

Astro 18, UCSC, Spring 2009
Homework 5, due Thursday May 7th

Do the following problems in Bennett:

From Chapter 13: Other Planetary Systems
Problems 46, 58, 60

Web project: Go to the Extrasolar Planets Encyclopaedia (<http://www.exoplanet.eu>). This website lists all the extrasolar planet candidates discovered so far. Click on “*Interactive Catalog*”, then “*Candidates detected by radial velocity*” to see a table of all the planets that have been detected with the Doppler method.

Select the “Correlation Diagrams” tool (this tool shows a plot of the properties of all the planets listed in the previous table).

- (1) Select “Year of Discovery” for the x-axis and “Planet mass” in the y-axis (select log. scale), and press OK; a plot should be generated on the right, showing the year of discovery on the x-axis and the masses of each planet compared the mass of Jupiter. Do you notice a pattern? Can you explain it?
- (2) Select “Planet semi-major axis” on the x-axis (log. scale) and “Planet mass” on the y-axis (log. scale). Explain how this plot challenges the classical picture of planetary formation (all giant planets should lie outside the snow line), and how current theories attempt to explain it.
- (3) (*Extra credit*) Select “Planet semi-major axis” on the x-axis (log. scale) and “Planet Period” on the y-axis (log. scale). Explain why not all points line in a straight line, despite the fact that Kepler’s 3rd law says that $P^2 \propto a^3$ and we are working on log-log axes.