The Spotty Surface of the Blue Giant ξ Persei

Tahina Ramiaramanantsoa
(Arizona State University – tahina@asu.edu)

Anthony F. J. Moffat (Université de Montréal)

ASU School of Earth and Space Exploration
Arizona State University

Université de Montréal

NASA

MOST

TESS

Image Credit: Martin Rusterholz

ξ Persei

- Naked-eye visible — V = 4
- Hot star — T_{eff} = 33500 K
- Massive star — 26 $M_{\odot}$

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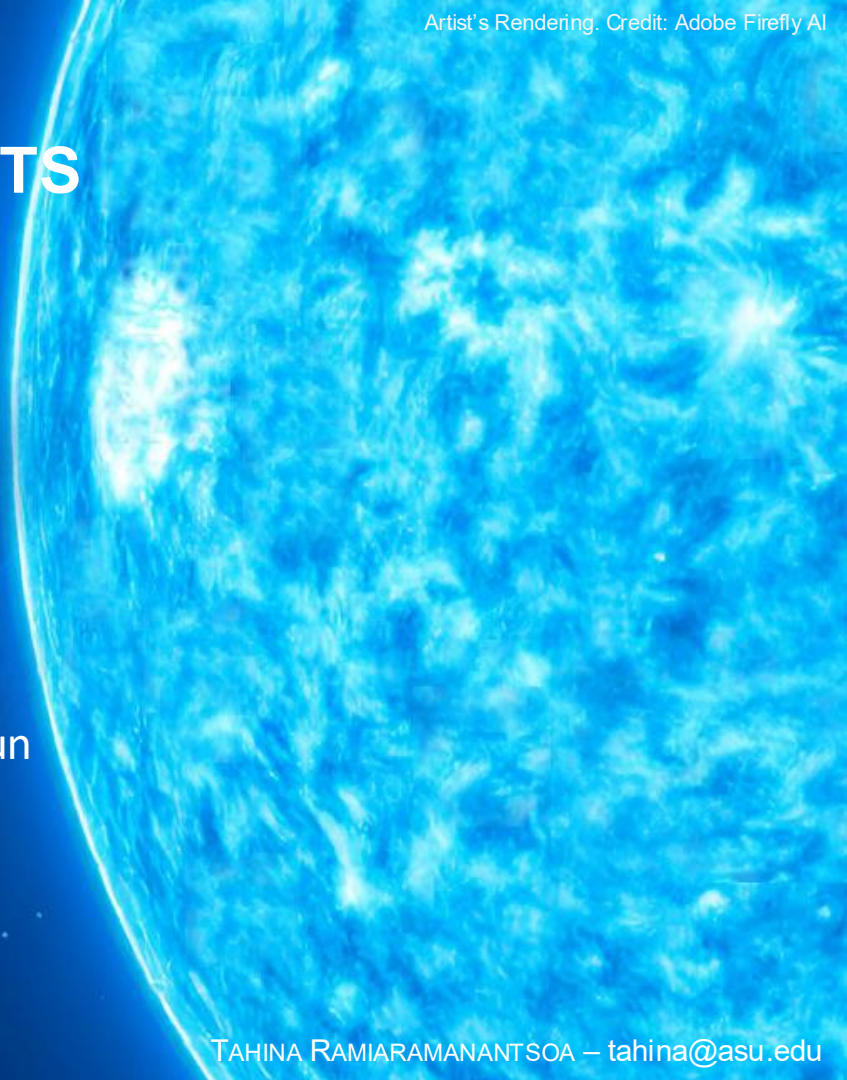
Arizona State University

Tahina Ramiaramanantsoa – tahina@asu.edu

Discovery Of Bright Spots On Hot Massive Stars

- Only two cases so far:
  - ζ Puppis (2018)
  - ξ Persei (this one)
- Unexpected:
  - Hot massive star structures are fundamentally different from that of the Sun
- Origins: Yet unknown



Artist's Rendering. Credit: Adobe Firefly AI

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Arizona State University

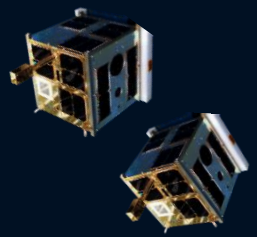
Tahina Ramiaramanantsoa – tahina@asu.edu

OBSERVATIONS

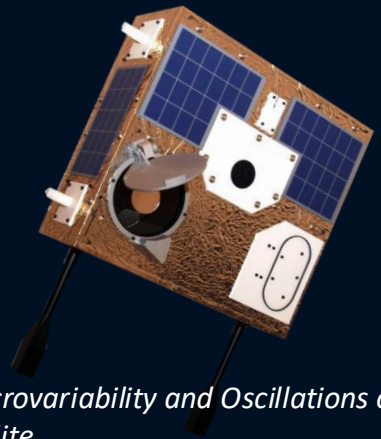
- 13 years of space-based optical photometric monitoring
- Probe light variations coming from the stellar surface

TESS (Transiting Exoplanet Survey Satellite)

(Pictures not to scale – Undeployed *TESS* is 20x bigger than *MOST* and 200x bigger than *BRITE*!)



BRITE (Bright Target Explorer) nanosatellites



MOST (Microvariability and Oscillations of Stars) microsatellite

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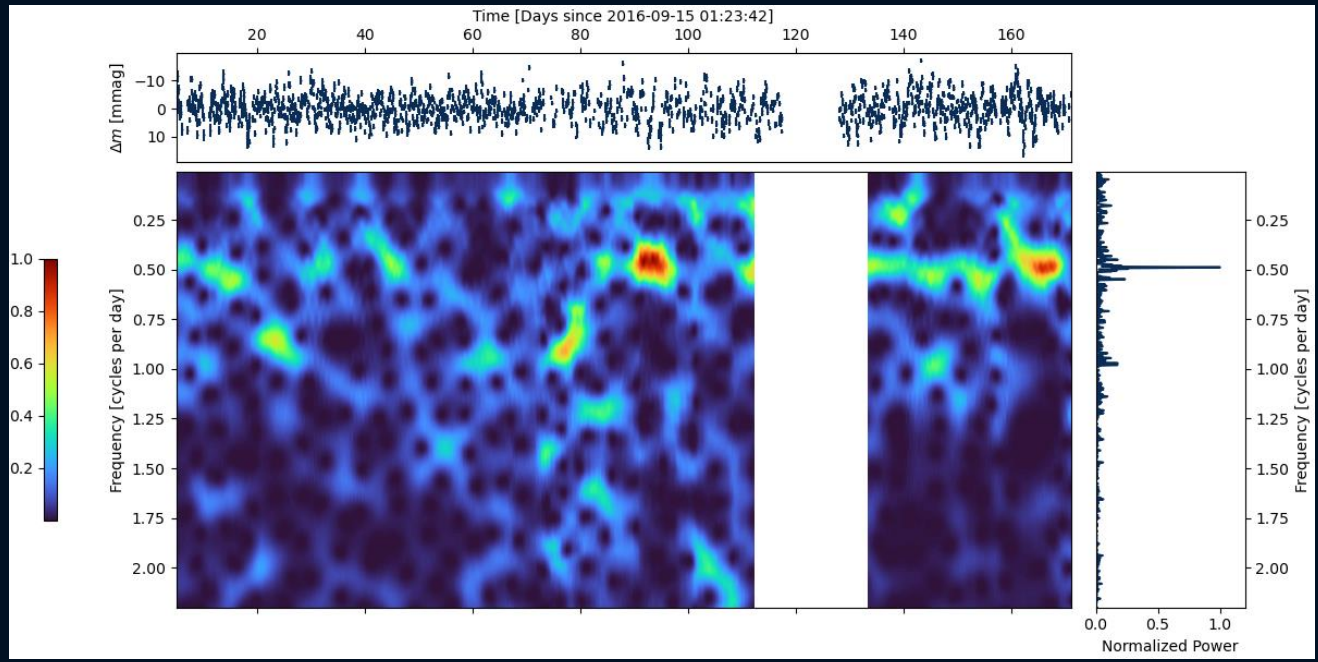
TAHINA RAMIARAMANANTSOA – tahina@asu.edu

Time–Frequency Analysis

- 2-day periodicity detected in all optical observations
- Behavior indicates rotational modulation caused by surface spots that come and go



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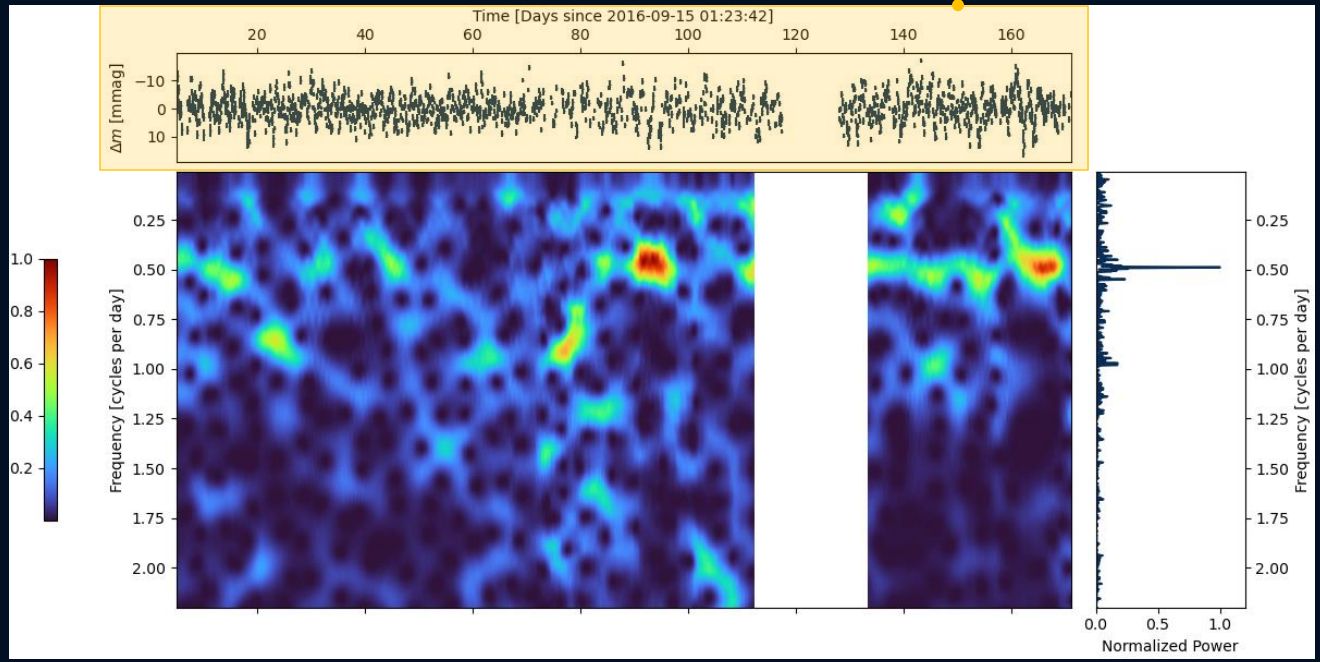
Variations of the light of ξ Persei over time as observed by *BRITE*



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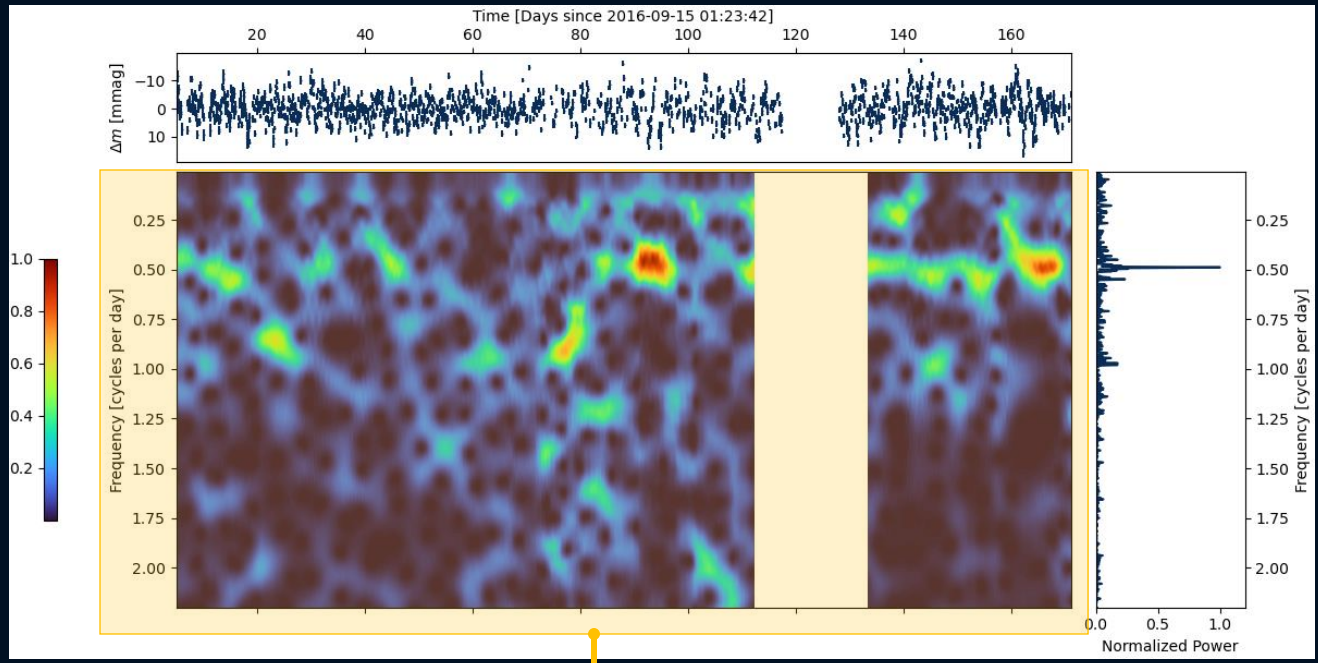

Time-frequency diagram: gives the strength of a signal in the observations at any given time

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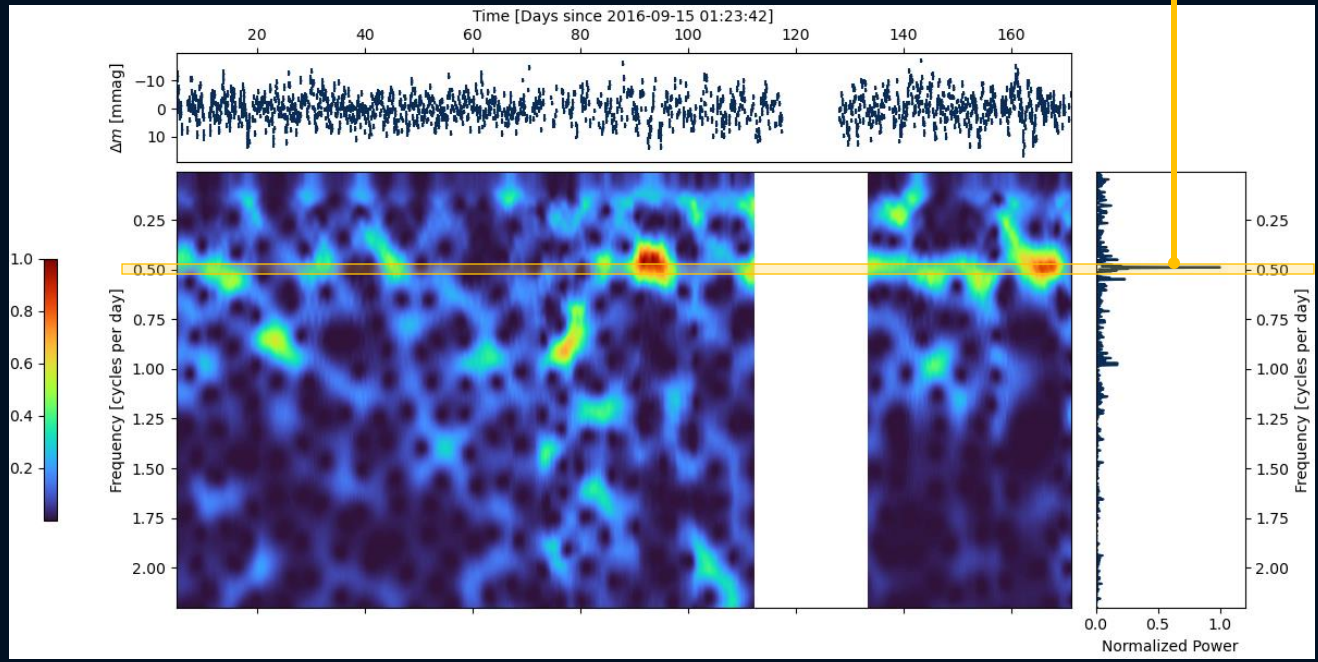

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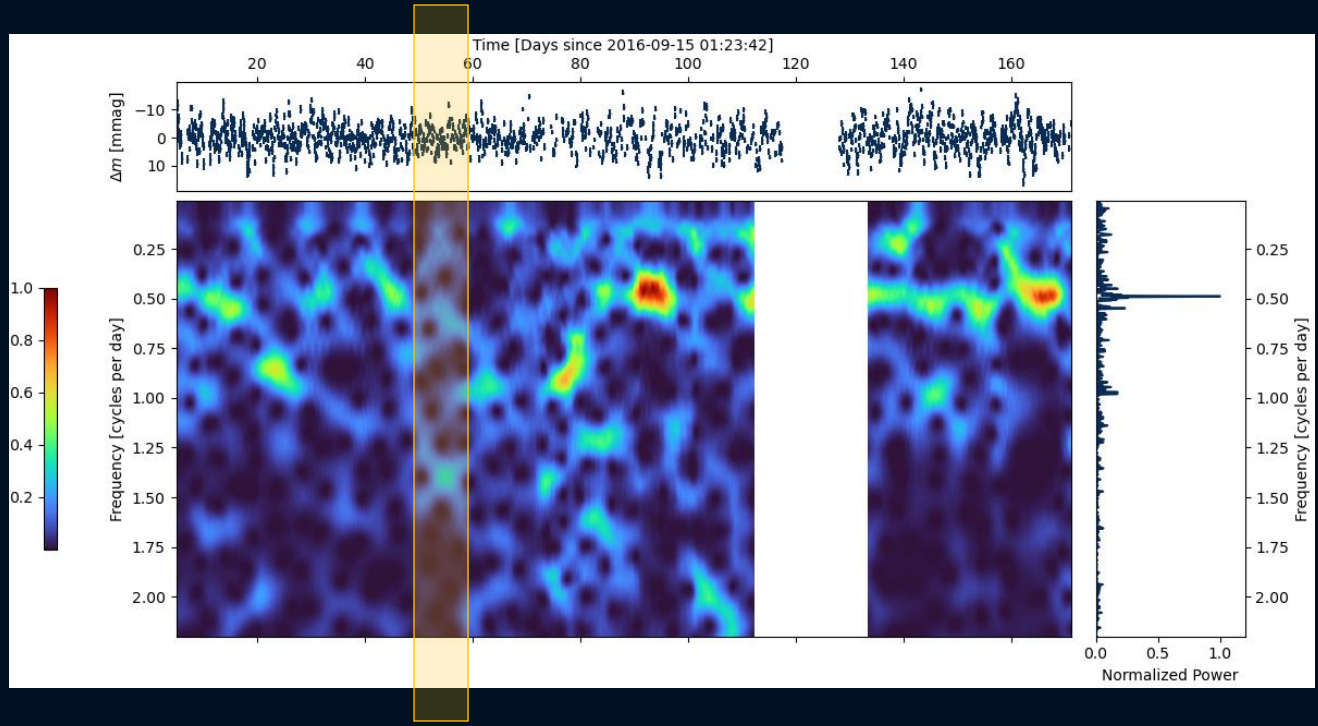

Just noisy stuff for about ten days, no periodicity

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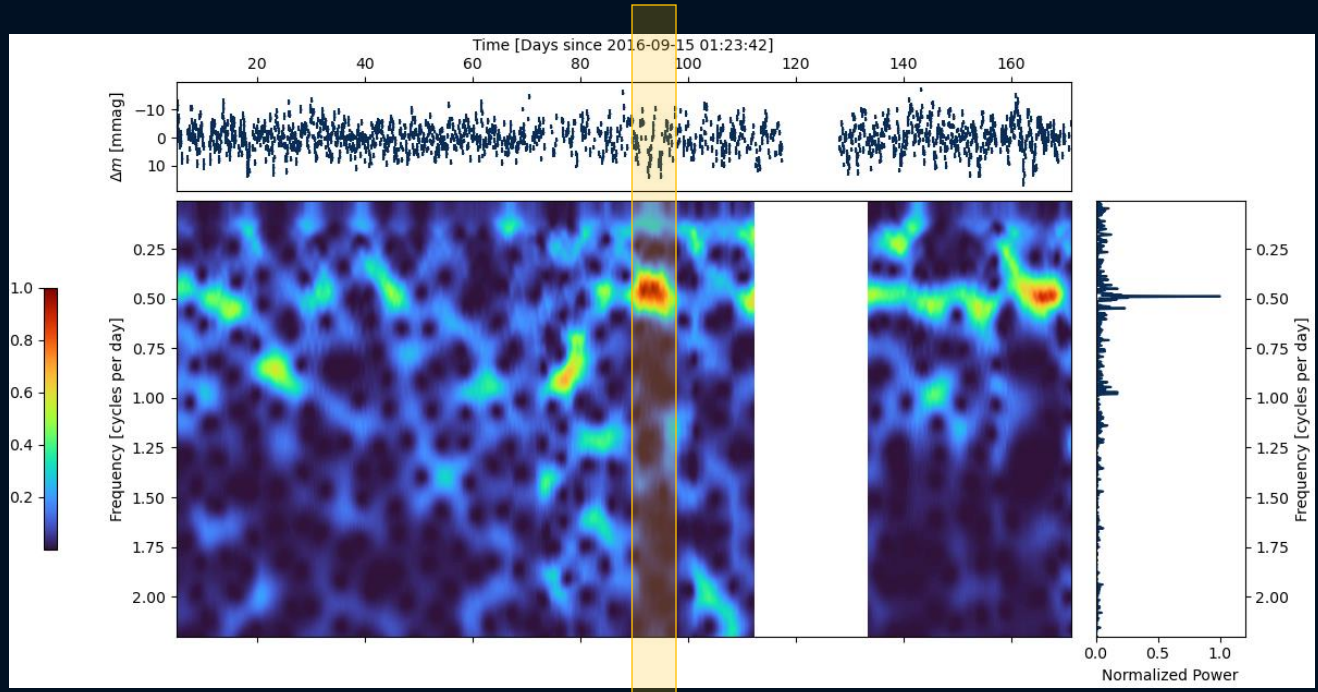

2-day periodicity is strong for about eight days

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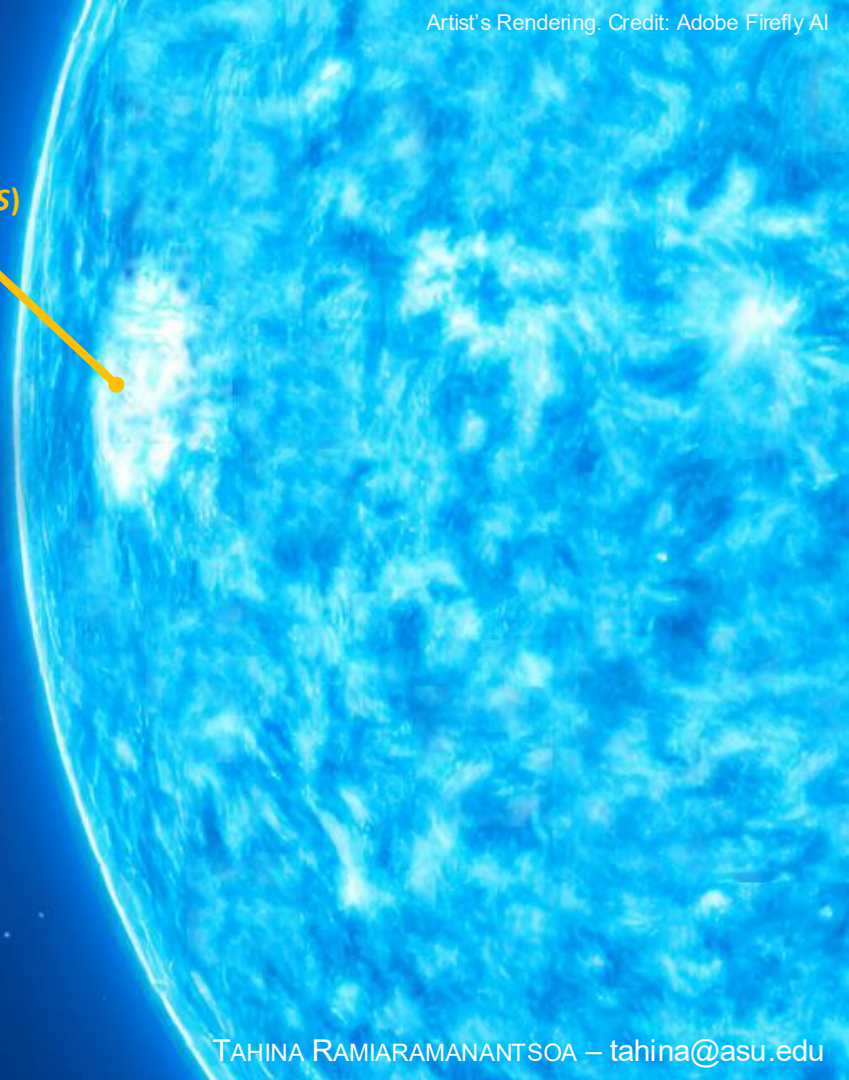
TAKEAWAY

13 years of space-based optical monitoring of the hot massive star ξ Persei with *MOST*, *BRITE*, and *TESS* revealed evidence of bright surface spots that are yet of unknown origins.

Contact: tahina@asu.edu



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