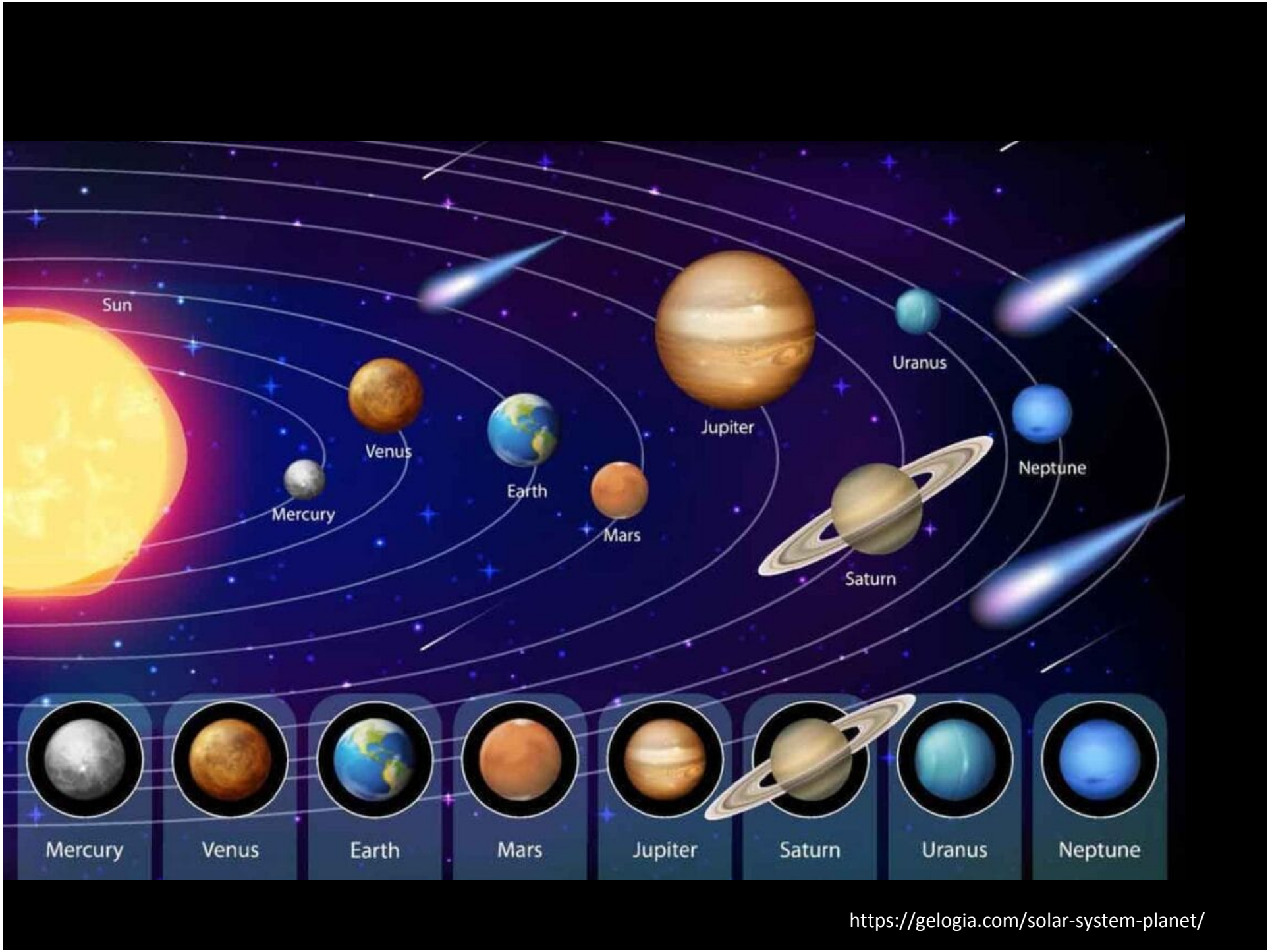
NASA/JPL-Caltech

Peterborough Astronomical Association
Novice Astronomy Class
September 5, 2025
Brett Hardy

History

- Known since antiquity
- Brightest planet in our sky at magnitude − 4.6
- Brighter than any star
- Named after the Roman god of love
- Often misinterpreted as a UAP (Unidentified Aerial Phenomenon)

Shree Palanpuwala



https://gelogia.com/solar-system-planet/

A Planet by the Numbers

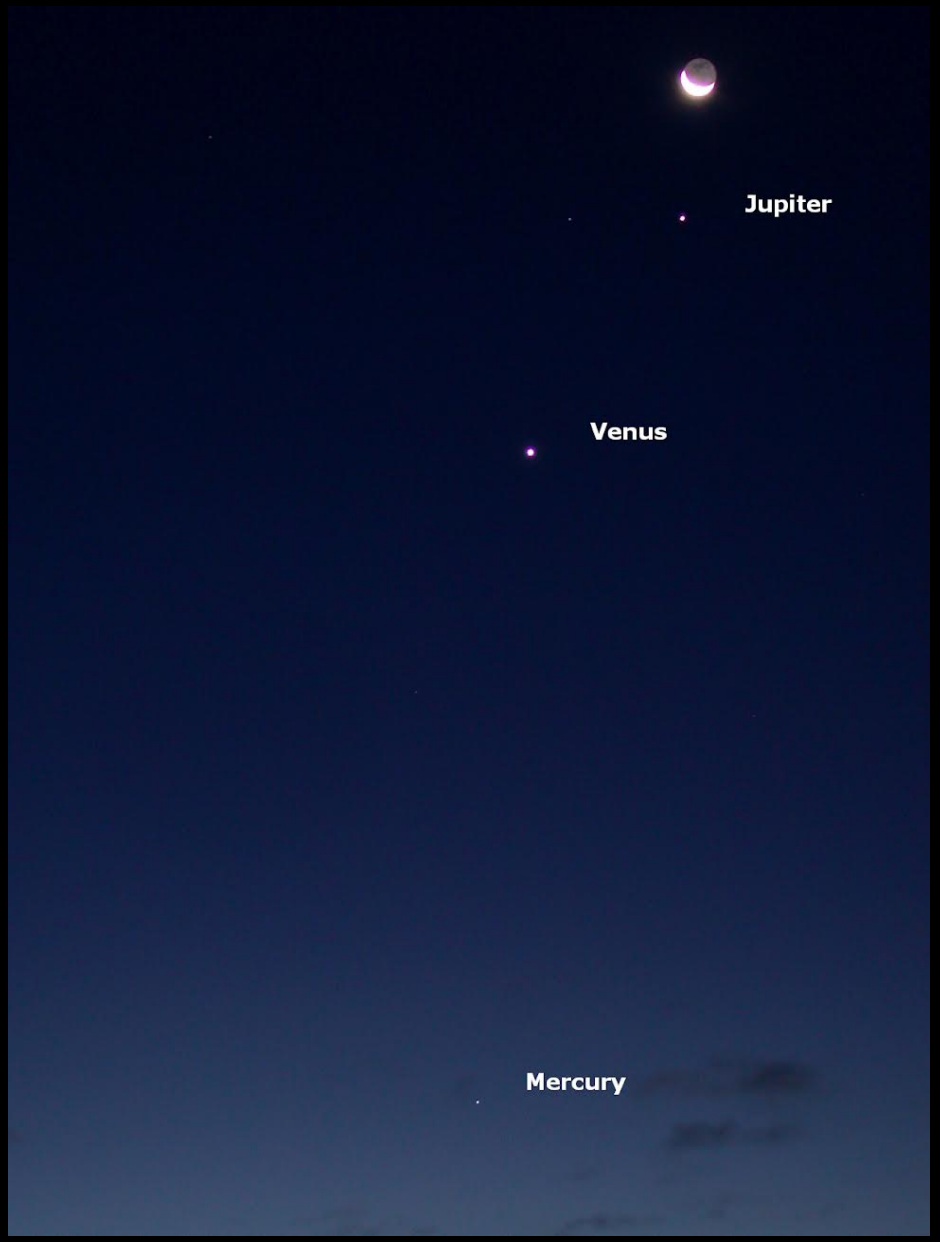
- Second planet from Sun
- 6th largest planet
- Obliquity 3°
- Earth's closest neighbour − average distance 108,000,000 km
- Closest approach 41,000,000 km
- Planet with the least eccentric orbit
- Brightest planet in night sky at ~ - 4.6
- Presents different phases
- Brightest when at its crescent phase
- Transit of Sun ~ 100 years
- Last occurred 2012
- Next transit 2117
- Duration of year: 224 days
- Length of day: 243 days
- Rotational speed at equator: 6.5 km/hr

Efrain

Rotation

- Retrograde rotation
- Duration of year: 224 days
- Length of day: 243 days
- Rotational speed at equator: 6.5 km/hr
- Due to slow rotation it is the most spherical planet

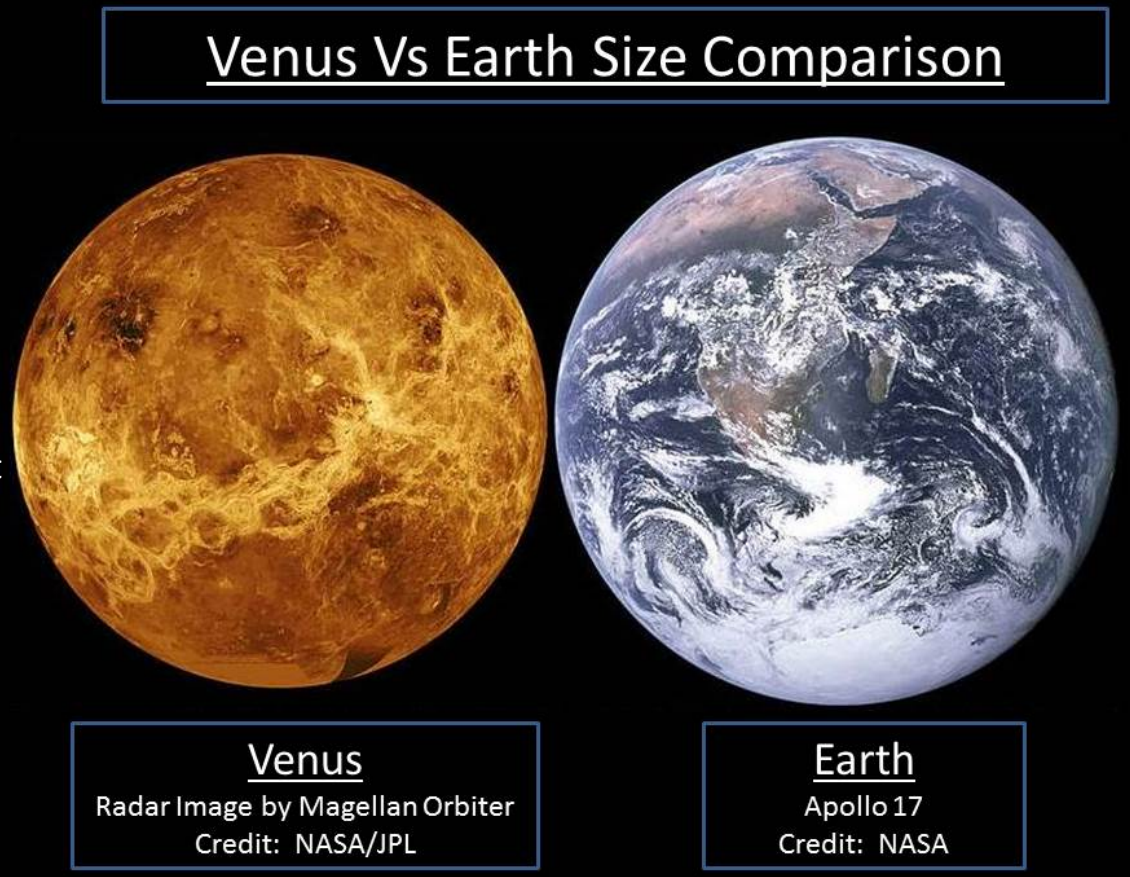
- Retrograde Explanation
  - large impactor
  - tidal locking with Sun
  - tidal effects of its dense atmosphere



Rick Stankiewicz

Earth's Doppelganger ?

- Many important similarities
  - terrestrial planets
  - similar size: 12,100 km vs 12,740 km
  - similar mass: 5.3 g/cm^3 vs 5.5 g/cm^3
  - similar gravity: 8.9 m/s^2 vs 9.8 m/s^2
  - similar composition
- Probably habitable in past
- Recent modelling suggests Venus was probably habitable until about 700 million years ago



Exploration

- Venera Spacecraft
- 1 & 2 failure
- 3 – 6 reached Venus, but did not land
- Venera 7 landed in 1970
    - first spacecraft to land on another planet & send back data
- Venera 8 determined visibility to be about 1 km
- Venera 9 first to send back images from the surface of another planet
- Venera 10, 13 & 14 send colour images and data on conditions

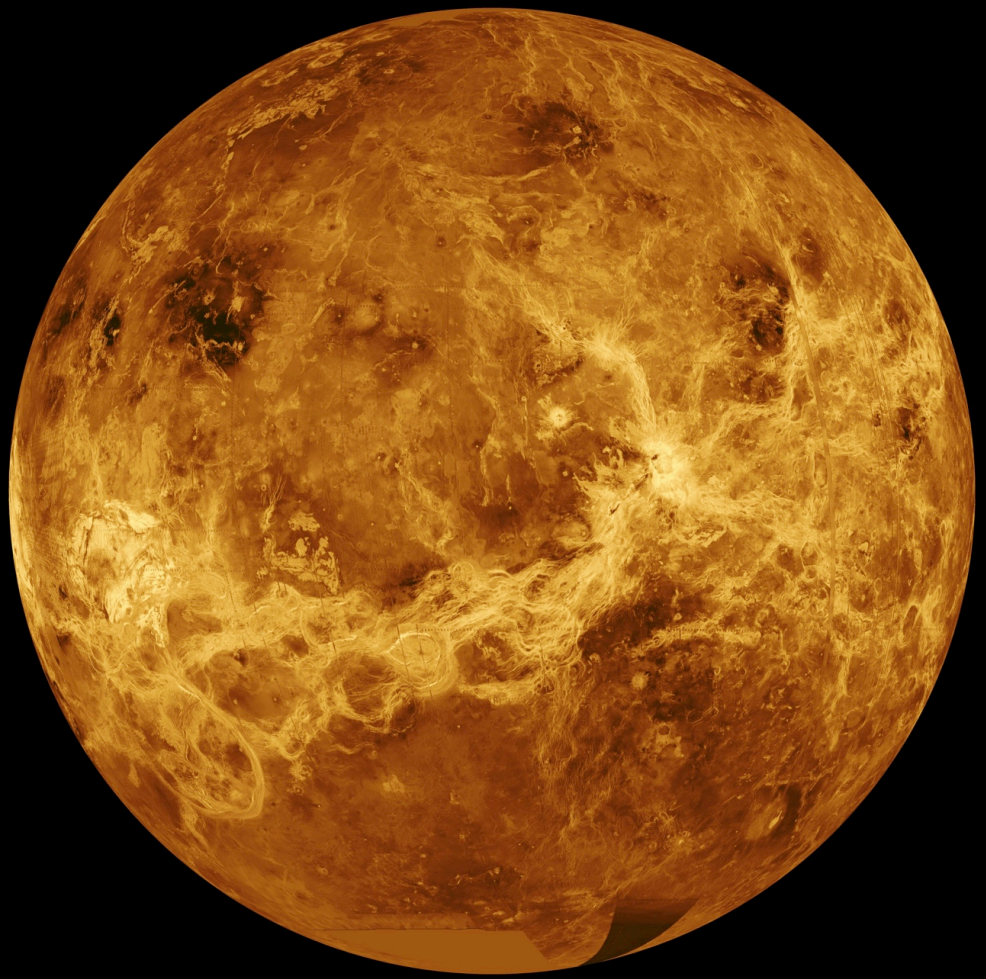
Russian Academy of Sciences

Exploration Continued

- Mariner 2 flyby December 14, 1962
- Magellan launched May 4, 1989
- Orbited August 10, 1990 – October 13, 1994
- Radar imagery > 98% of surface

- Da Vinci – descent probe 2029?
  - investigate atmosphere and surface composition
- VERITAS – orbiter
  - detailed surface mapping

- ESA: EnVision orbiter mission 2031
  - radar mapping and spectroscopy



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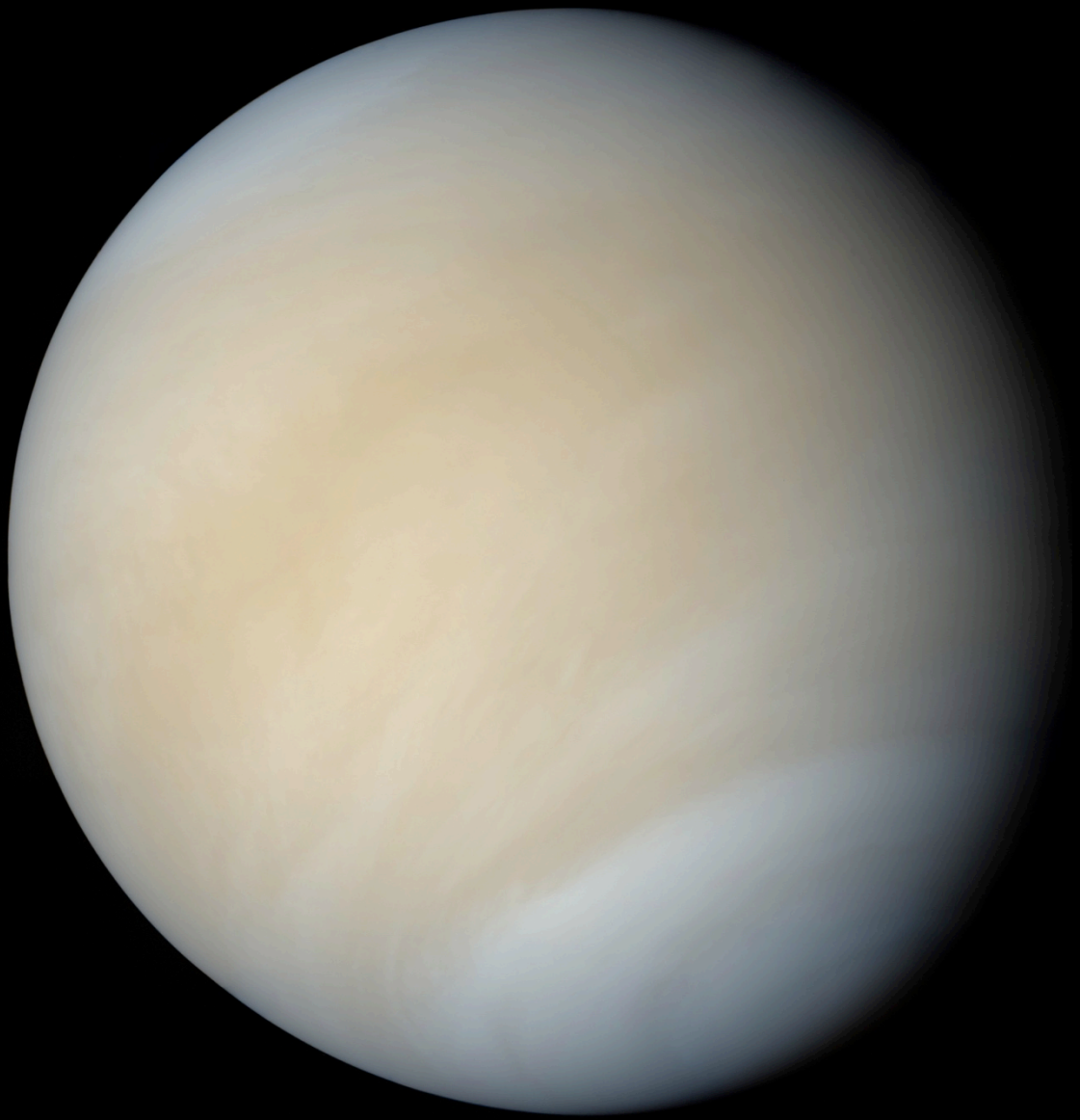
Atmosphere

- Composition mostly carbon dioxide (CO_2) combined with sulphur dioxide (SO_2)
- Atmospheric density is 93x greater than Earth
- Same pressure as being 1 km underwater
- Thick clouds of sulfuric acid obscure surface
- Clouds highly reflective ~ 10% of sunlight transmission
- Cloud layer sits above the thick CO_2 layer
- Acid rain evaporates before reaching the surface.
- Clouds can produce lightening
- Wind speeds low at surface: couple km/h
- At cloud level: 300 km/h
- Runaway greenhouse effect



NASA/JPL: Mariner 10

Atmosphere Continued

- Temperatures at surface: 462° C
- Greater than at Mercury: 426° C
- At elevation of 50 km, temperature, pressure and gravity much like Earth
- Phosphene purported to have been detected in atmosphere where temperatures are room temperature here on Earth

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Surface Features, Geology & Magnetic Field

- History of planet wide volcanism
- Hundreds of thousands of volcanoes
- 167 volcanoes over 100 km in diameter
- No plate tectonics
- 900 impact craters, none smaller than 3 km in diameter
- Any meteor 50 m or less burns up in the atmosphere
- No magnetic field similar to Earth's
- Induced magnetic field caused by interaction with charged particles from Sun and cosmic radiation
- Binds ionosphere close to planet
- During periods of weak solar wind, ionosphere can expand causing a plasma tail

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Future Exploration

- Da Vinci+ – descent probe 2029?
  - investigate atmosphere and surface composition
- VERITAS – orbiter
  - detailed surface mapping

- ESA: EnVision orbiter mission 2031
  - radar mapping and spectroscopy

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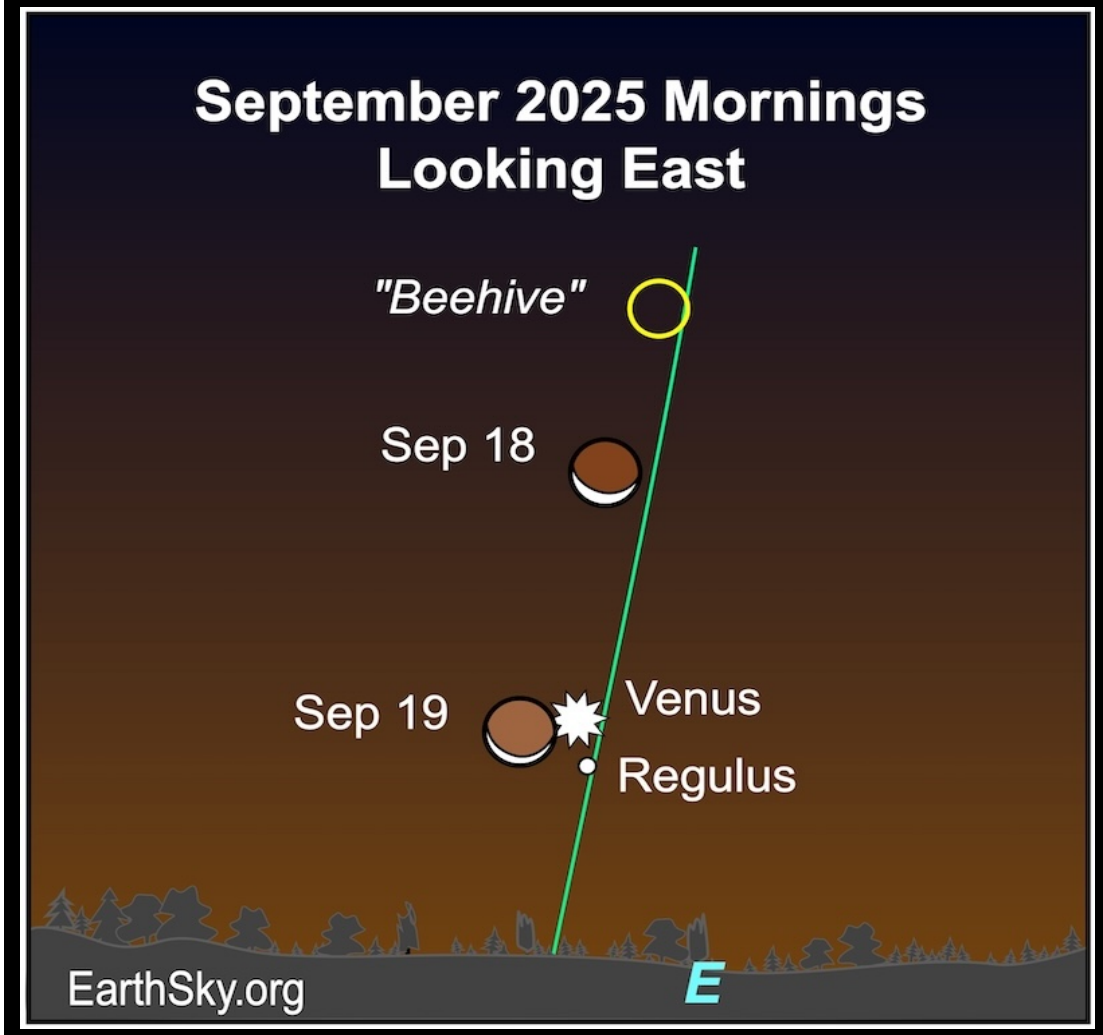
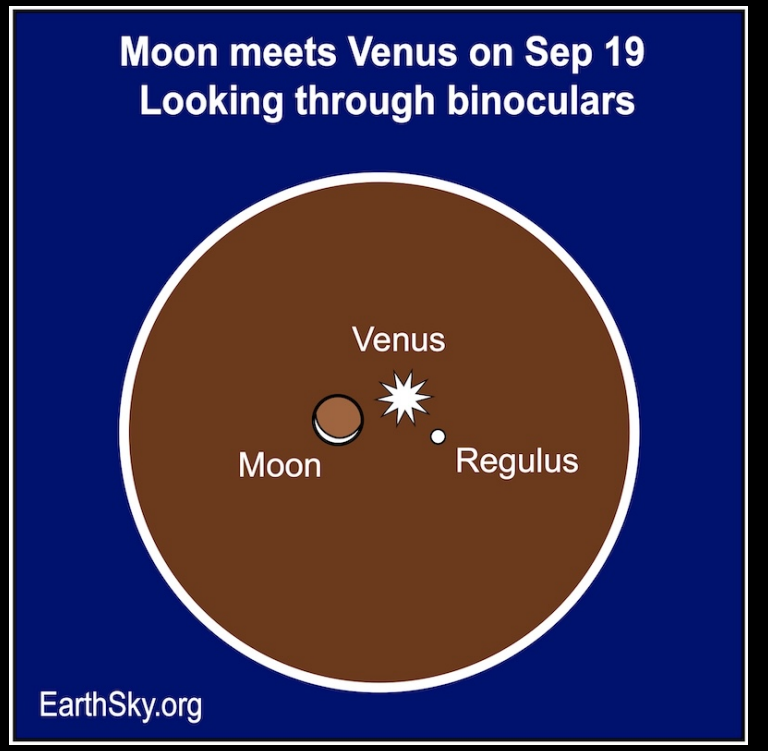
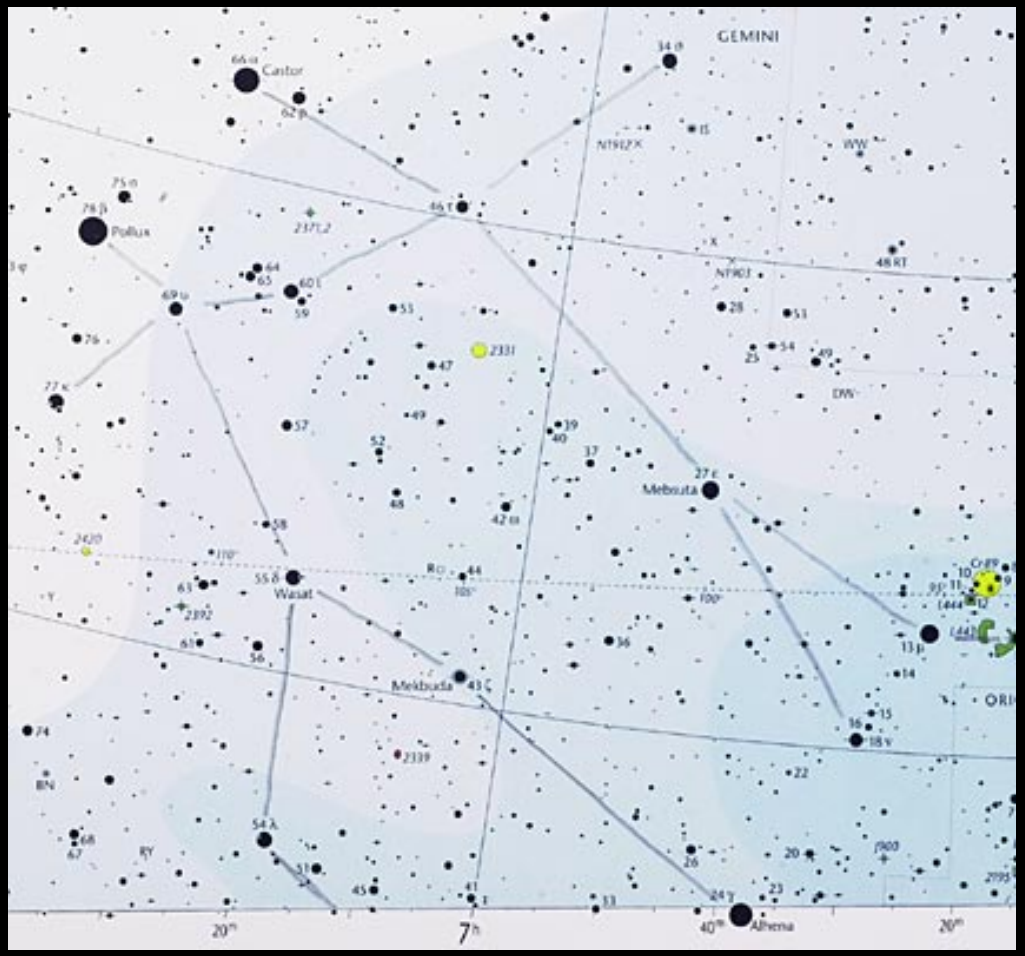
Observation Opportunities

- Visible in the east before sunrise until November 6





Novice Astronomy Class
The Magnitude Scale
October 3, 2025



Sky Atlas 2000.0