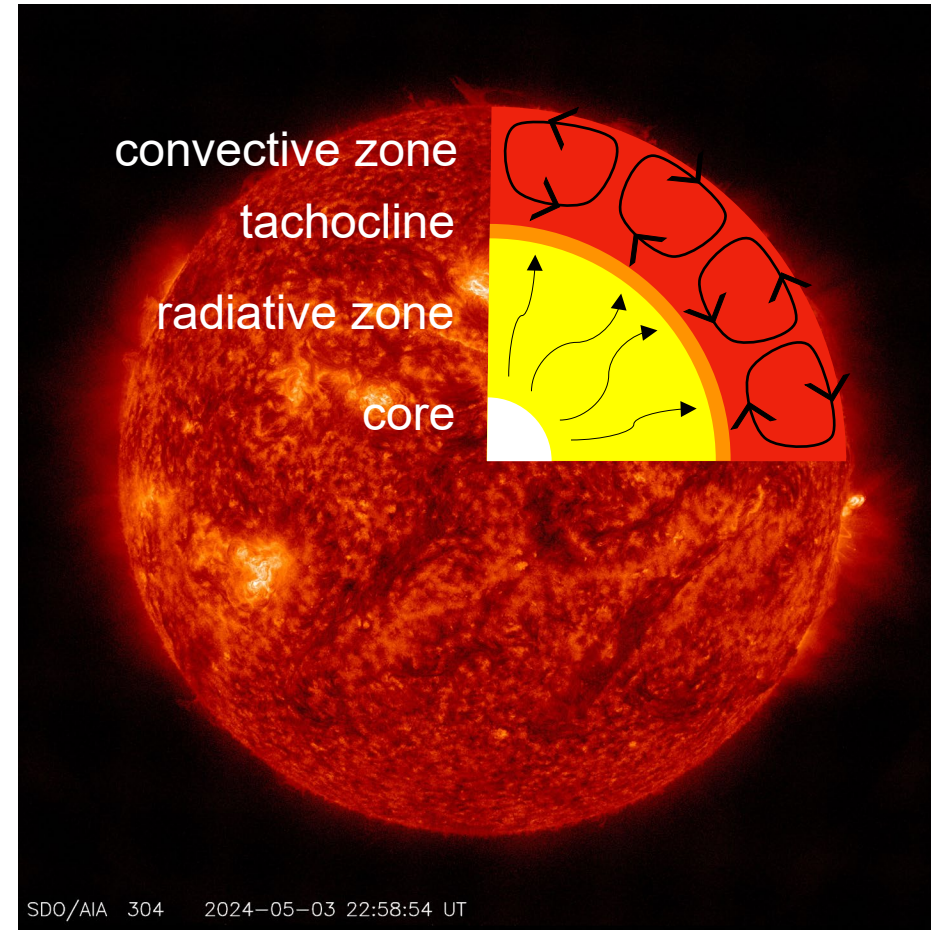




Interferometry and Sun-like Stars

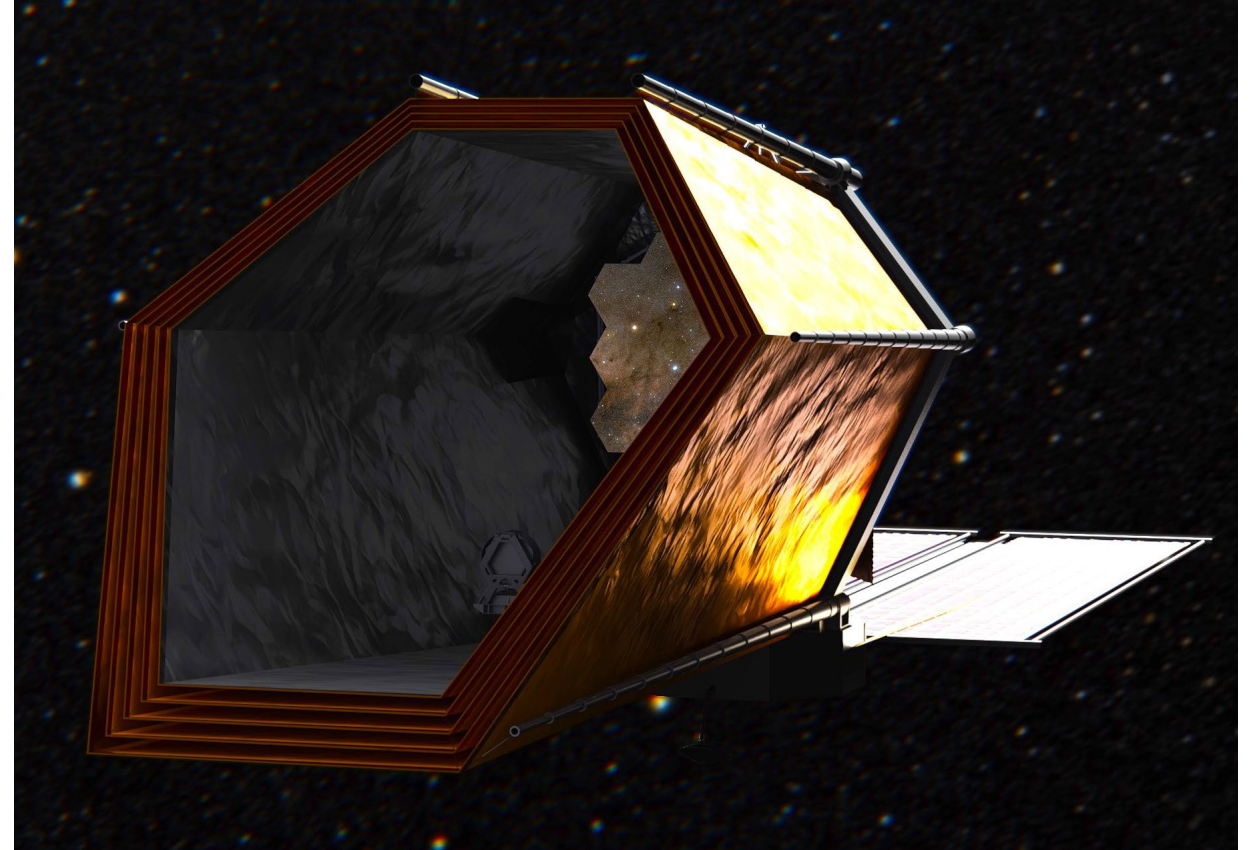
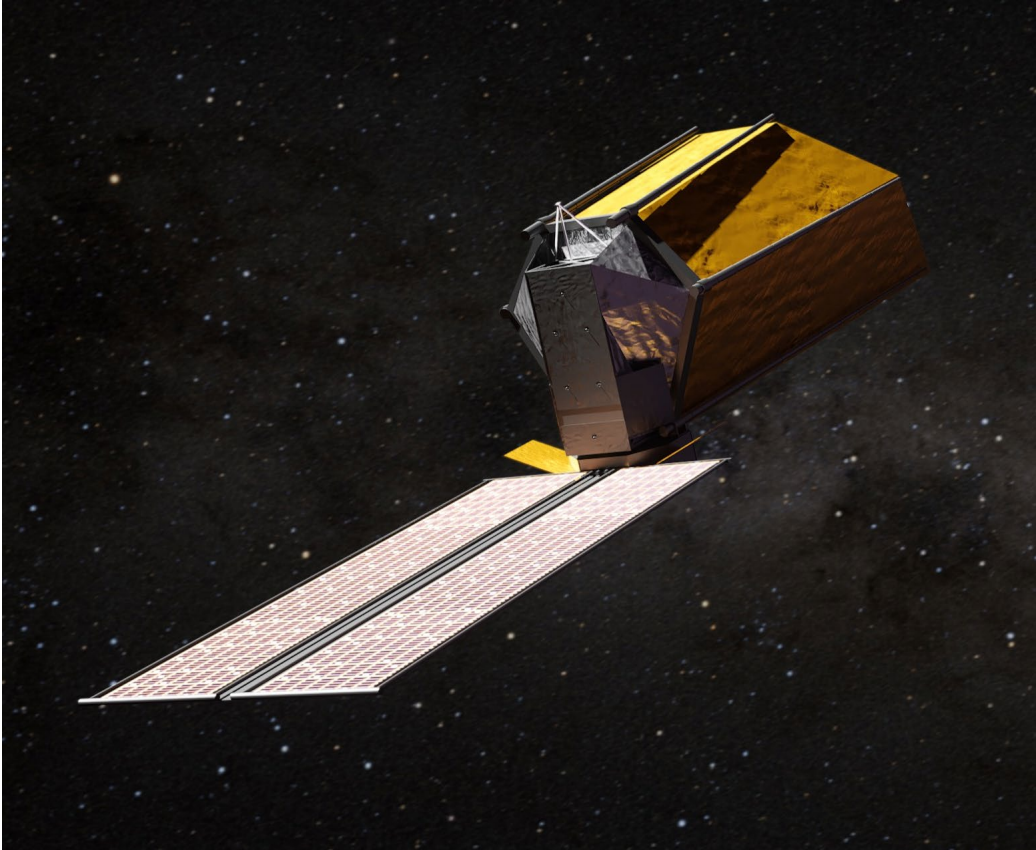
Rachael Roettenbacher
University of Michigan

Sun-like Stars



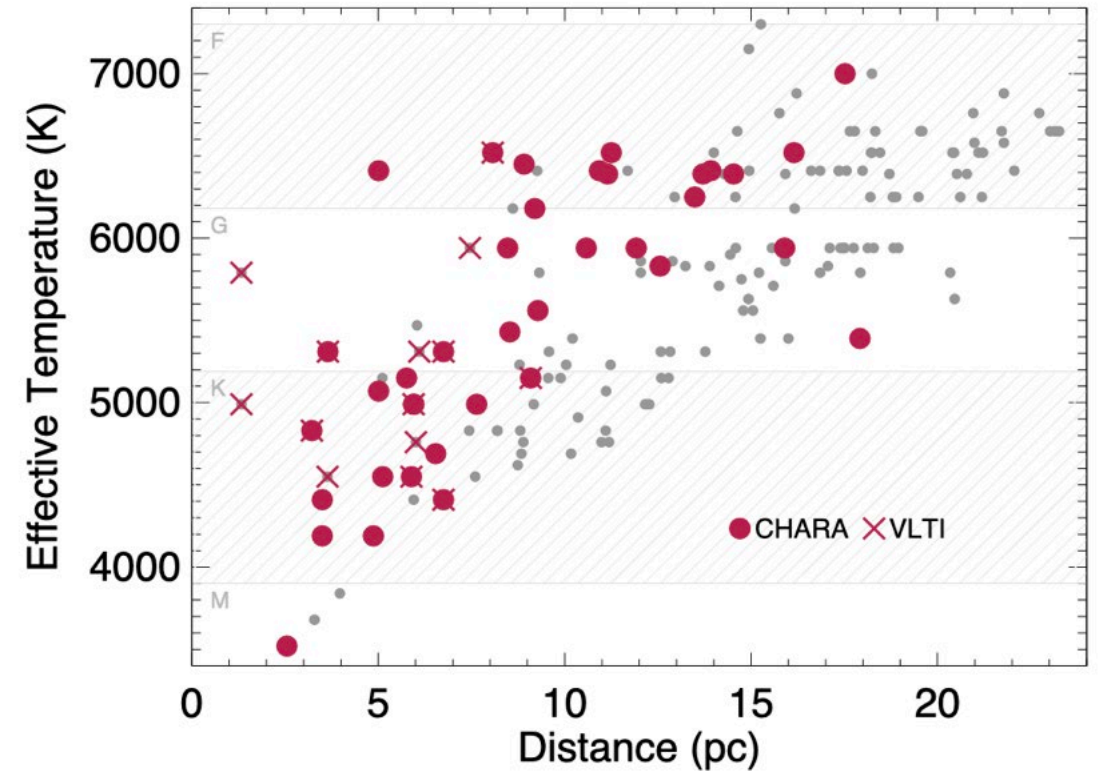
SOHO/RMR

Habitable Worlds Observatory



Habitable Worlds Observatory

- 42 HWO provisional target stars
 - 33 stars with $\theta > 1.0$ mas observable by the CHARA Array
 - 15 stars with $\theta > 1.7$ mas observable by VLTI
- Precise, consistent angular diameters
- Limb-darkening measurements
- Search for faint companions
- Image any surface asymmetries

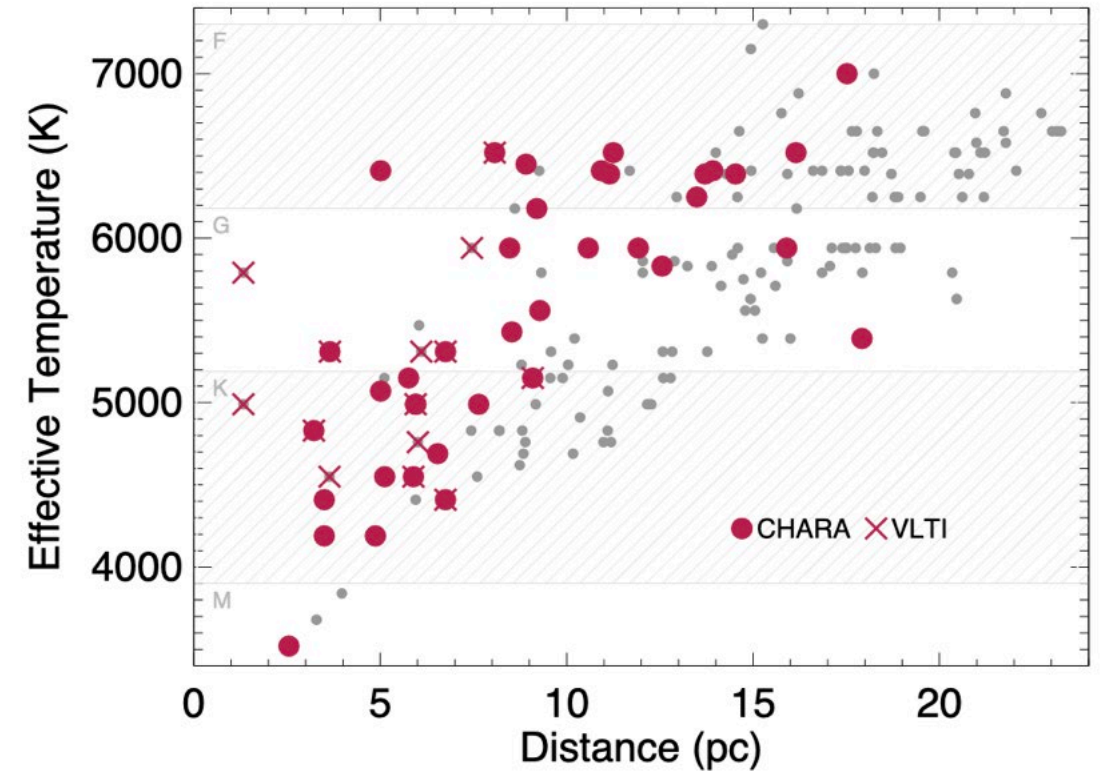


Supported by NASA Astrophysics Decadal Survey
Precursor Science Program

Collaborators: John Monnier, Narsi Anugu,
Ellyn Baines, Jordan Stone, Jayadev Rajagopal

Habitable Worlds Observatory

- 2025A 2 of 5 0.5 nights successful
 - GJ 380, GJ 411, β CVn, β Vir, ξ Boo A
- Ongoing radial velocities (EXPRES)
- Coordinating with AAVSO

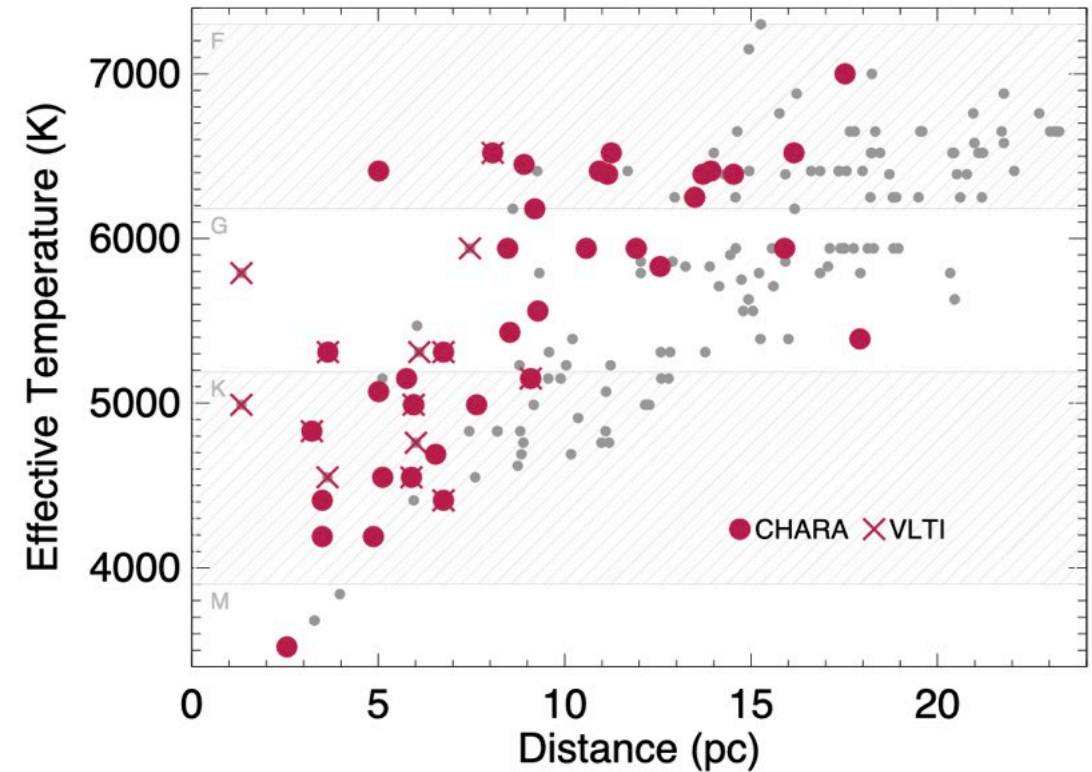


Supported by NASA Astrophysics Decadal Survey
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Collaborators: John Monnier, Narsi Anugu,
Ellyn Baines, Jordan Stone, Jayadev Rajagopal

Future Work with HWO Provisional Targets

- First measurements coming soon!
- Proposals submitted for 2025B and P116
- To continue at the CHARA Array through 2027A

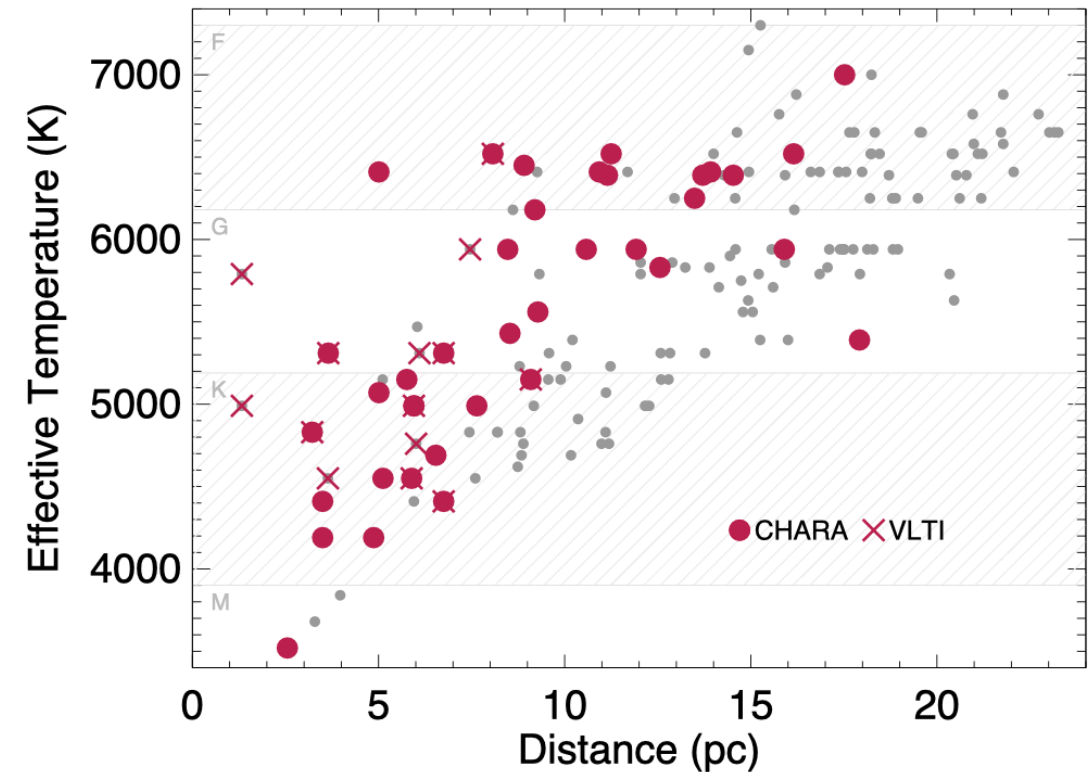


Supported by NASA Astrophysics Decadal Survey
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Future Work with HWO Provisional Targets

- First measurements coming soon!
- Proposals submitted for 2025B and P116
- To continue at the CHARA Array through 2027A
- Expanding sample size with SPICA

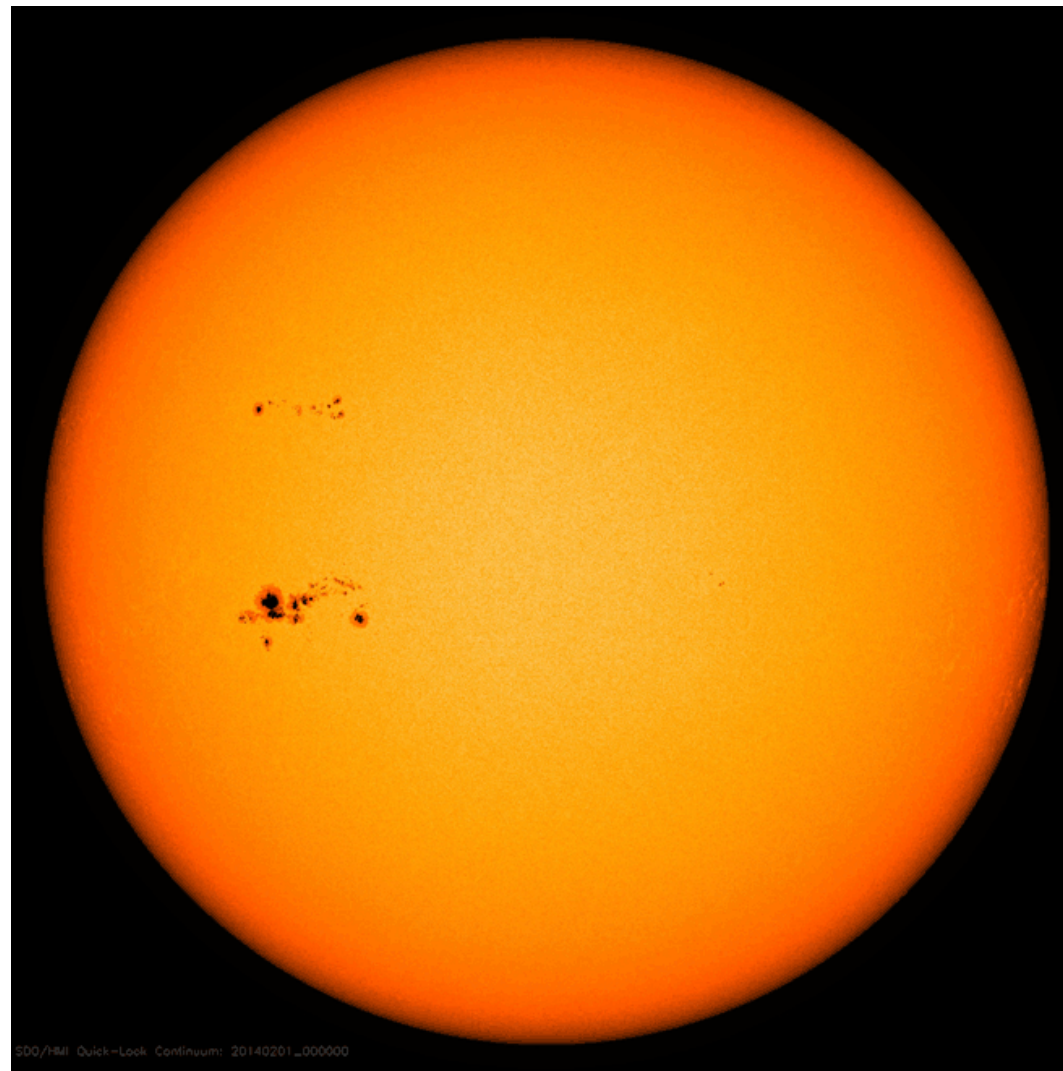


Supported by NASA Astrophysics Decadal Survey
Precursor Science Program

Collaborators: John Monnier, Narsi Anugu,
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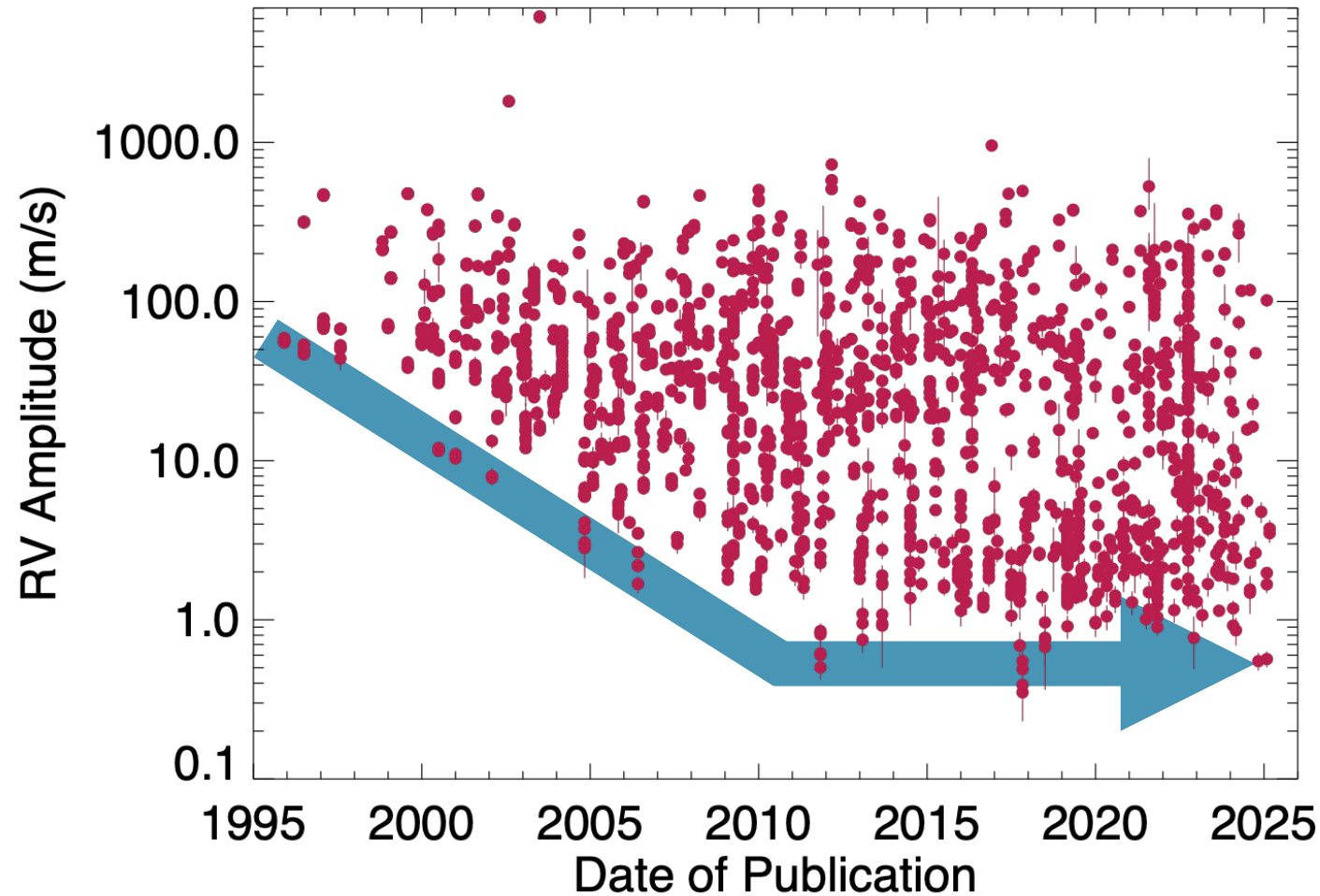


Magnetic Activity



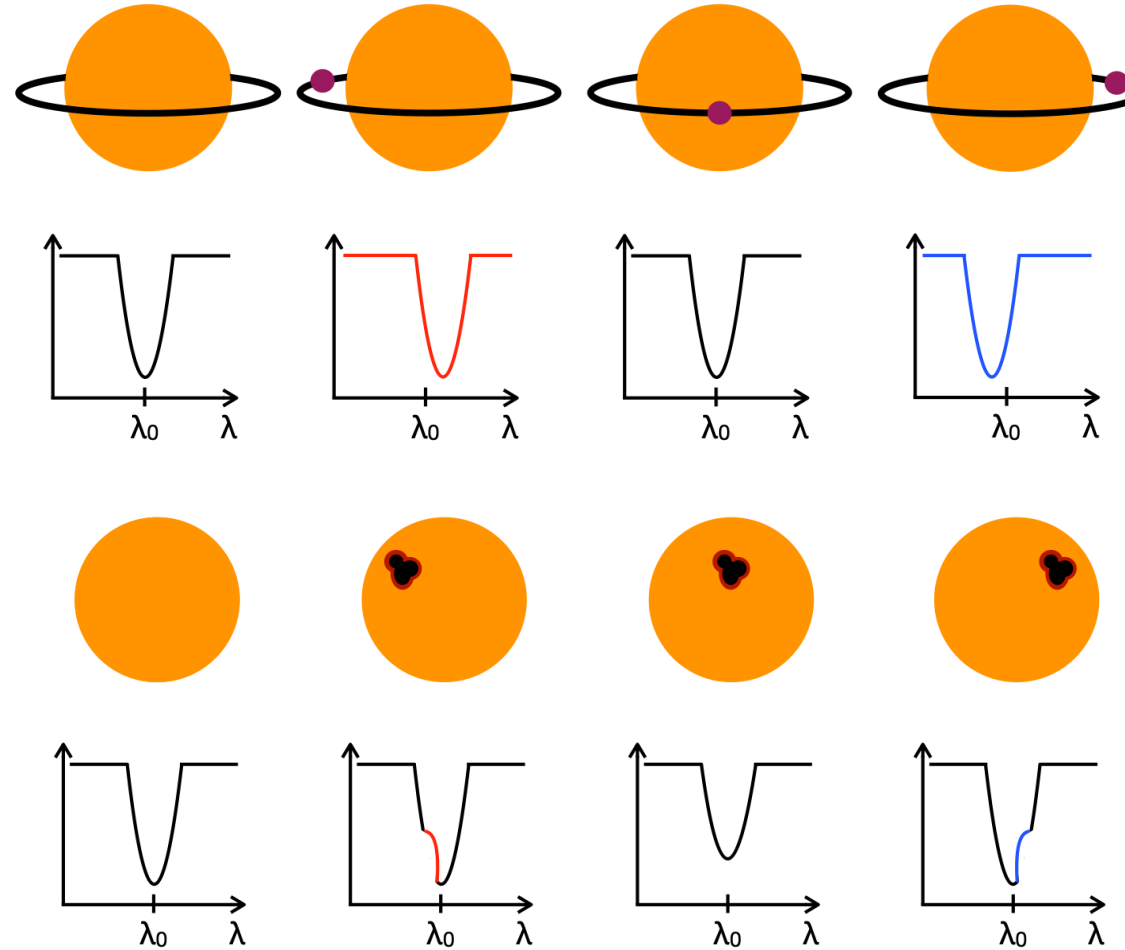
SDO/HMI/NASA

Radial Velocity Exoplanet Studies



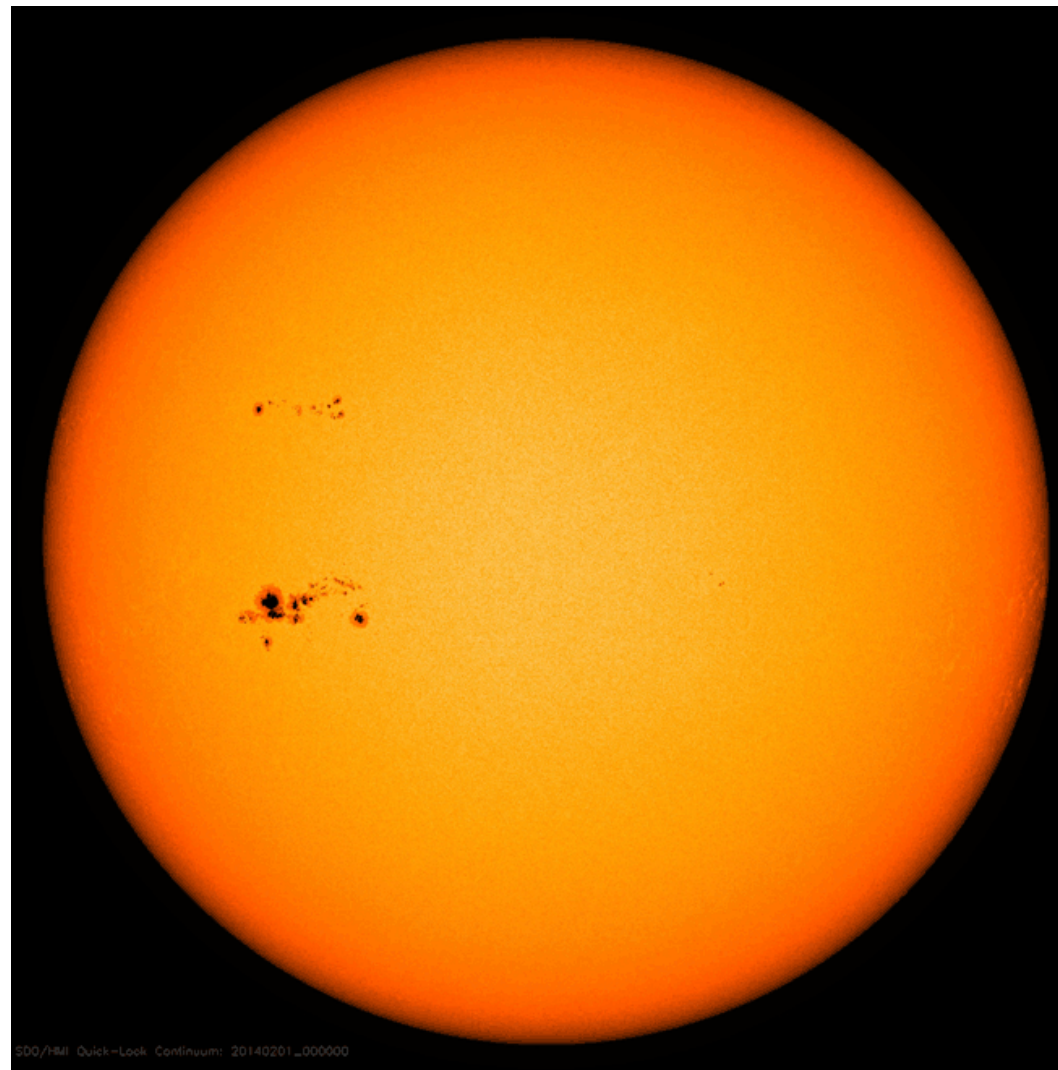
NASA Exoplanet Archive

Radial Velocity Exoplanet Studies





Magnetic Activity

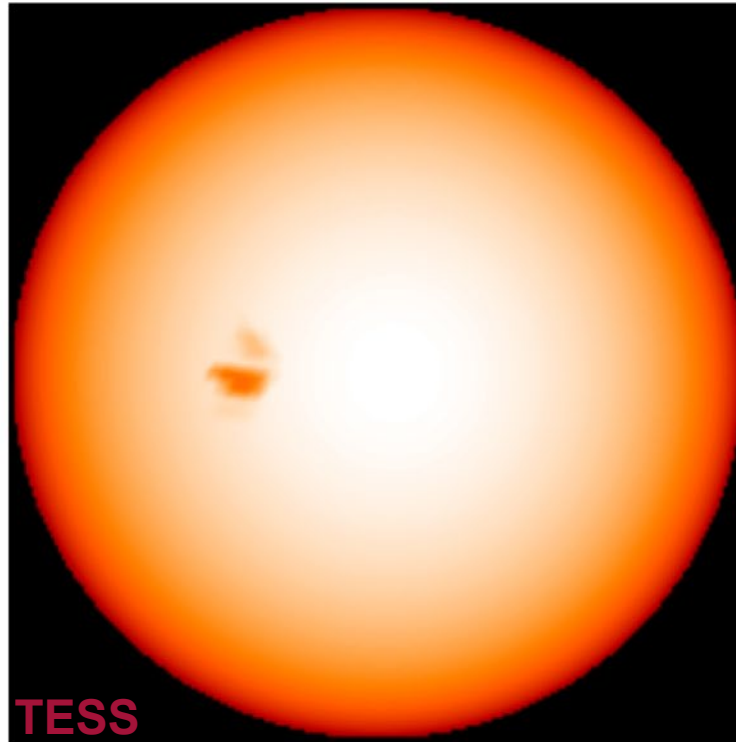


SDO/HMI Quick-look Continuum: 20140201_000000

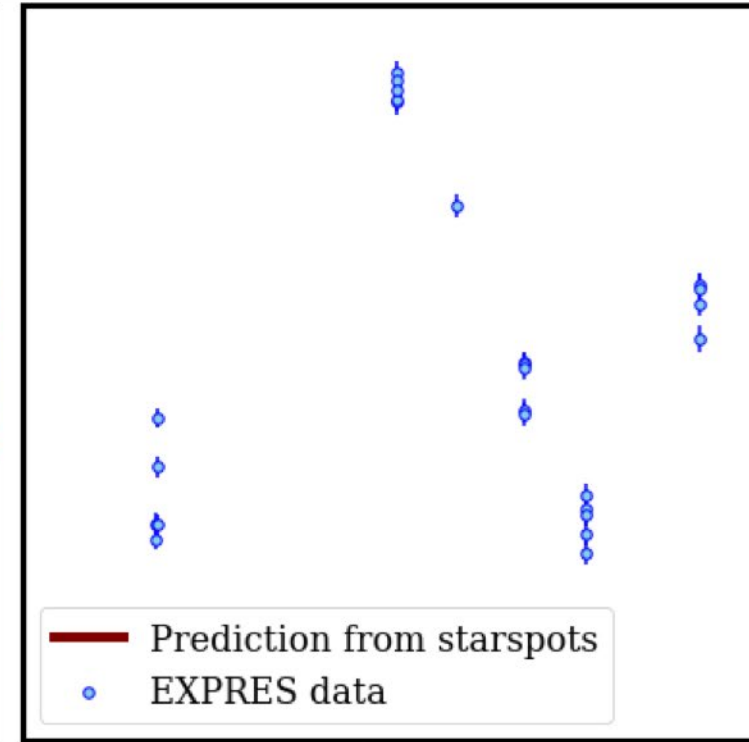
SDO/HMI/NASA

Magnetic Activity

ϵ Eridani



Visualization by S. Cabot

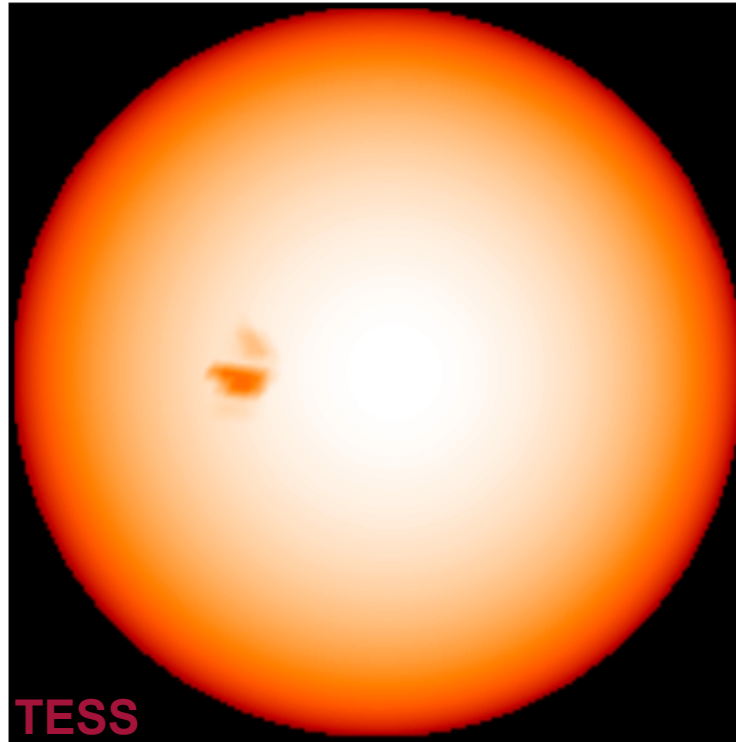


~20 m/s

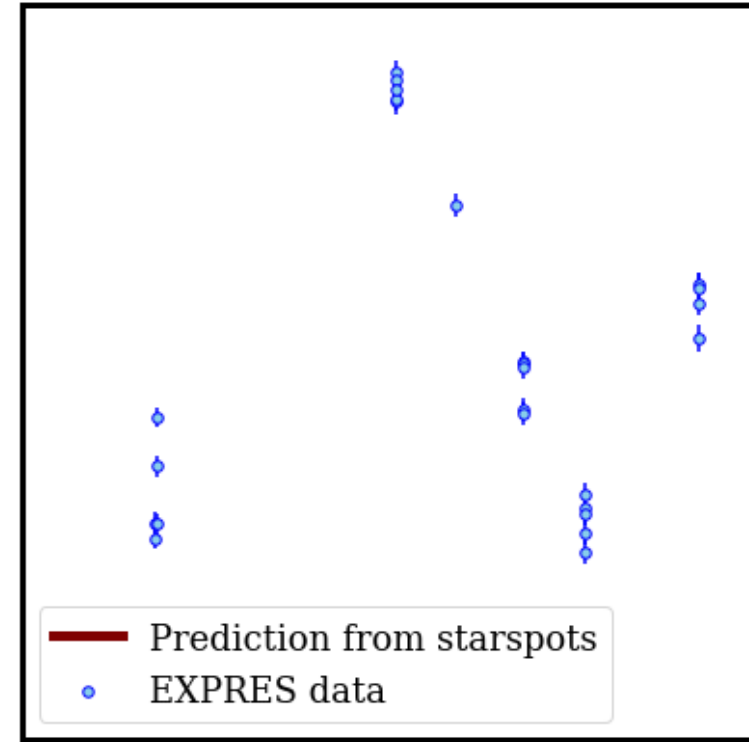
Roettenbacher et al. 2022

Magnetic Activity

ϵ Eridani



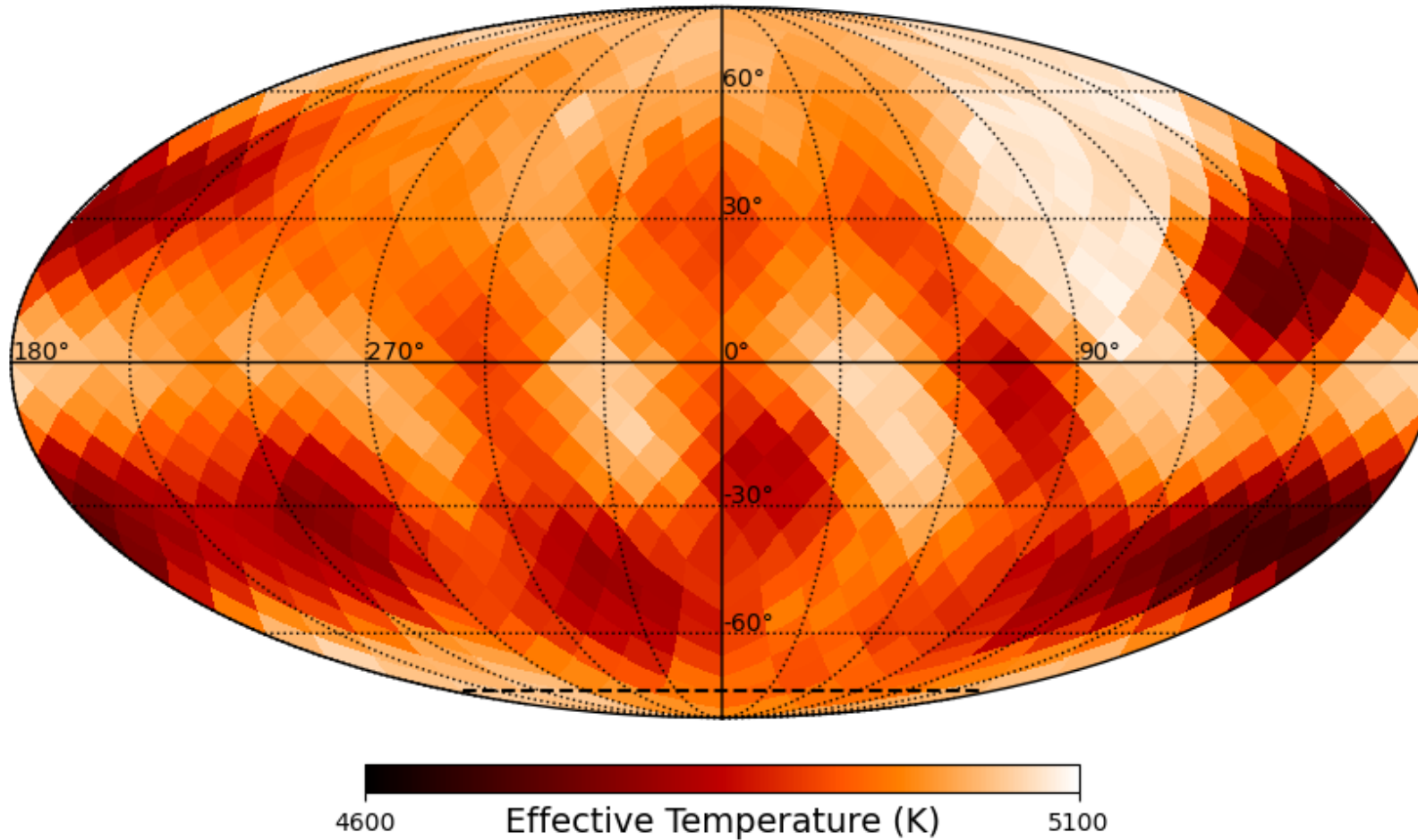
Visualization by S. Cabot



~20 m/s

Roettenbacher et al. 2022

Interferometric Temperature Map of ϵ Eri

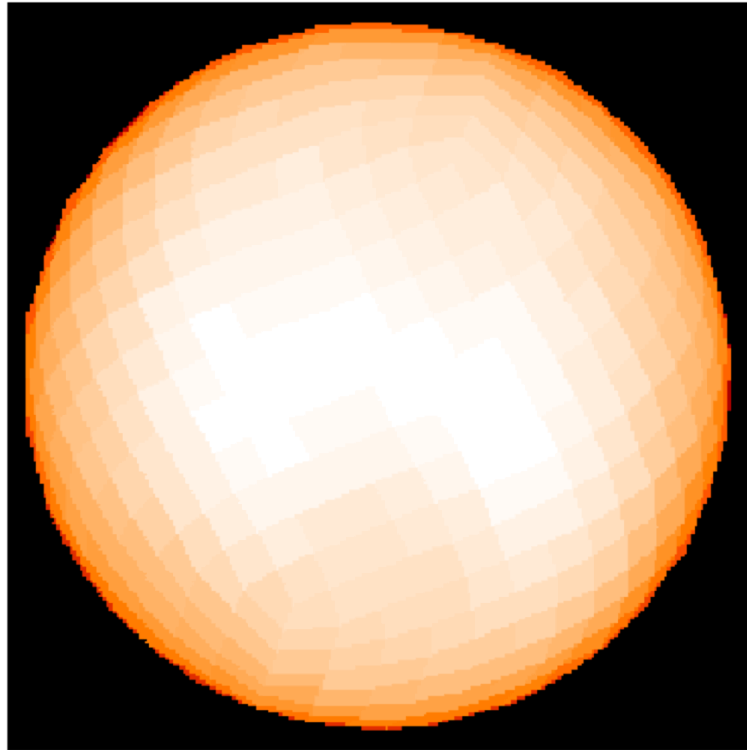


MIRC-X

Interferometry and
Sun-like Stars

Roettenbacher et al. in prep.

Interferometric Image of ϵ Eri



Limb-darkening

$\theta_{LD} = 2.15$ mas

MIRC-X



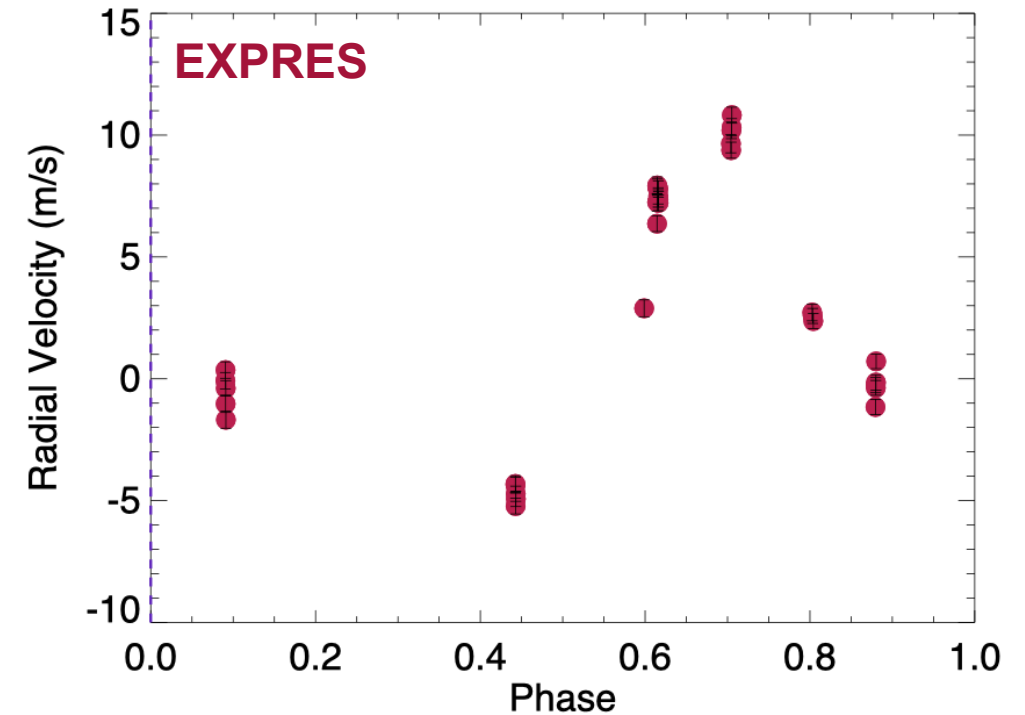
No limb-darkening

Roettenbacher et al. in prep.

Radial Velocity Observations of ϵ Eri



No limb-darkening



MIRC-X

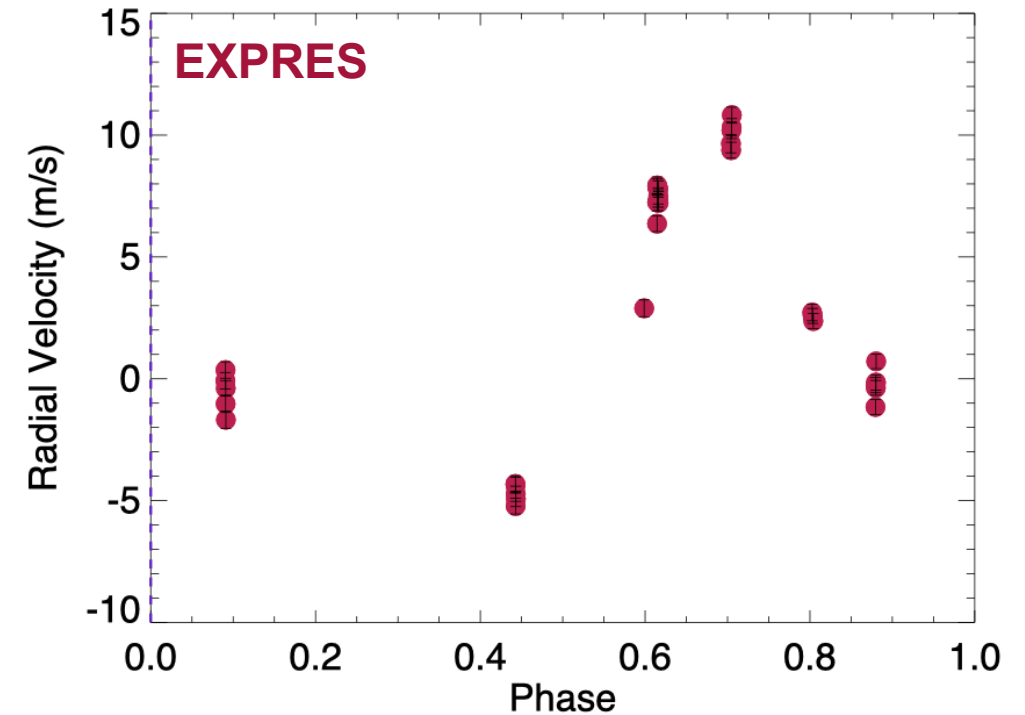
Roettenbacher et al. in prep.

Radial Velocity Observations of ϵ Eri



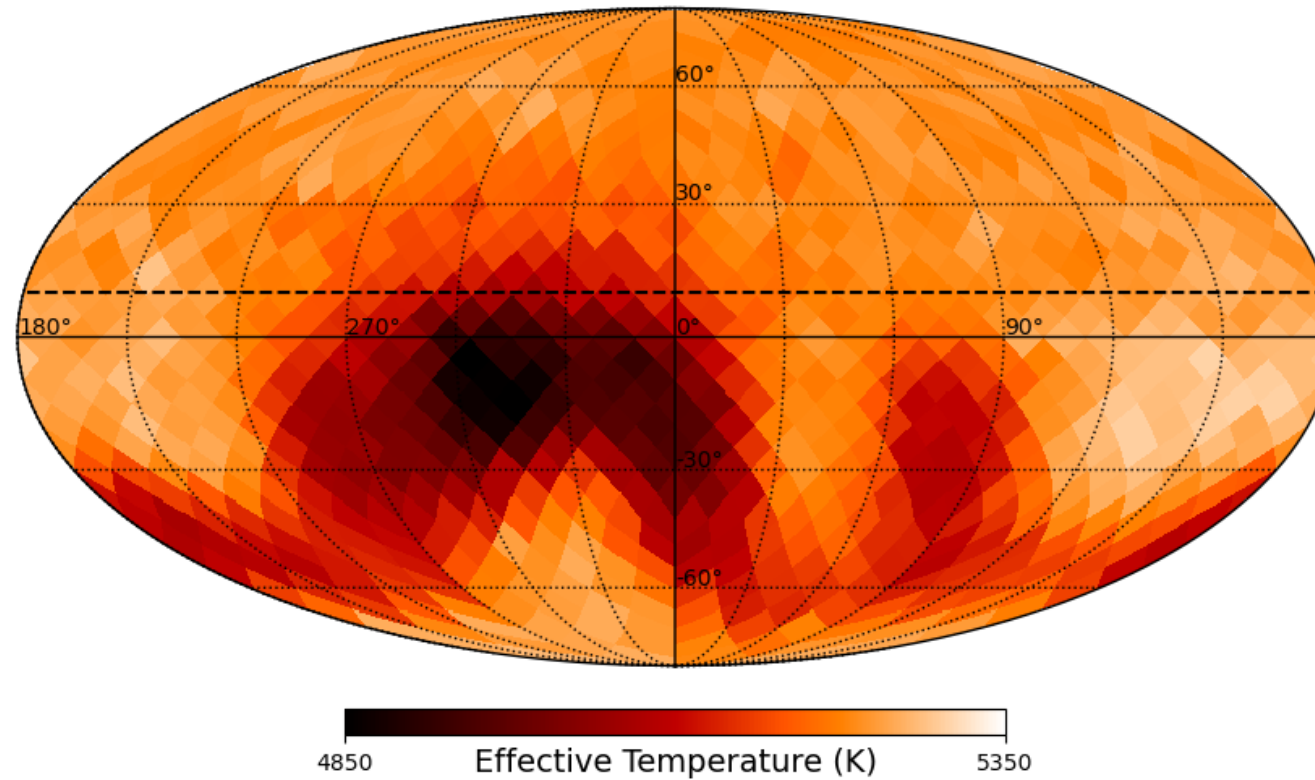
No limb-darkening

MIRC-X



Roettenbacher et al. in prep.

Interferometric Image of τ Ceti

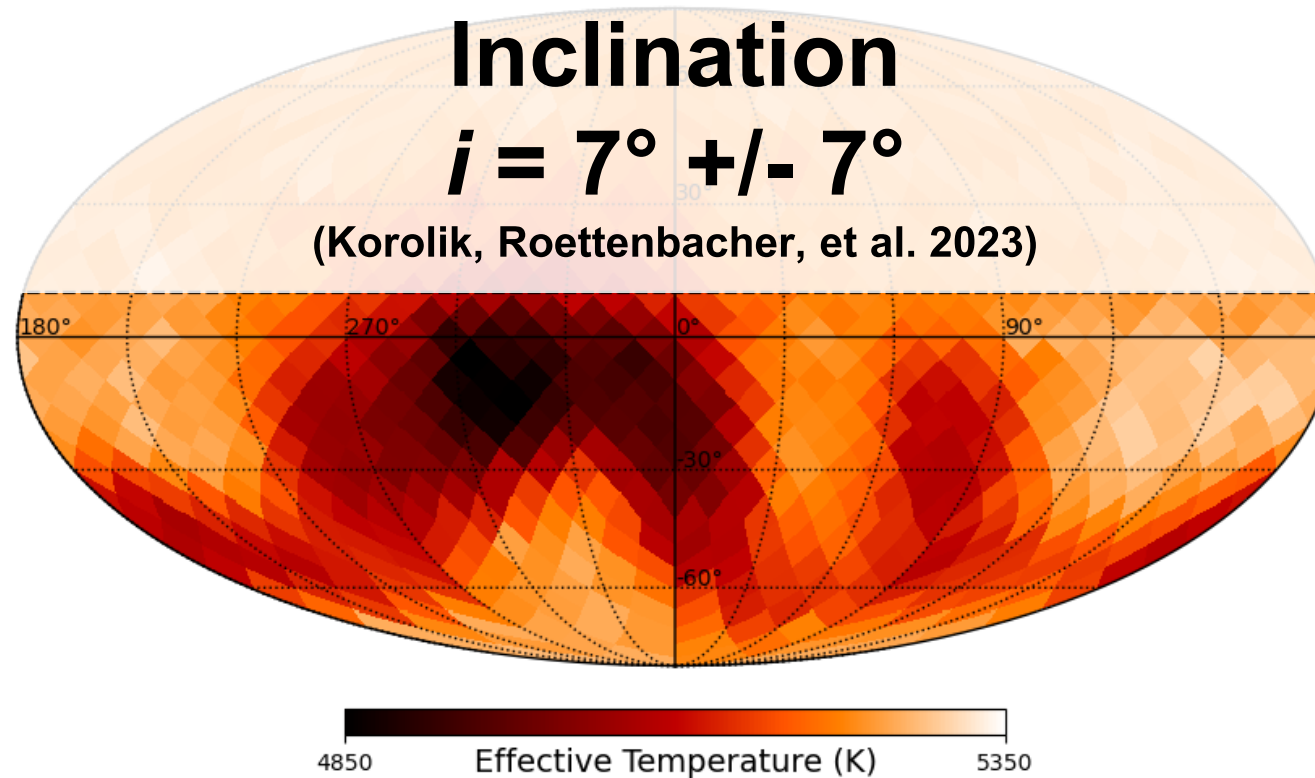


MIRC-X

Interferometry and
Sun-like Stars

Roettenbacher et al. in prep.

Interferometric Image of τ Ceti

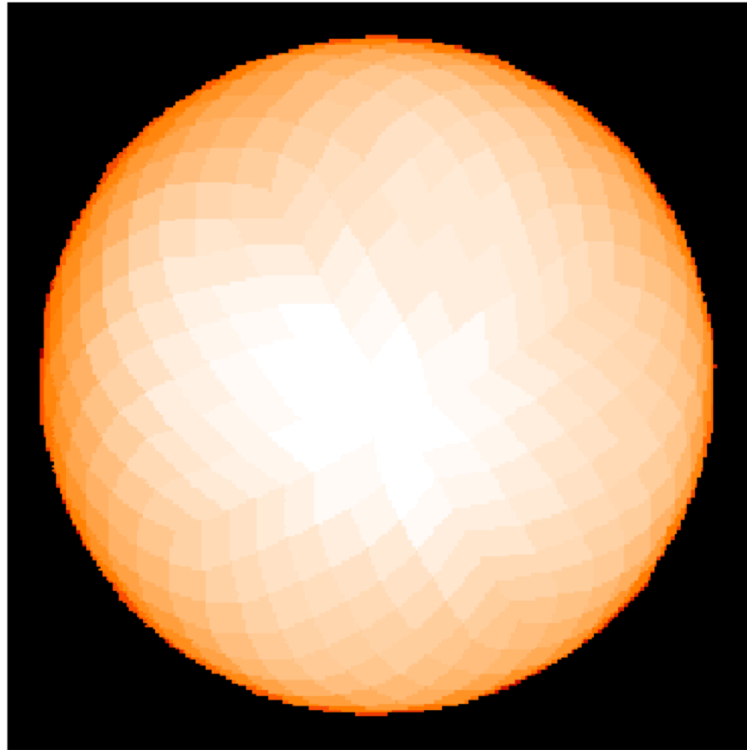


MIRC-X

Interferometry and
Sun-like Stars

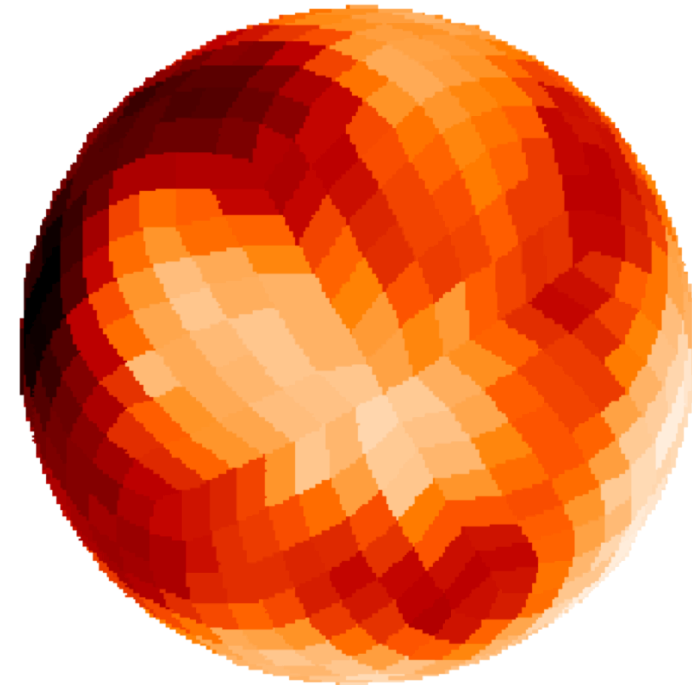
Roettenbacher et al. in prep.

Interferometric Image of τ Ceti



Limb-darkening

$\theta_{LD} = 2.02$ mas

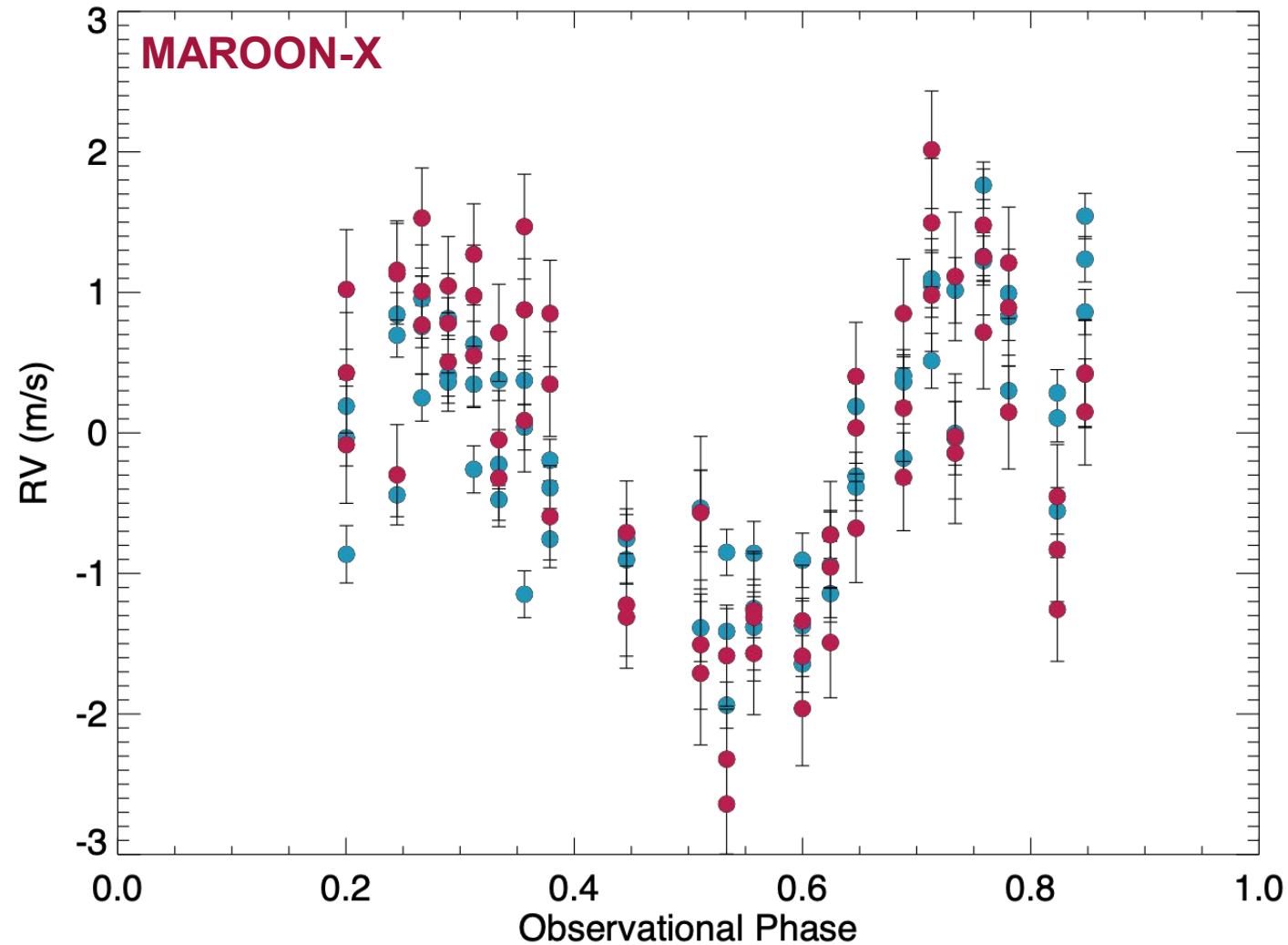


No limb-darkening

MIRC-X

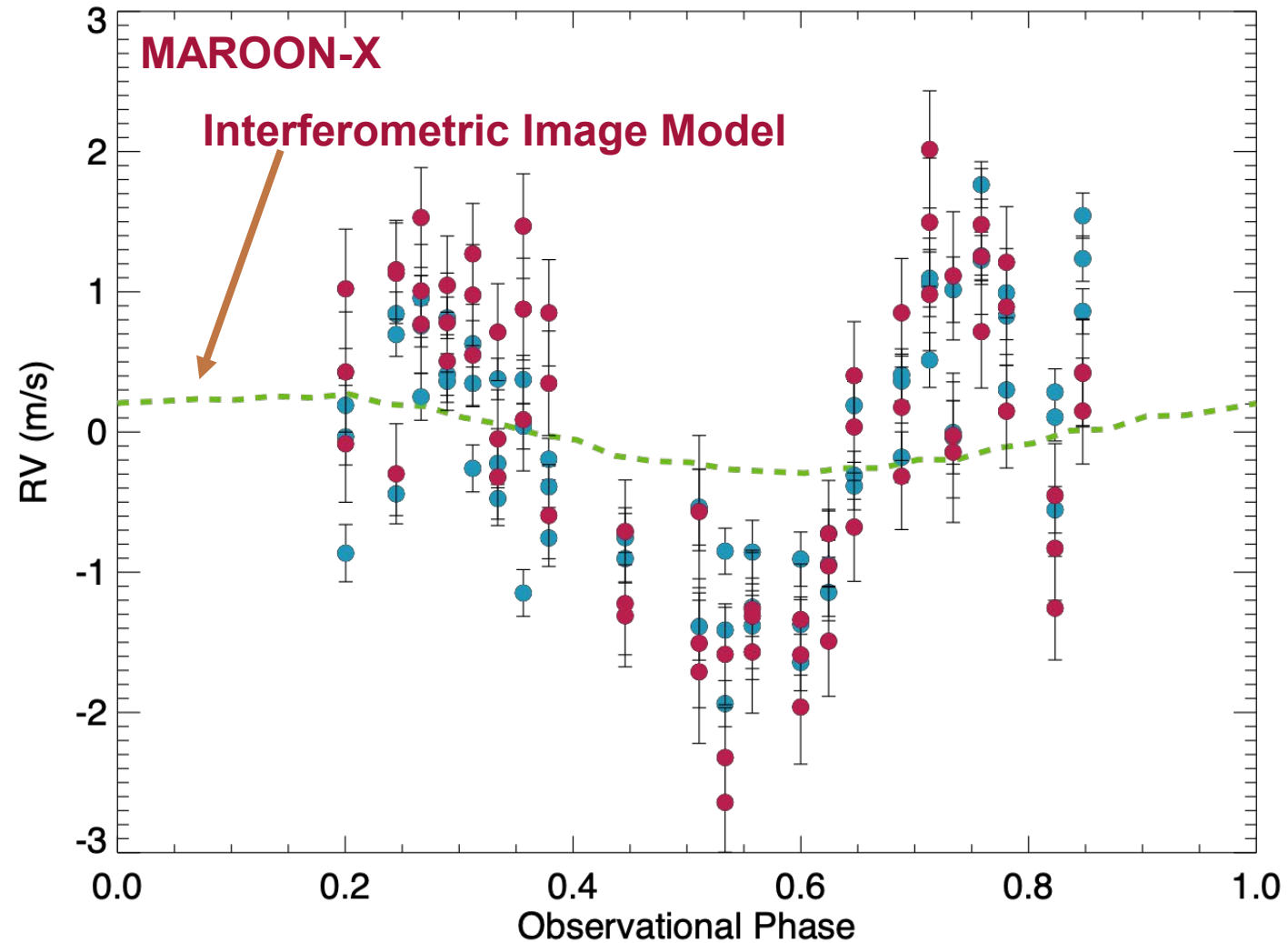
Roettenbacher et al. in prep.

Radial Velocity Observations of τ Ceti



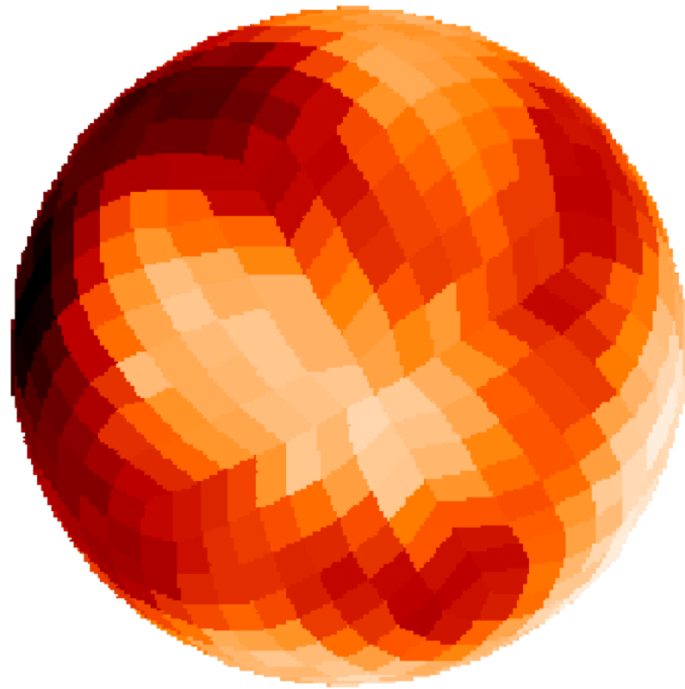
Roettenbacher et al. in prep.

Radial Velocity Observations of τ Ceti

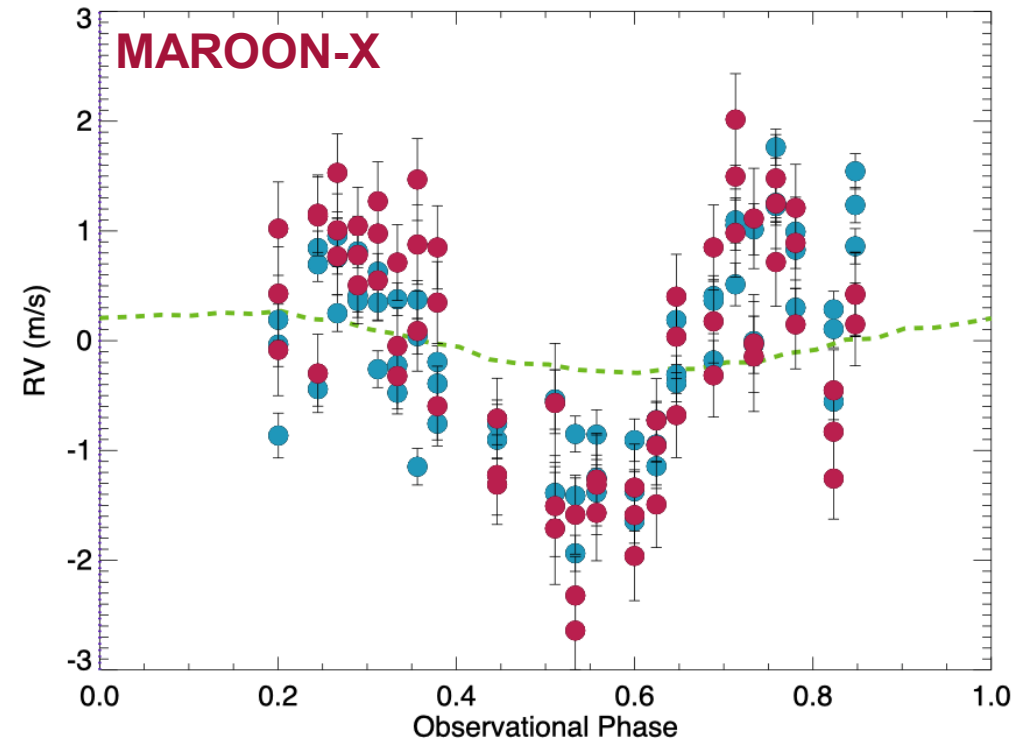


Roettenbacher et al. in prep.

Radial Velocity Observations of τ Ceti



$\theta_{LD} = 2.02$ mas
No limb-darkening

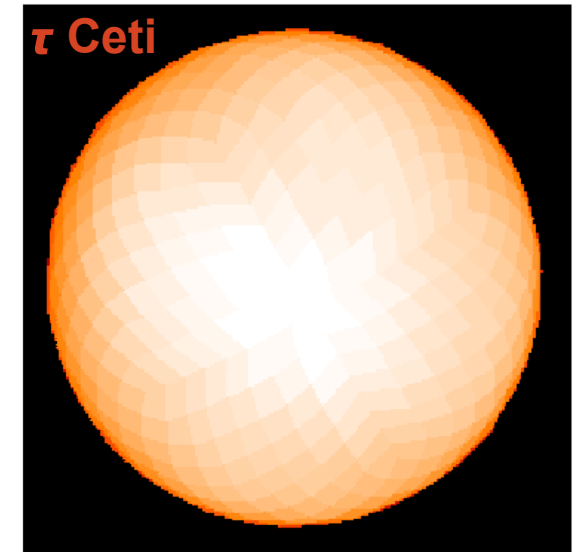
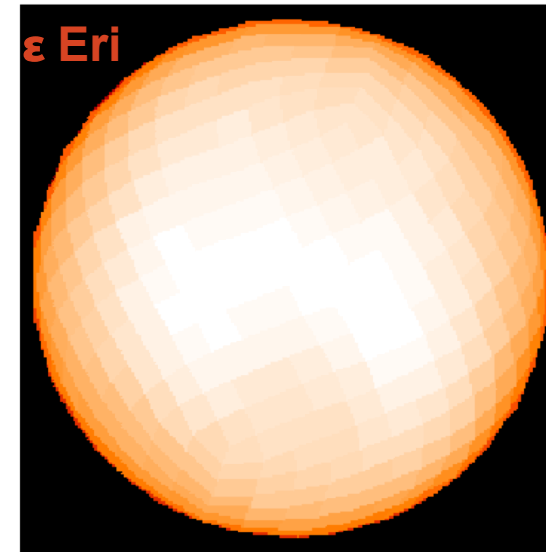


MIRC-X

Roettenbacher et al. in prep.

Imaged Stellar Surface Radial Velocities

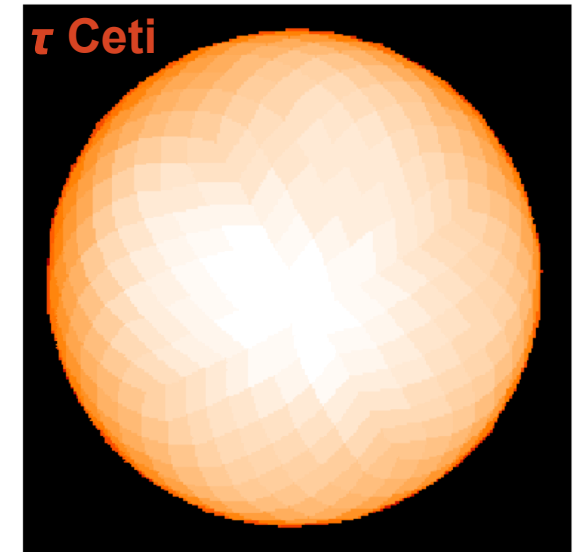
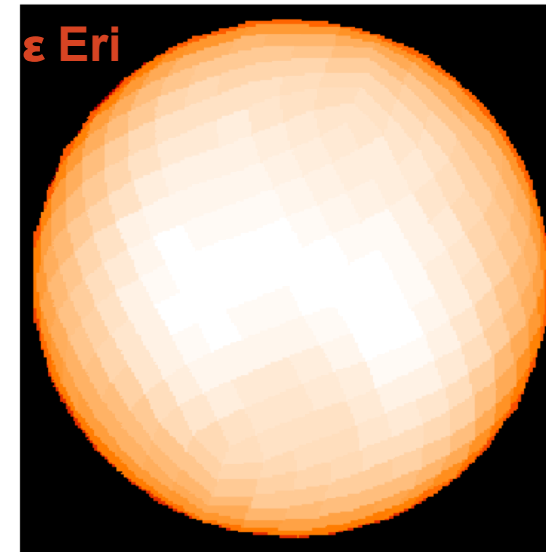
- Interferometric imaging of six main-sequence stars
- Model radial velocity contribution of stellar surface
- Compare to contemporaneous extreme precision radial velocity observations
- Two stars observed at multiple epochs to investigate longer term trends



Supported by NASA Extreme Precision
Radial Velocity Program
Collaborators: John Monnier, EXPRES Team

Future Work with EPRV Targets

- Finishing work on ϵ Eri and τ Cet
- Imaging data in-hand:
 - 61 Cyg A & B
 - ϵ Eri (reobserved)
- Observations planned in June for σ Dra
- Proposal submitted for repeated observations for τ Cet and new observations of GJ 33



Supported by NASA Extreme Precision
Radial Velocity Program
Collaborators: John Monnier, EXPRES Team