An assessment of potential Plato Observing strategies to maximize science return from the Kepler Field.

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Abstract

The Plato Mission has the unique capacity to provide long-base observations of thousands of stars and their transiting planets. The current mission plan includes a 2-year stare than includes the Kepler Field. Plato observations have the potential to improve science return from the Kepler field. Including, the reliability of Kepler planet candidates in the low S/N regime, detection of long-period planets and an overall improvement of exoplanet occurrence rates and transit timing variations and long-term stellar variability and stellar cycles. The low S/N transit regime includes potential Earth-sized habitable zone planets around Sun-like stars, which is of high intellectual interest.

Kepler Planets

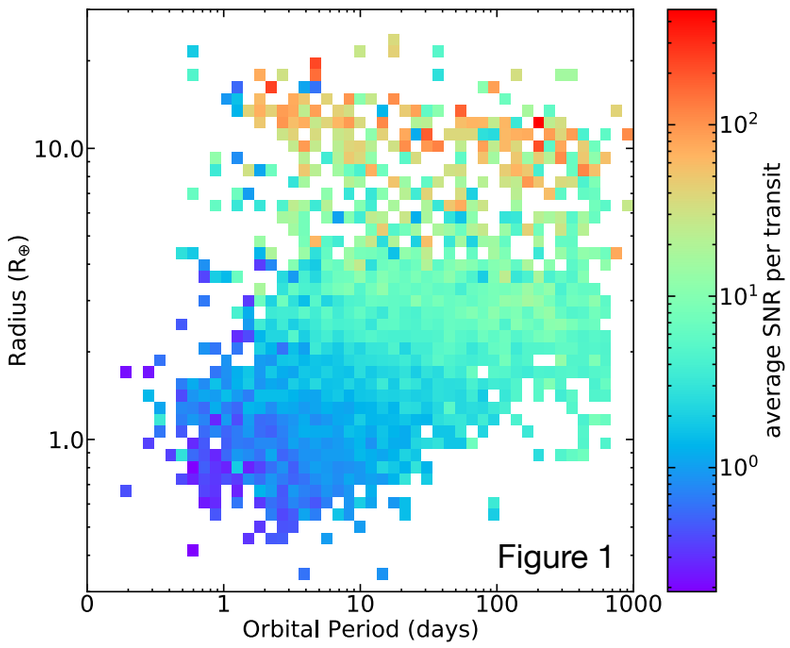

Figure 1 shows the average SNR per transit vs orbital period and radius. The average SNR generally increases with radius. Trends associated with period are a result of the Kepler mission requiring a total SNR ≳ 7.1 for candidate selection, thus few transits requires a large average SNR per transit for detection threshold.

Plato detection SNR in the Kepler Field

The baseline Plato mission includes a 24 month continuous stare that includes the Kepler Field. Due to orbital constraints, the Kepler is located towards the periphery of the Plato FOV and will be covered by 6 - 12 cameras. This is roughly equivalent to 1/8 to 1/4 of the Kepler light gathering ability. **Figure 2**, shows an estimate of the expected SNR of a planet transit in the Kepler Field observed by Plato. Of note, is the very low SNR recovery of long-period planets with a radius less that ~ 4 $R_\oplus$.

Figure 3 shows the hypothetical scenario of observing the Kepler Field, but centred in the Plato FOV. Note, this configuration is not possible. However, by centring the FOV, there is an overall increase in transit SNR recovery which greatly benefits planets smaller than 4 $R_\oplus$.

Figure 4 shows our proposed observing plan which would centre the Kepler Field, and to break the observing campaign into four 6-month campaigns. This gives the benefit of more *Plato Glass* on the Kepler field, but extends the observing baseline to 4-years, which allows for recovery of approximately half of Kepler's long-period Earth-sized planets. **Notice the significant increase in SNR for planets with periods greater than 300 days and radii less than 4 $R_\oplus$.**

Also: see Talk by J. Lissauer and Poster by D. Jontof-Hutter