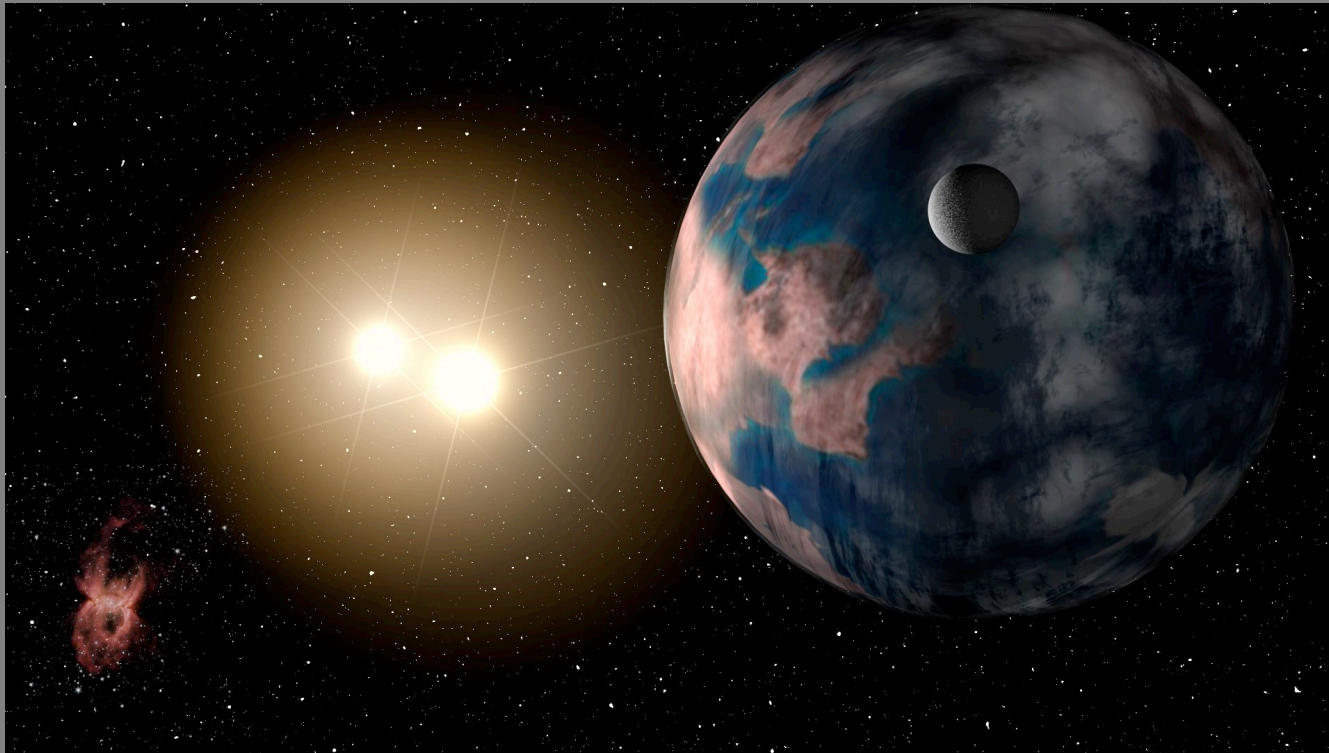


# Theoretical Models of Extrasolar Super-Earth Atmospheres

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Eliza Miller-Ricci



# Super-Earth Discoveries

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- 8 super Earths with mass  $< 10_{\oplus}$  have already been reported in the literature.
- The CoRoT satellite (launched 12/27/06) recently reported the first possible detection of a transiting super-Earth.
- Kepler (expected launch March, 2009) will potentially find dozens of transiting super-Earths.
- Ground-based surveys, such as MEarth, are being constructed to detect super-Earths transiting M-dwarfs from the ground.

# Modeling Super-Earth Atmospheres

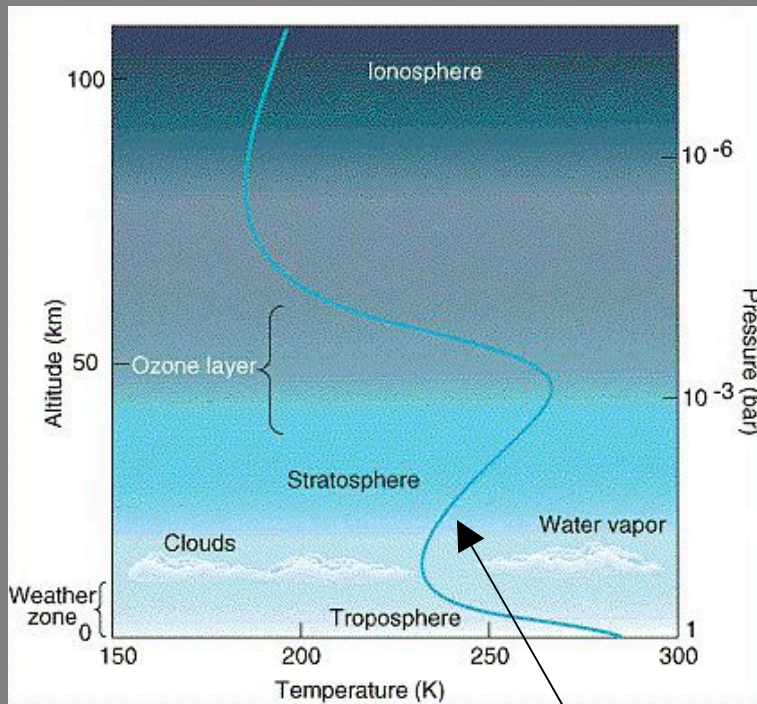
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## Questions:

- Do super Earths retain atmospheric hydrogen?
- Optically thin vs. optically thick atmospheres?
- What are the photochemical properties?
- Outgassing history?
- Plate tectonics & cycles?
- Habitability?

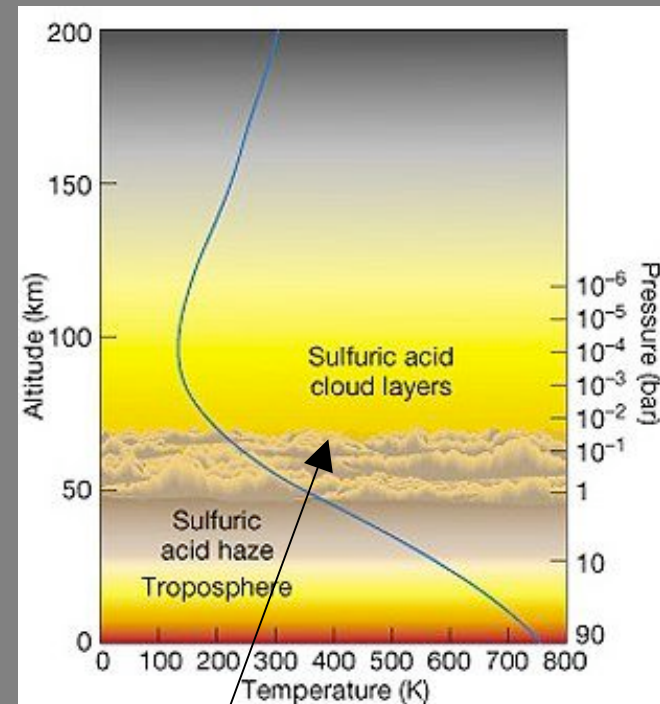
# Photochemistry

Earth:



Photochemical production of ozone causes the temperature inversion in Earth's stratosphere

Venus:

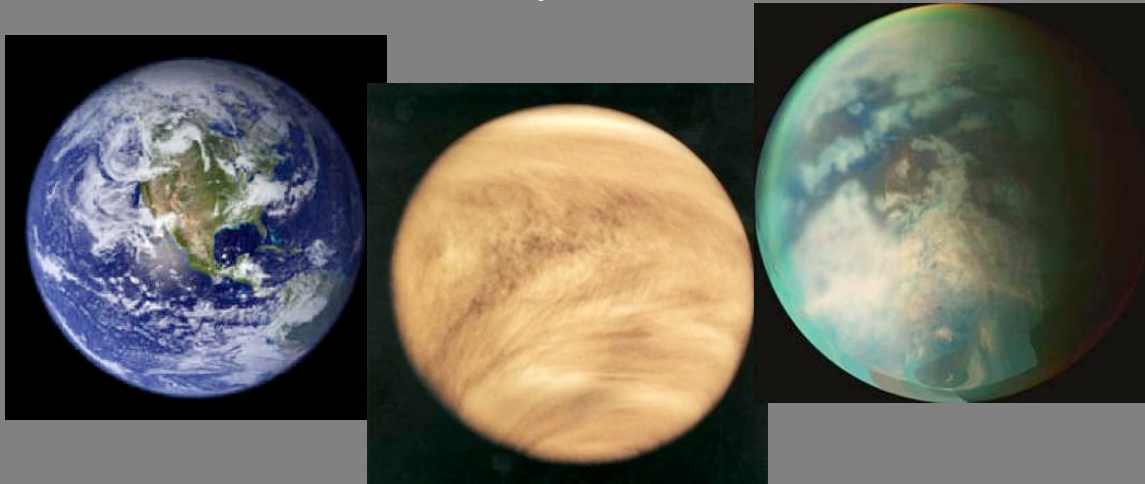


Photochemical reactions create sulfuric acid clouds in Venus' atmosphere

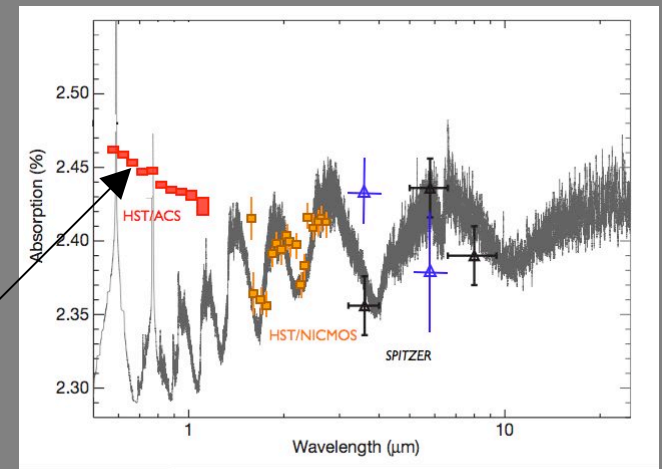
What are the effects of photochemistry on super-Earth atmospheres?

# Clouds

Clouds in the Solar System:



Potential detection of hazes in the atmosphere of the exoplanet HD 189733:



Pont et al. 2008, Swain et al. 2008, Tinetti et al. 2007 Eherenreich et al. 2007

How do clouds and cloud structure affect atmospheric structure and composition for super-Earths?