

Homework 4

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Objectives : Use exoplanet database and interpret some recent discoveries.

1 Planet Mass vs Separation

1) Connect to the American exoplanet database exoplanets.org, click on "Plots" and produce the graphic « **Planet Mass [Earth Mass] vs Separation [AU]** » in logarithm scale. Use the filters to differentiate the planets discovered by the transit method (red), the RV (blue), the gravitational lens (green) and by direct imaging (yellow).

2) Interpretation:

1. In the figure, you can distinguish different kinds of planet populations, which ones ?
2. Discuss the bias associated to each detection methods and its impact on the types of discovered planets.
3. Are the giant planets present at the whole range distance to their host star ? Is this real of caused by a possible observational bias ? Why ?
4. The transit method does not allow to access the planet masses. Why do the planets discovered by this method appear in this graphic ?
5. Which kind of planets seems to be the most abundant ? Are those present in our Solar System ?

2 Orbital Eccentricity vs $M \sin(i)$

1) Produce the graphic « **Orbital Eccentricity vs $M \sin(i)$ [Earth Mass]** » in logarithm scale for all the planets discovered by the radial velocity method. Use the filters to differentiate the single planets (symbol : circles) and planets discovered in a multi-planet system (symbol : squares). For each case, indicate by a color code the metallicity of the host star (red for $[Fe/H] > 0$, green for $[Fe/H] < 0$).

2) Interpretation:

1. Describe the distribution of the eccentricity with respect to the giant planets ($> 50 M_{\oplus}$) and the sub-giants or rocky planets ($< 50 M_{\oplus}$). Compare with our Solar System.

2. What information can we get from stellar metallicity indicators ?
3. Do you find more planets around metallic or non metallic stars ? Why?
4. Is the previous finding also true for the two kinds of populations (single vs multi-planets)? Do you see why ?