Jupiter like exoplanets

Soichiro Hattori

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1 Jupiter-size transit depth and width

Transit depth

Using simple geometry(I will need to write this up with my notes later) one can roughly approximate the depth of a transit δ for a planet of radius R_p orbiting a star of radius R_s to be

$$\delta = (\frac{R_p}{R_s})^2$$

Given that a Jupiter-size transit is what is needed, it is possible to roughly approximate the transit depth by the following,

$$\delta_j = (\frac{R_j}{R_s})^2$$

where R_j is the radius of Jupiter (6.9173×10^7m), and R_s is the radius of the sun (6.955×10^8m). From the calculation,

$$\delta_j = 0.00989188$$

this is a unitless number that represents the percentage of how much the lightcurve will dip during the transit. For a Jupiter-size planet, it is roughly 1%

Transit Width

(Derivation will be written later.) The transit width T, with units in days, is given approximately by the equation

$$T = \frac{R_s P}{\pi r}$$

where R_s is the radius of the star, P is the period of the orbit of the planet in days, and r is the distance from the star to the planet. To approximate the values for the Sun and Jupiter will be used. The time it takes for Jupiter to complete a full orbit around the sun is $P = 4332.8201$ days, and the distance between the Sun and Jupiter is $r = 7.9062 \times 10^{11}$m. Plugging these numbers into the equation,

$$T = 1.21325$$

where the unit is in days. Converting to hours, it is 29.118 hours.

Median Filter window size

During one of the group meetings it was arbitrarily decided that the number of data points that would be considered for the size of the moving window is 80 data points on each side of a given data point.

PDCSAP_FLUX vs SAP_FLUX

Pre-Search Data Conditioning (PDC) Simple Aperture Photometry (SAP) was used instead of SAP as it removes certain systematic artifacts in the data such as spacecraft jitter. Although plotting the entire dataset for a star showed that the PDC_SAP FLUX had certain artifacts in the trend of the data (larger systematic decrease in absolute flux value across individual data sets), we decided this would not have negative impact on search as the program normalizes each of the individual data sets to the value 1.0 for each individual data set.