First Rocky Exoplanet Detected

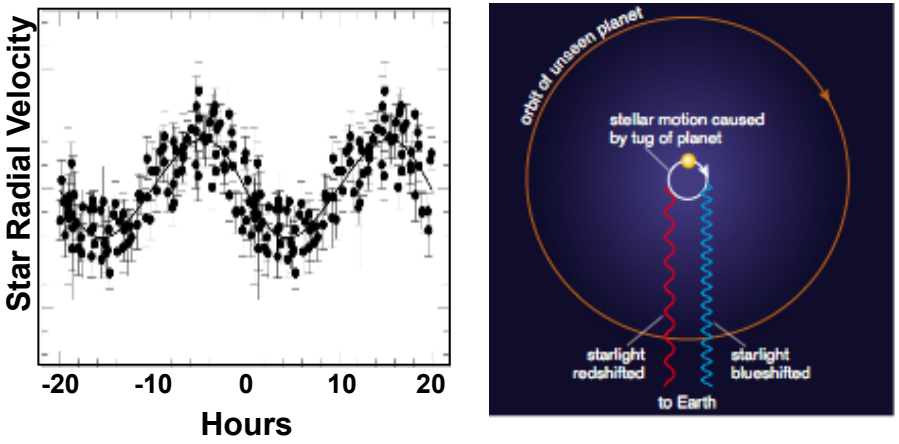
- Most known exoplanets are large and have low densities - similar to jovian planets in our solar system
- A space telescope recently discovered a planet with radius only 70% larger than Earth's
- Groundbased observations show the planet's mass is less than 5 times Earth's
- Together, the observations reveal that the planet's density is similar to Earth's - the first confirmation of a "rocky" exoplanet

Artist's conception of the view of the rocky planet's parent star (Corot-7) from above the surface of the planet (Corot-7b). Image from ESO / L. Calcada.

How Can We Find a Planet's Density?

- Density = Mass / Volume

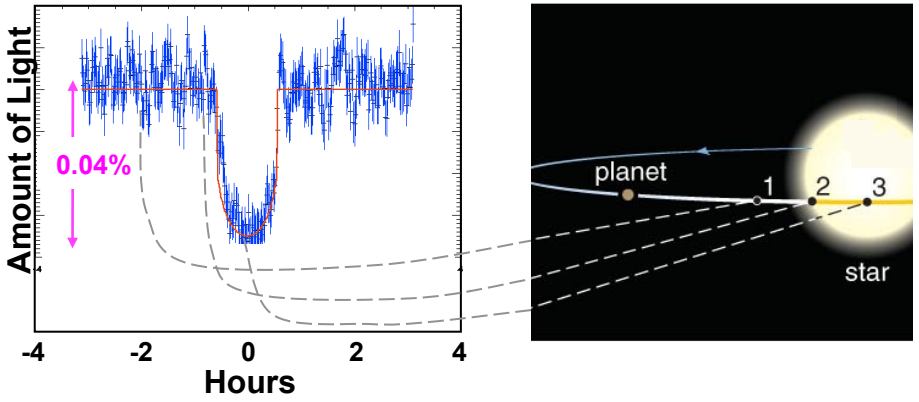
- The planet's mass was determined using the *radial velocity method:*
  The planet gravitationally 'tugs' on the star, shifting the wavelength of light the star emits back and forth. The amount of shift indicates the planet's mass.



Changes in the measured wavelengths of star light are caused by a planet with mass ~5 times Earth's.

- Volume = 4/3 π R^3

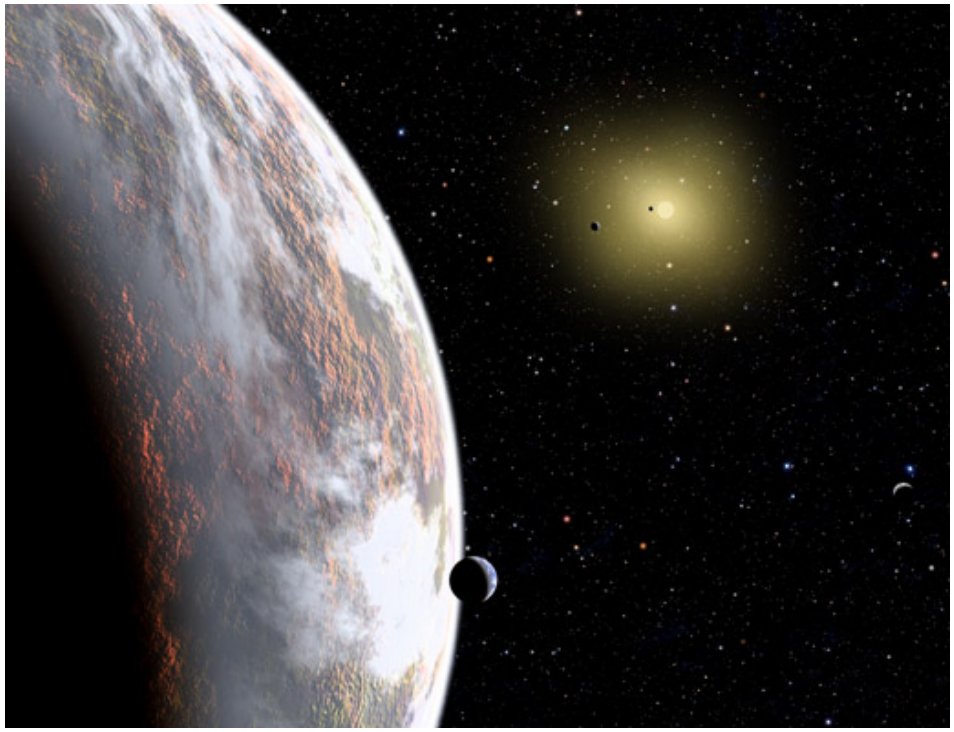
- The planet's size was determined using the *transit method:*
  The amount of light measured from a star decreases when a planet passes in front. The amount of decrease indicates the planet's size.



Periodic decreases in light from the star are caused by a planet with diameter 1.7 times Earth's passing in front.

The Big Picture

- After discovering hundreds of exoplanets resembling our jovian planets, astronomers have found the most Earth-like planet to date
- Although planet Corot-7b's density is close to Earth's, differences abound: it orbits its star in ~20 hours (faster than any known exoplanet) - so close that its rocky surface may be molten
- With the existence of Earth-like planets now demonstrated, astronomers have reason to hope that the Kepler mission will discover more



Detection of more rocky exoplanets ('Super-Earths') like those in this artist's depiction should come rapidly, thanks to dedicated space telescopes and improving ground-based detection capabilities. Image from D. Aguilar, Harvard Smithsonian CfA.

For More Information…

Press Releases

- Space.com - 09/16/09 - “First Rocky World Confirmed Around Another Star”
  http://www.space.com/scienceastronomy/090916-rocky-exoplanet.html
- Eurpoean Southern Observatory - 09/16/09 - ‘First Solid Evidence for a Rocky Exoplanet’
  http://www.eso.org/public/outreach/press-rel/pr-2009/pr-33-09.html

Images

- Artist depiction of Corot-7 system courtesy European Southern Observatory / L. Calcada
  http://www.eso.org/public/outreach/press-rel/pr-2009/pr-33-09.html
- Detection method cartoons - 2006 Pearson Education Inc., publishing as Addison Wesley
- Transit and radial velocity data plots adapted from source articles below
- Artist depiction of Super-Earth courtesy David Aguilar, Harvard Smithsonian CfA
  http://www.cfa.harvard.edu/news/2008/pr200802_images.html

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

- Léger et al., ‘Transiting exoplanets from the CoRoT space mission VIII. CoRoT-7b: the first Super-Earth with measured radius’, *Astronomy and Astrophysics*, **in press**, 2009.
  http://www.aanda.org/articles/aa/pdf/forth/aa11933-09.pdf
- Queloz et al., ‘The CoRoT-7 planetary system: two orbiting super-Earths’, *Astronomy and Astrophysics*, **in press**, 2009.
  http://www.aanda.org/index.php?option=article&access=doi&doi=10.1051/0004-6361/200913096