SESSION 2Q

ASTRONOMY AND ENGINEERING

Session Moderator: Suzanne Hawley, Astronomy
JHN 026
3:30 PM to 5:15 PM
* Note: Titles in order of presentation.

Searching for Exoplanets with Sputtering Space Telescopes

Nicholas Keller Saunders, Senior, Physics: Comprehensive Physics, Astronomy, Comparative Literature (Cinema Studies)
NASA Space Grant Scholar, UW Honors Program
Mentor: Rodrigo Luger, Astronomy
Mentor: Rory Barnes, Astronomy

As the *Kepler* Space Telescope's follow-up *K2* mission enters its final campaigns of observation, the fuel powering the spacecraft's stabilizing thrusters is expected to begin to run out, causing thruster fires to sputter. Sputtering will cause higher magnitude and less predictable motion of stellar Point Spread Functions (PSFs) relative to the spacecraft detector, generating more noise in transiting exoplanet light curves. To understand this increased noise, I am creating a forward model of the *Kepler* detector, and simulating stellar targets traversing different regions of quantum sensitivity variation. Using these simulations, I am characterizing the contribution of detector sensitivity variation to the noise of *K2* light curves and testing various models for thruster sputtering in preparation for identifying high motion in future *K2* data. I am also testing methods to increase the effectiveness of existing noise-removal techniques for space telescope exoplanet targets, focusing my treatment on stars with bright neighbors or high motion relative to the detector. Using techniques tested on simulations, I am studying a population of exoplanet targets that has received less attention due to difficulties arising from contribution by bright nearby stars. In this talk I will demonstrate the potential value in continued observation during thruster sputtering and discuss the results of my follow-up study on crowded exoplanet targets. To ensure a productive legacy for the *Kepler* mission, it is essential to develop robust tools to analyze existing data after the spacecraft becomes defunct. My noise-removal methods can be applied to current and future *K2* data, as well as data from future missions such as the Transiting Exoplanet Survey Satellite (*TESS*) and the James Webb Space Telescope (*JWST*).

POSTER SESSION 4

Commons East, Easel 71
4:00 PM to 6:00 PM

Stability of Ice Belt Formation on High Obliquity Planets around Main Sequence Stars

Caitlyn E. Wilhelm, Junior, Pre-Sciences
Mary Gates Scholar
Mentor: Russell Deitrick, Astronomy
Mentor: Rory Barnes, Astronomy

Obliquity, or axial tilt, is the angle rotational axis and a line perpendicular to the orbital plane. At low obliquity, Earth-like planets will tend to form permanent ice sheets at the poles, if anywhere. However, at high obliquity, the poles receive more sunlight on average than the tropics, and so ice sheets might be expected to form at the equator. We investigate the formation of such "ice-belts" under a range of orbital parameters, obliquities, and host star properties. We find there is a narrow range of semi-major axis and obliquity values that allow for such "ice-belts" to form. First, we experiment with changing the luminosity of the host star to see the effect of changing the stellar flux on ice belt formation, while keeping the relative stellar flux approximate to Earth's, as well as making the appropriate adjustment to the ice-albedo for the host star's spectrum. Our results suggest that the more luminous the star is, the smaller (and ultimately less stable) the range of ice belt formation becomes. To fully understand the full effect the host star had on ice belt formation, we vary the orbital eccentricity, the spin-axis orientation (precession angle) and the depth of the ocean that can absorb stellar energy (mixing depth). This work suggests that it should not be typical for Earth-like worlds at high obliquity to maintain large ice sheets around main sequence stars.