

K2 monitoring of known transiting planet phase curves and bright planet hosts

Ming Zhao

Pennsylvania State University

We propose K2 monitoring of known, nearby transiting planet phase curves, and characterization of radial velocity planet hosts as well as long-term precise RV targets in the Campaigns 6 & 7 fields. Nearby known planets are all orbiting bright stars ($V < 13$) and have RV measurements. Continuous K2 monitoring of these rare but important targets will provide invaluable data for detailed high precision characterization of both the planets and their host stars. Previous K2 campaigns, unfortunately, have missed a few of these bright and known planetary systems (e.g., WASP-17, HD 99492). We therefore propose and urge Campaigns 6 & 7 to include these systems. In particular, Campaigns 6 & 7 will have better pointing than previous ones, and Campaign 6 will cover a high galactic latitude, providing the highest available photometry quality in K2.

Our main science goals are:

- (1) Measure the optical phase curves and secondary eclipses of two known transiting hot Jupiters, Qatar-2b and WASP-55b, to determine their optical albedos, heat redistribution, and eccentricities. In particular, Qatar-2b is one of the best targets for atmospheric characterization in both optical and near-IR, and provides a rare opportunity for joint studies over a wide wavelength range.
- (2) Improve the orbital and physical parameters of both transiting systems and better constrain the masses, radii and densities of the planets.
- (3) Characterize the stellar properties (rotation, activity, jitter, flicker) of known RV planet hosts and long-term RV targets to better understand the stars, their planets, and aid the search of long-period planets in these systems.
- (4) Search for planet transits in the RV systems.

We propose a total of 28 targets, including 2 transiting planets and 26 known RV planetary systems and long-term precise RV targets in Campaigns 6 & 7. We require short cadence data for the known transiting planets in order to constrain the ingress and egress timing of their transits and eclipses to precisely measure their eccentricity and orbital parameters. We only need long cadence data for the rest of the RV systems. We will implement the detrending and calibration methodology developed by Vanderburg & Johnson (2014) and combine it with our own algorithms to extract the raw K2 light curves. Our transiting planet host stars are in the magnitude range of 11 to 13 mag in the visible, falling in the “sweet spot” of the demonstrated K2 precision of 30 - 40 ppm per 6-hour integration (Vanderburg & Johnson 2014), sufficient to measure the optical phase curves and secondary eclipses of these best hot Jupiters with high significance when combining the 80-day data together.

Our science goals are directly related to exoplanet detection, characterization and stellar astrophysics, all of which are the main areas of the K2 GO program and NASA's exoplanet exploration program. These observations cannot be replicated from the ground due to the requirement of continuous monitoring and very high precision for optical phase curves. Particularly, the optical phase curves will be rare and valuable datasets for exoplanet characterization before the era of TESS.