Lighthouses of the galaxy;

Explaining the overabundance of transiting exoplanet detections in the Keppler data

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Abstract
An overabundance of transiting exoplanets in the Keppler data is observed based on simple estimations from average properties of known exoplanets and stars. This implies that there is larger amount of variable stars than stars with exoplanets. An anomaly which can be elegantly resolved the need for navigational beacons by galactic extraterrestrial civilizations.

The problem
It is relatively simple to estimate the chance to detect a random transiting exoplanet using parametrs from known exoplanets and stars. Firstly the chance to observe an exoplanet depends on the radius of the star and the inverse of the semi major axis of the planet. The exact relation is:

$$0.9 * arcsin(\frac{Rstar}{a}) = fraction\ (in\ percent)$$

Using the fact that the Kepler mission mostly observed G-type stars [1] and the average G-type star has a radius of about one solar radius (~7 10^8 meters) and the fact that the average semi major axis of exoplanets turns out to be about 1 astronomical unit (A.U.) (1.5 10^{11} meters), this formula givers a detection chance of about 0.3 percent. The average semi major axis mostly depends on planets detected by the radial velocity method, which is sensitive to planets of all inclinations and therefore gives a more fair view on the true exoplanet population.

The number of detected stars in the Kepler field is about 150.000 [1], while it detected about 3.548 exoplanet candidates of which about 3.200 will be actual detections [2]. This gives a fraction of 2.1 percent of the stars with exoplanets. A factor 10 more than would be expected on the basis of average properties.

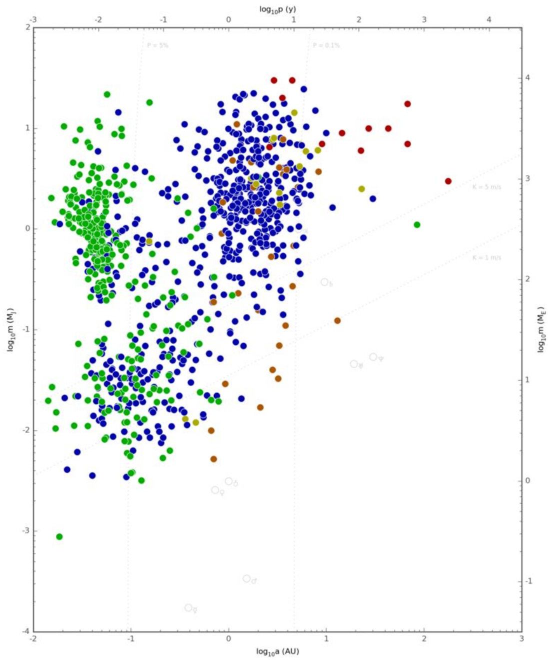

Figure 1 - Properties of known exoplanets. Blue datapoints represent the reliable radial velocity method and green datapoints the transit method. The average of the semi major axis can be seen to be about 1 A.U. (Courtesy: wikipedia commons)

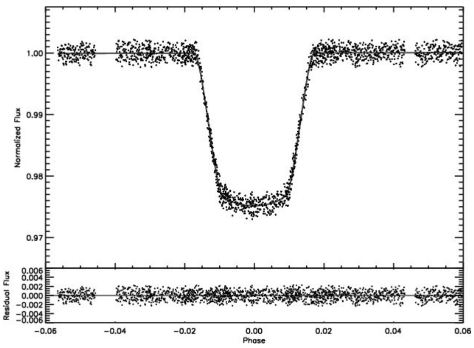

Figure 2 - Typical lightcurve as detected by Kepler. (Courtesy: [3])

Galactic navigation

A possible resolution for this striking anomaly between average exoplanet properties and exoplanets detected by Kepler could be the fact that the changes in light output are not a result of the transit of an exoplanet, but the result of some other process. Natural causes for such processes can be excluded, since the boundaries of the dips in the lightcurves are too sharp [4], which leaves only extraterrestial intelligence as a reasonable explanation.

The purpose of these stars with very constant variablity is comparable to the purpose of lighthouses here on earth; navigation. In principle all kinds of variable stars can be used, but the natural occurence of variable stars is relatively low and these stars are also clustered in space [5]. This results in large volumes of space which are void of navigational beacons, making the travel through these places difficult and dangerous.

The solution to this problem is simple, namely the creation of artificial navigation beacons. However, the power needed to have a navigational beacon with a reasonable spatial range is enormous. Moreover, because of doppler effects when one travels near the speed of light, a wide frequency band is needed at the transmission side. Therefore it would be easier to use an existing source of electromagnetic radiation and simply make it variable.

Though it requires less power than creating an artificial beacon, making a non variable star variable would require large ammounts of energy. This energy would be proportional to the ammount of variation in the star. Thus it would be more efficient to have a small ammount of change in the light output of the star than a large change. This explains the extremely dim variations in the flux of the Kepler stars.

This explanation would also be an elegant explanation for the frequent observation of hot jupiters, which are very hard to explain with current models of planet formation [6]. These hot jupiters are mostly detected via the transit method and are thus, according to this new theory, not exoplanets at all, ruling in favor of our current understanding of planetformation.

Conclusion

The problem with the overabundance of transition exoplanet detections in the Kepler data can be elegantly explained by the need for navigational beacons by galactic civilizations.

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