Planetary Oblateness, TESS's View of the Solar System



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Transiting Exoplanets



Transiting Exoplanets



Solar System w/ TESS







Rotation -> Oblateness

Measure Oblateness -> Constrain rotation

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Measure Oblateness -> Constrain rotation

(and obliquity)















time [arbitrary]



time [arbitrary]



time [arbitrary]

https://squishyplanet.readthedocs.io



This illustrates just how flexible models of non-spherical planets can be— depending on the flattening,

But...other things are happening on the limb



But...other things are happening on the limb Need to jointly model oblateness and limb darkening









Quadratic

Can impose priors and fit Inflexible

Non-linear

Must fix, no sensible prior



Flexible

1.000 Teff = 5500Teff = 5600Slight stellar Teff = 5700Teff = 5800uncertainty Teff = 59000.990 Teff = 6000-> 50 Diff. w/ Teff=5500 [ppm] 0 -20 0 0 0 0 different Teff = 5500ingress / Teff = 5600Teff = 5700egress! Teff = 5800Teff = 5900Teff = 6000-22 -6-46 0 4 Time [hours]

Fit coefficients of a model that mimics stellar intensity profile



Fit the stellar intensity profile directly

Coming soon!

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	en-cassese untested full runthrough	117e083 · 3 weeks ag	o 🕚 4 Commits
	docs	initial commit	last month
	src/asterias	untested full runthrough	3 weeks ago
	🗋 .gitignore	initial commit	last month
	.pre-commit-config.yaml	initial commit	last month
	.python-version	initial commit	last month

Transit Fit, usual params



Transit Fit, usual params



But now stellar props. as well



Completely different conclusions w/ different limb darkening prescriptions!

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TESS's View of the Solar System

1) Light curve contamination



Asteroids are ubiquitous in the ecliptic plane



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Target-by-target, how do they affect transient searches?

Simulate where all the asteroids are at every time

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Generate mock images

Simulate where all the asteroids are at every time



Generate mock images















> 50% of T>13 targets are contaminated > 1%

2) TESS as an Engine for TNO Discovery







Gladman & Kavelaars 1996 Holman, Payne, & Pál 2019 Rice & Laughlin 2020

name: 62_1_3_origin_128_512_13 peak pix significance: 6.29 x_shift / 27 days: 105.0 y_shift / 27 days: 3.0 x_loc (+/- ~3 days): 197 y_loc (+/- ~3 days): 602 RA: 166.4529 Dec: -2.4913 nearest known obj: (620088) nearest known pix dist: 3.75 known obj shift / sec dur: 96.77, -1.54 nearest known mag: 22.748

best-ever frame

500 -

450 -

400 -

350 -

300 -

250

300

350

400

450











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Summary

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Extra figures

Neptune-Sized Planet











