

Optimizing Science Return from Plato's Observations of the Kepler Field

The Plato mission could substantially enhance its scientific yield by focusing a significant fraction of its observations with all 24 cameras viewing the Kepler Field of View (FOV). Kepler, while exceptionally productive, did not accomplish its goal of providing a direct measurement of the abundance of Earth-analog planets around sunlike stars. On this issue, Plato observations centered on the Kepler FOV would enable planet searches using the combined data sets to achieve more precise estimates of planetary occurrence rates than obtainable using data from either mission alone. The ecliptic latitude of the Kepler FOV is too low for Plato to observe with 24 cameras year-round, so current plan's for Plato's Northern Stare places the Kepler FOV in the periphery, reducing the number of photons collected from Kepler targets by factors of 2 or 4. We propose instead four ~6 - 8 month Plato stares with 24 cameras observing the Kepler FOV during the Plato primary mission, instead of a single 2 year stare with the Kepler FOV located to the periphery. This change would greatly increase the amount of 'Plato glass' dedicated to the continued study of the Kepler FOV, while still enabling Plato to observe other parts of the sky during the majority of its prime mission. In addition to discovering planets below Kepler's detection threshold, this change would yield transit follow-up of thousands of known exoplanets with an effective throughput of a 0.6 m space telescope. It would also extend the observing baseline of the Kepler FOV to timescales of decades, providing key data for stellar cycles, the analysis of transit timing variations, and other decade-timescale variations. Such a campaign enhances the likelihood of the detection of true Earth-analog transiting planet candidates around sunlike stars, provide the best statistical study of exoplanet systems with transit timing variations and duration variations, and open up the study of stellar variability to new time-domains with precision on large numbers of faint targets that only 24 Plato cameras can provide.

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