



**WISCONSIN**  
UNIVERSITY OF WISCONSIN-MADISON

# TESS Full Frame Image Search for White Dwarf Exoplanets

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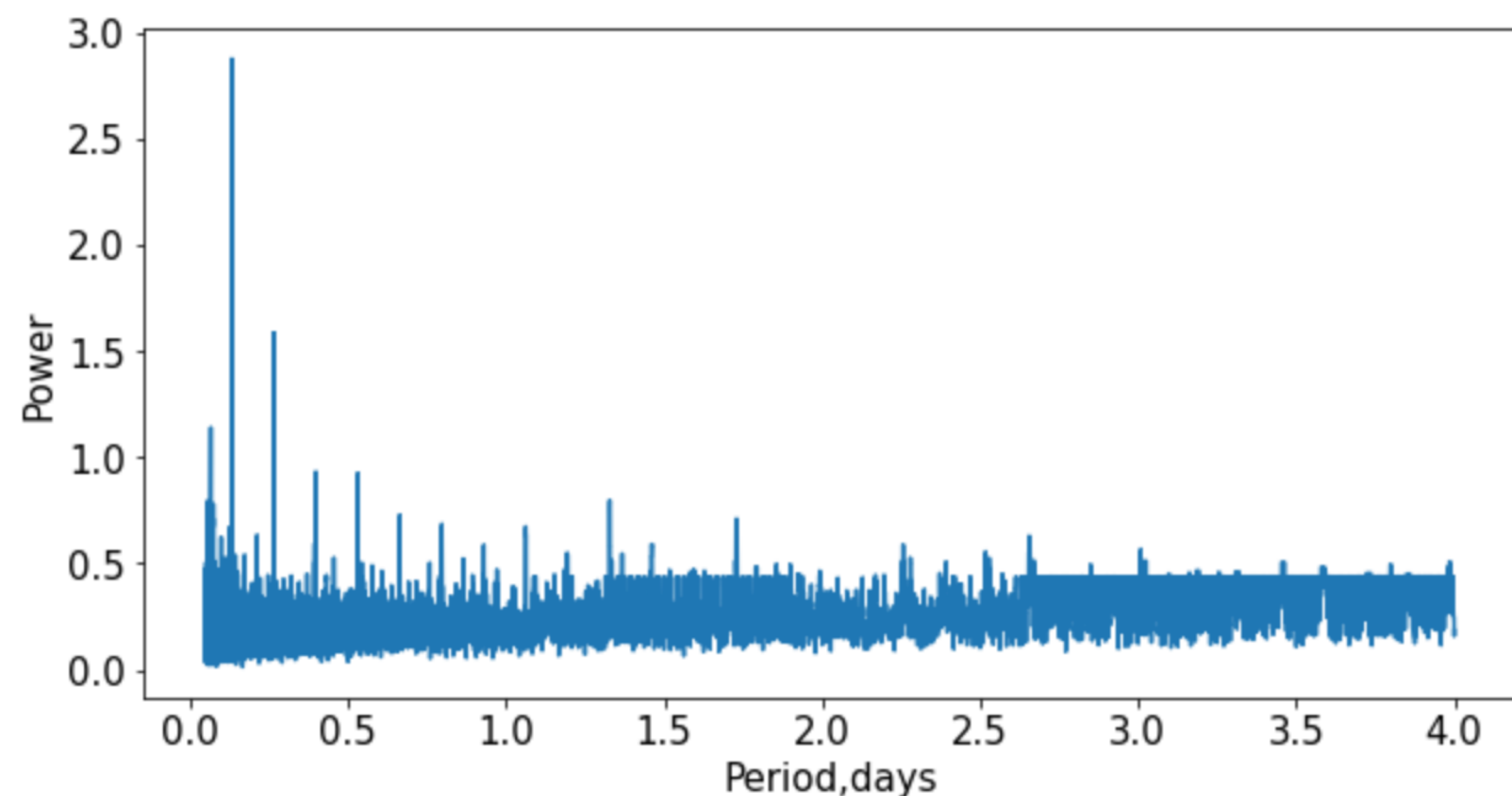
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## Science Objective

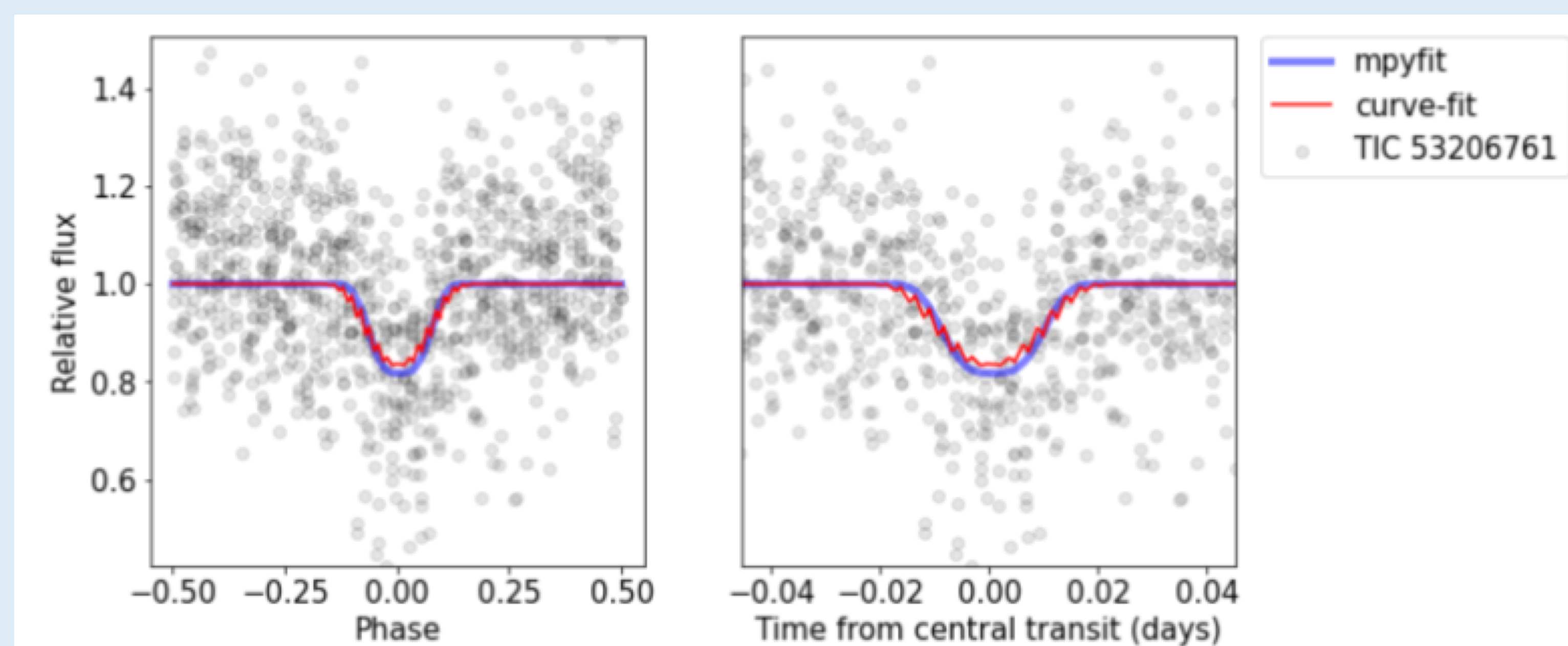
Identify rare exoplanets orbiting white dwarf stars by searching TESS Full Frame images to identify candidates and observing using moderate size telescopes to confirm exoplanet transits.

## Method

- TESS Full Frame Images taken every 10 - 30 minutes for 28 days.
- Search periods from 1 hour to 4 days
- Searching ~30,000 white dwarf (WD) star locations from GAIA DR2 and EDR3 with magnitudes < 18.0
- 3 to 30 minute transit durations for planets orbiting WD stars
- Several candidates identified, need to be confirmed with higher cadence TESS and/or ground observations



TESS light curve analyzed using box least squares periodogram to identify periodic signals.



Light curve is folded over the predicted period to identify transits.

Local 12" – 32" diameter telescopes can be used to observe TESS WD Exoplanet candidates because transits are deep!

An International collaboration is following up with observations on candidates using modest size telescopes



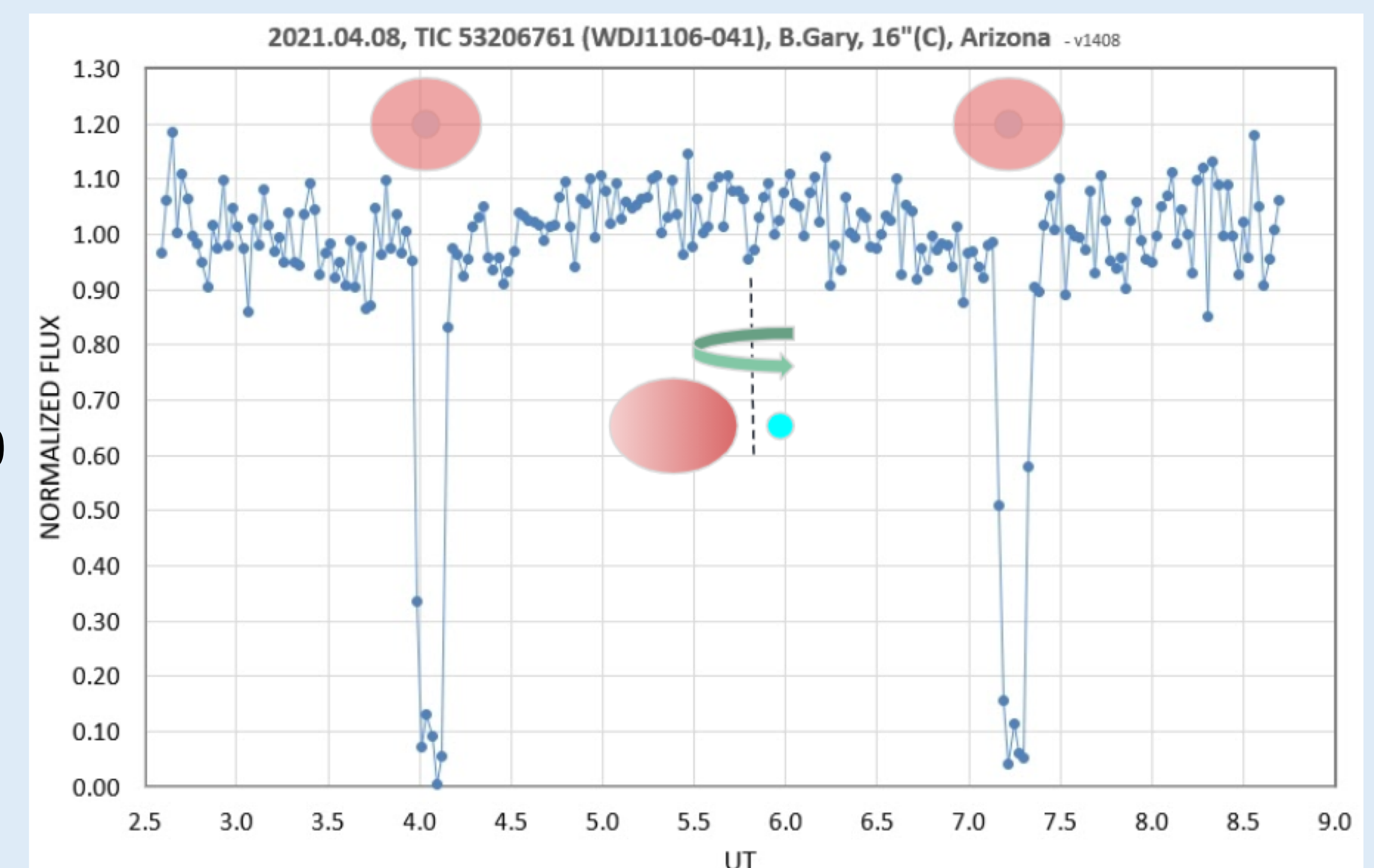
Observing Collaboration

1. UW Madison 16"
2. UW Milwaukee 14"
3. Yerkes - WI 24"
4. Josch Hamsch, ROADS, Chile 20"
5. Bruce Gary - AZ 16"
6. Kevin Balton - Benson, AZ 14"
7. Tom Kaye - JBO, AZ 32"
8. Adam Popowicz - Otivar, Spain - 12"
9. Adam Popowicz - Pyskowice, Poland - 12"
10. Barbara Harris - FL 16"
11. Arto Oksanen - A91 Finland 16"

## Preliminary Results

No exoplanets confirmed yet, but interesting binary identified with small red dwarf star transiting white dwarf every 3.2 hrs with 30 minute duration.

Illumination of oblong red dwarf has minimum flux during transits and maximum flux between transits

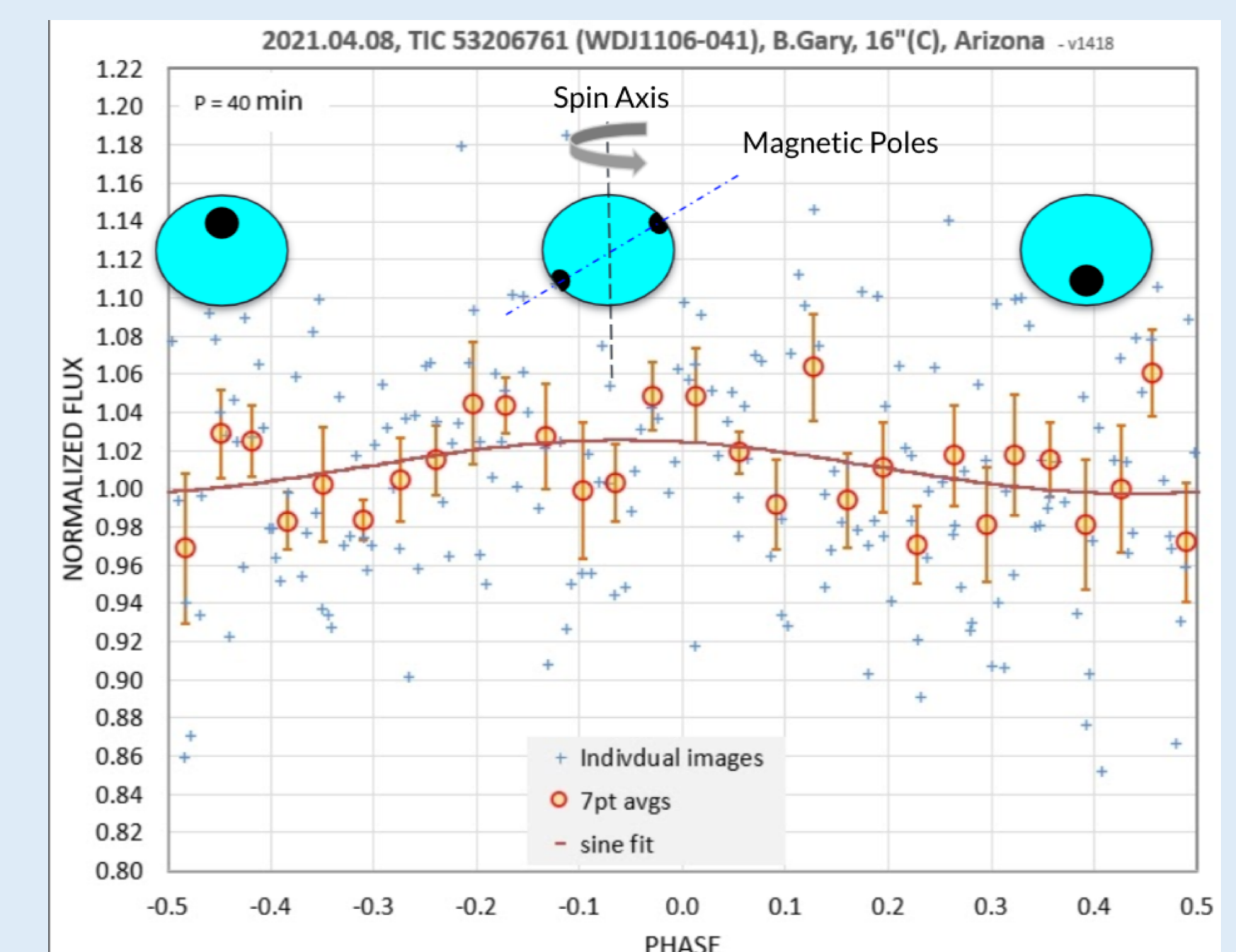


Observation by Bruce Gary, AZ

Potential star spot identified with 44 minute period. Flux is minimum as spots cross center of star and maximum as spots rotate to edge of star. Time of Arrival (TOA) measurements for transits and star spot minimums could possibly be used to confirm an exoplanet.

## Future Work

The pipeline is being refined. Our sensitivity to white dwarf exoplanet transits will improve as more 10 minute FFI and targeted 2 minute data becomes available. We hope to identify one or more promising candidates soon.



Observation by Bruce Gary, AZ



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