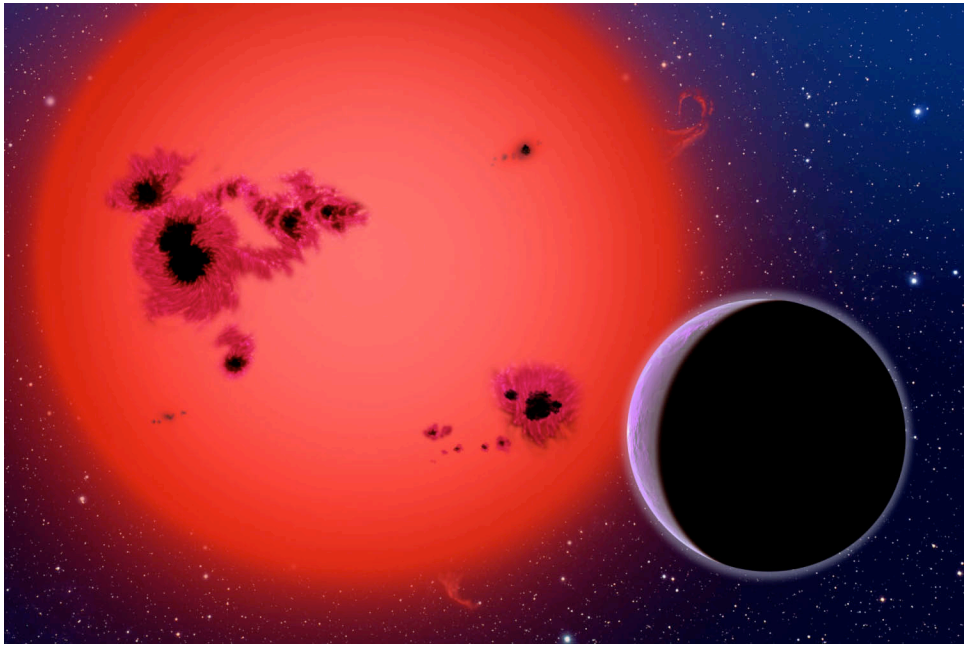
Possible ‘Water World’ at 40 Light Years

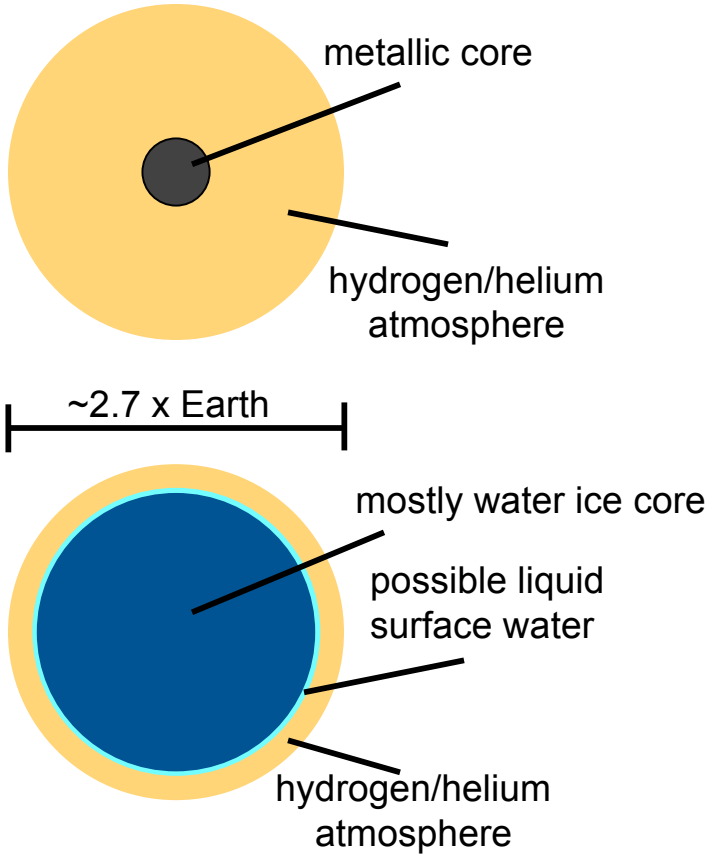
- A configuration of 8 small telescopes detected an exoplanet passing in front of a nearby small star
- Observations provide estimates of the planet’s size (~2.7 x Earth) and mass (~6.5 x Earth)
- The density of ~1.8 g/cm^3 implies that the planet may be composed primarily of water, which has density of ~1 g/cm^3



Artist’s conception of GJ 1214b - a ‘Super Earth’ orbiting a star ~40 light-years away. The planet orbits at a distance of only ~15 stellar radii. Image from David Aguilar.

Inferring Composition from Density

- Knowing the mean density of the planet does not uniquely tell us its composition
- The planet *may* have a small, dense metallic core surrounded by a massive hydrogen atmosphere - but the star should rapidly boil the atmosphere away
- *More likely* the planet has a core made mostly of solid water (ice) and a small hydrogen atmosphere (expected for a planet orbiting so close to its star)



Two possible interior structures of GJ 1214b.

The Big Picture

- The planet's surface is hot, but high pressures may allow for liquid or solid water there
- The planet is so close (only ~40 light years from Earth) that our radio and TV transmissions have passed it
- The Spitzer Space Telescope will soon conduct infrared observations to measure conditions in the atmosphere

Eight 16" telescopes monitor a few thousand stars cooler than the Sun, searching for transiting planets as part of the MEarth project. Similar ground-based configurations may soon be able to detect Earth-sized planets. Image from Dan Brocius.

For More Information…

Press

- Harvard-Smithsonia Center for AStrophysics - 12/16/09 - “Astronomers Find Super-Earth Using Amateur, Off-the-Shelf Technology”
  http://www.cfa.harvard.edu/news/2009/pr200924.html
- Wired Science - 12/16/09 - “Most Earth-Like Extrasolar Planet Found Right Next Door”
  http://www.wired.com/wiredscience/2009/12/super-earth/
- Space.com - 12/16/09 - “Nearby Super-Earth May Be a Waterworld”
  http://www.space.com/scienceastronomy/091216-super-earth-water-atmosphere.html

Images

- Slide 1 image courtesy David A. Aguilar, CfA
  http://www.cfa.harvard.edu/news/2009/pr200924_images.html
- Slide 3 image courtesy Dan Brocius, CfA
  http://www.cfa.harvard.edu/news/2009/pr200924_images.html

Source Articles (on-campus login may be required to access journals)

- Charbonneau et al., ‘A super-Earth transiting a nearby low-mass star’, *Nature*, 462, 10.1038/nature08679, 2009.
  http://www.nature.com/nature/journal/v462/n7275/full/nature08679.html

Prepared for the Division for Planetary Sciences of the American Astronomical Society by David Brain and Nick Schneider
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