THE PROBLEM OF VARIABILITY OF CHEMICALLY PECULIAR AM STARS

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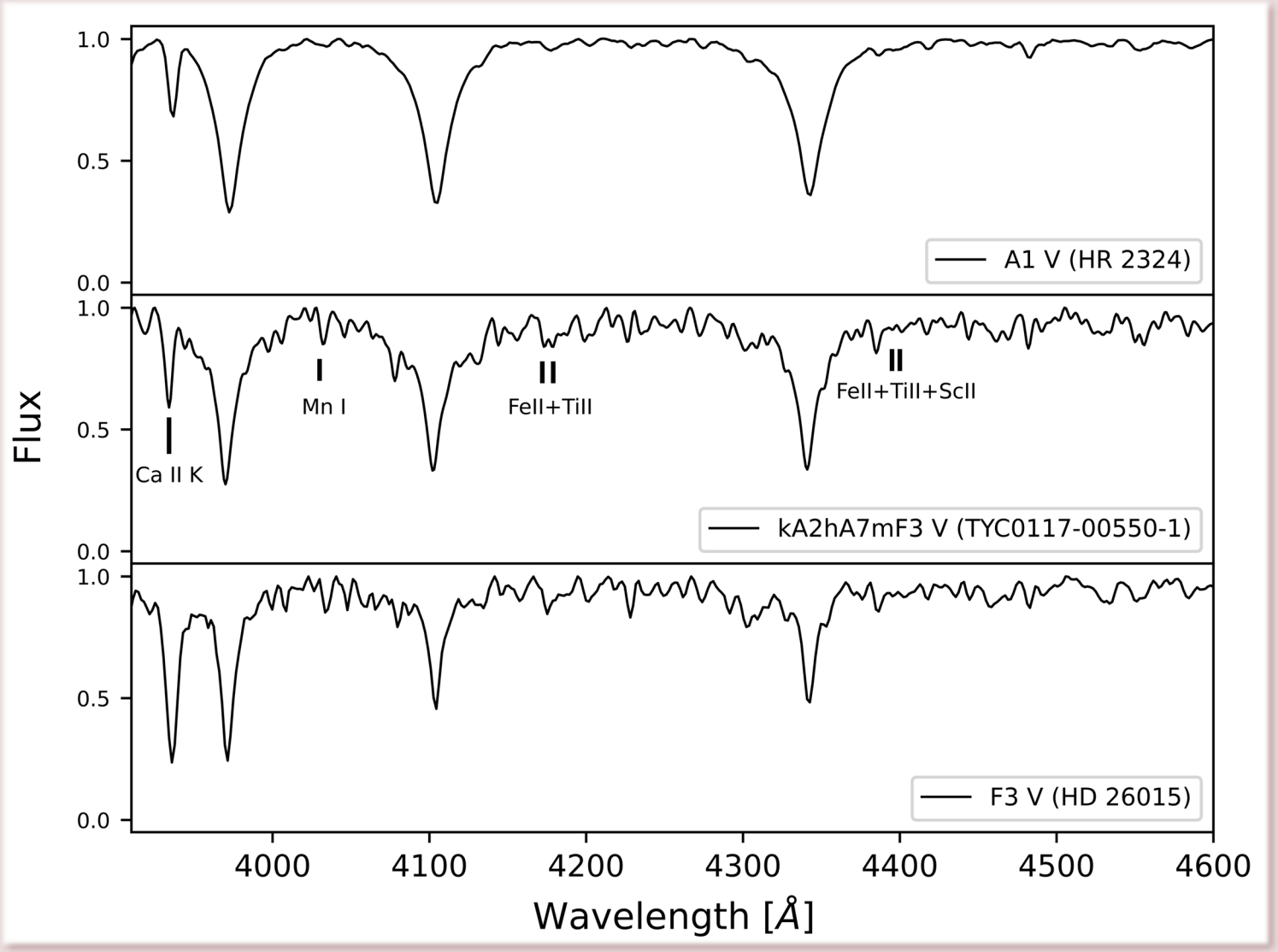
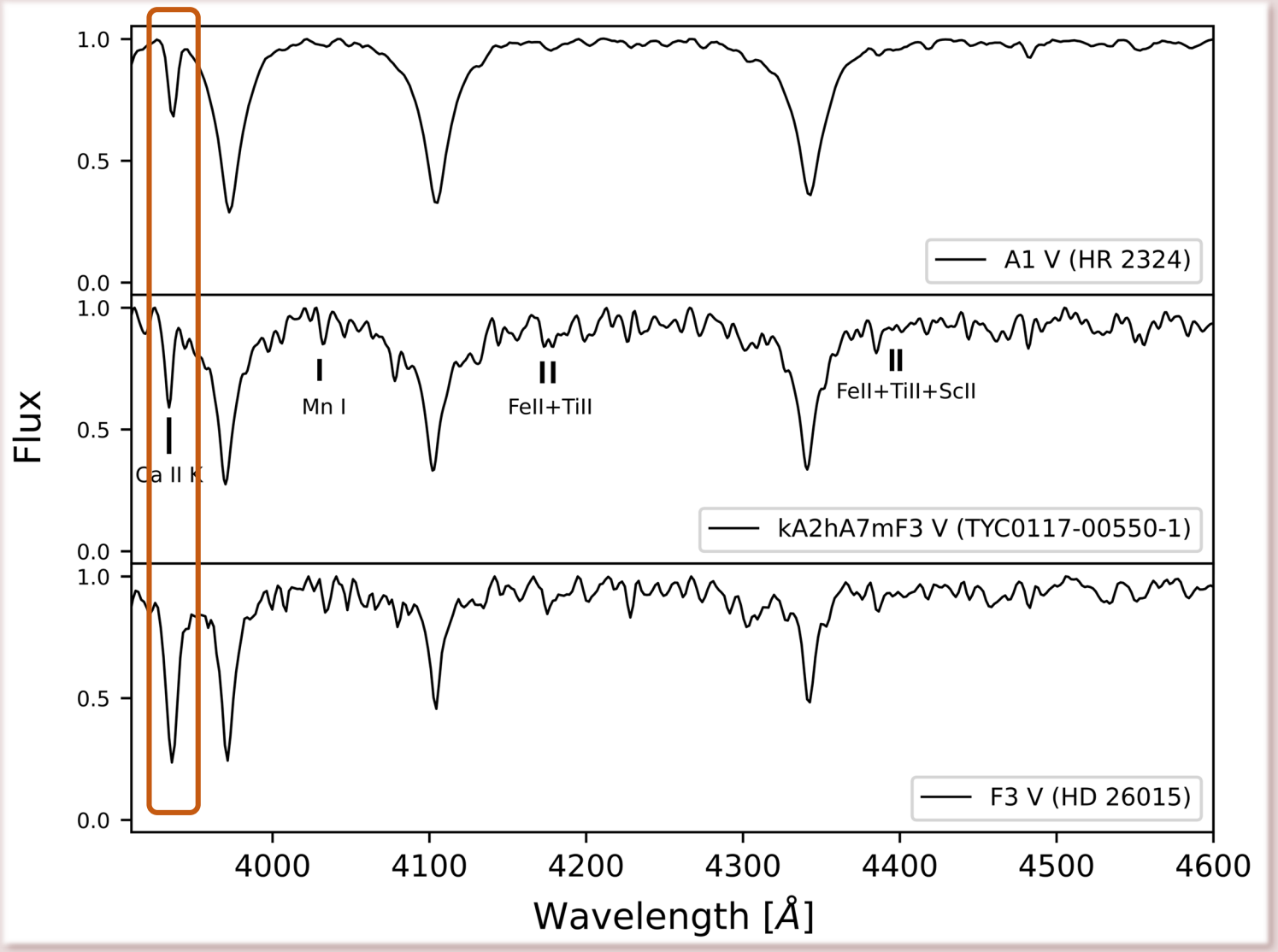
THE MILKY WAY REVEALED BY GAIA: THE NEXT FRONTIER, BARCELONA, 5.09.2023

CHEMICALLY PECULIAR AM STAR



T_{eff} : 7000 – 10 000 (A0–F3)

CHEMICALLY PECULIAR AM STAR



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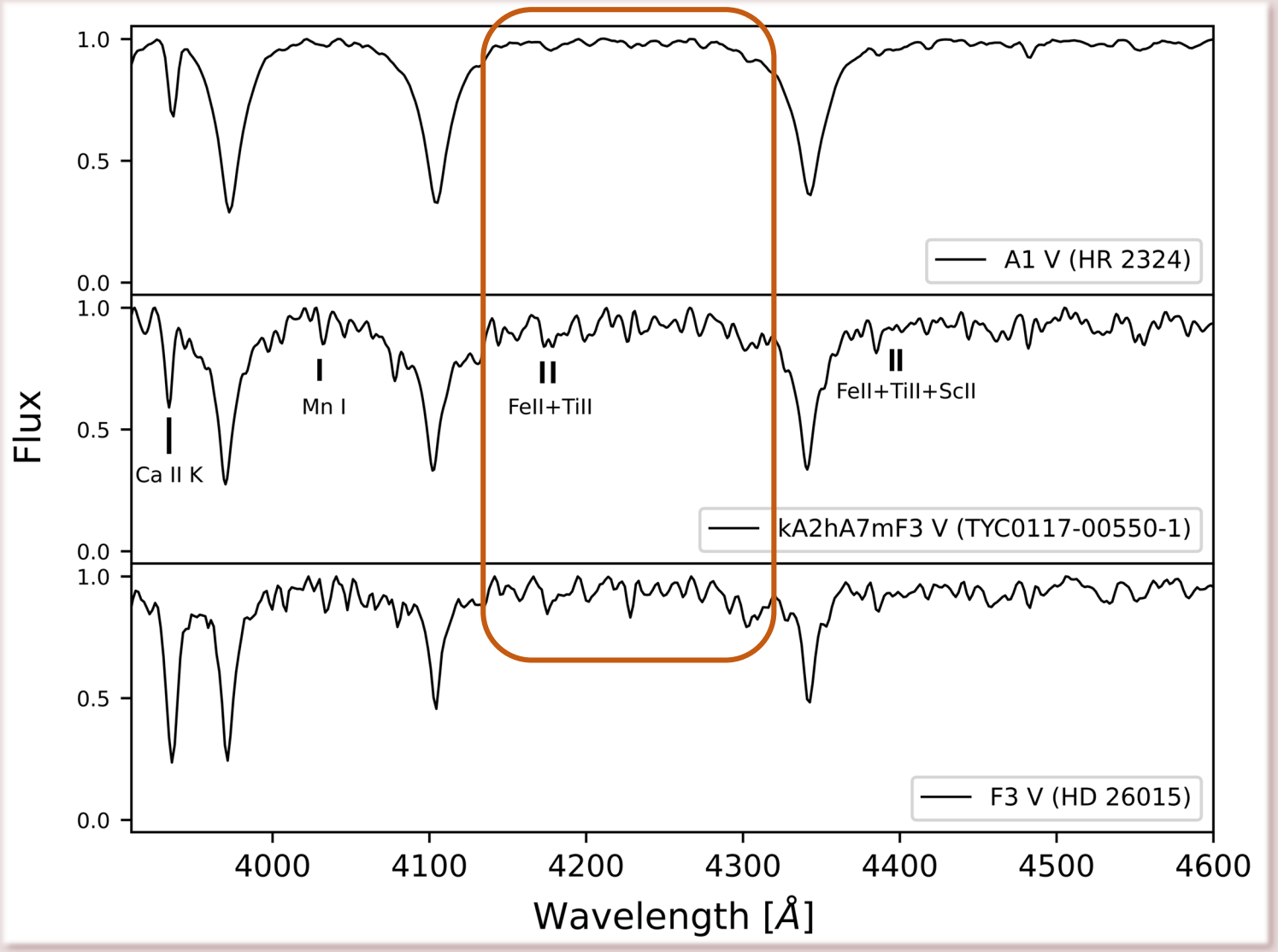

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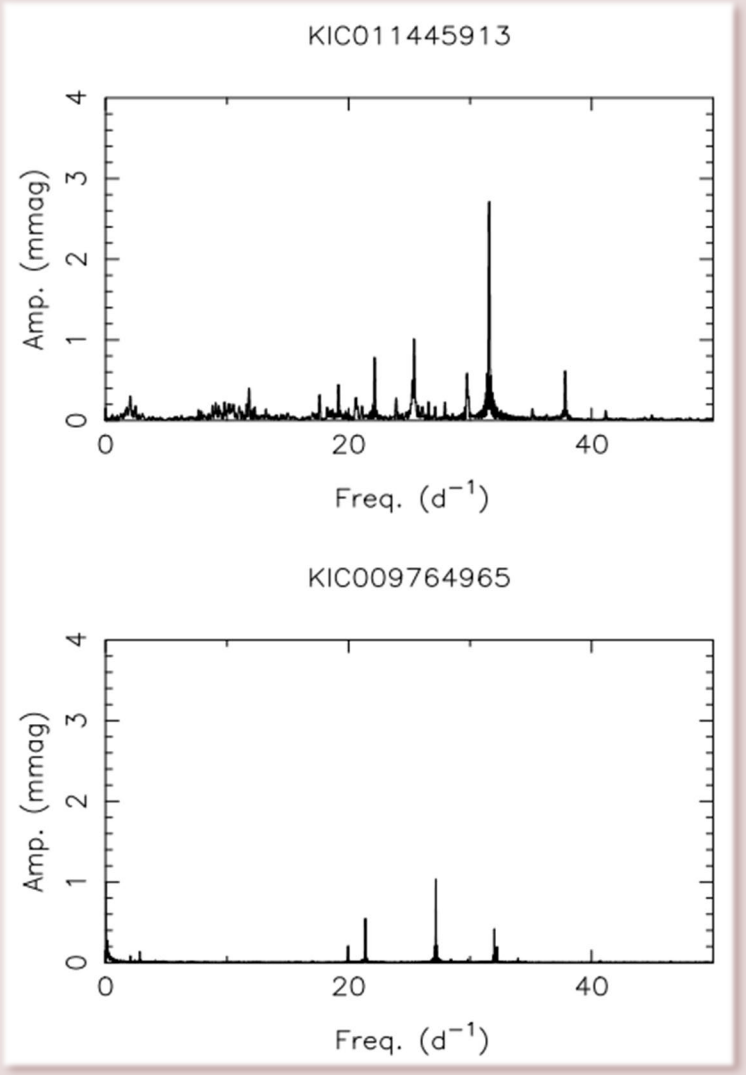
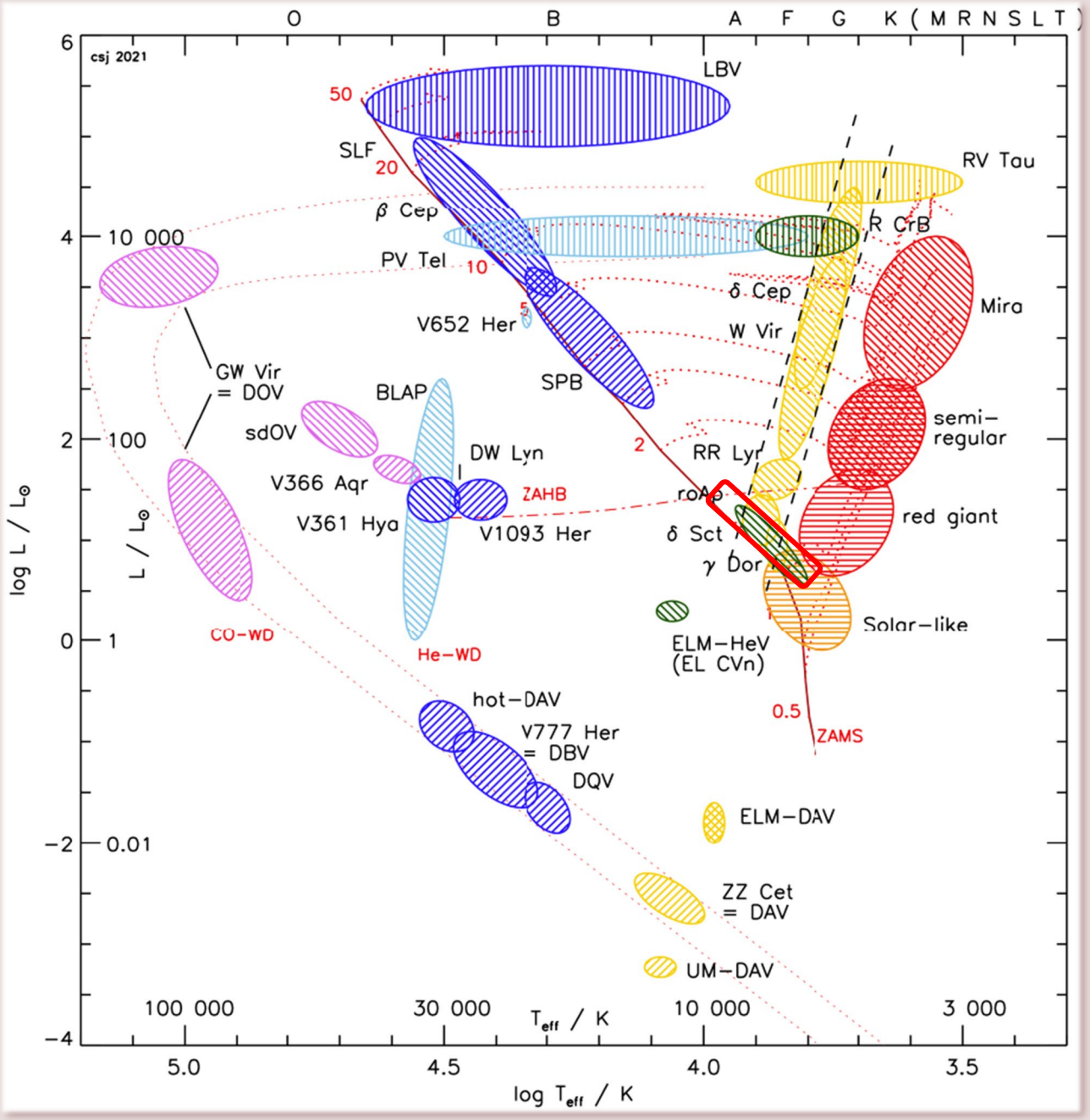
PULSATIONS



Smalley et al., *SuperWASP observations of pulsating Am stars* (2011)



Kurtz, *Asteroseismology across the hertzsprung–russell diagram* (2022)

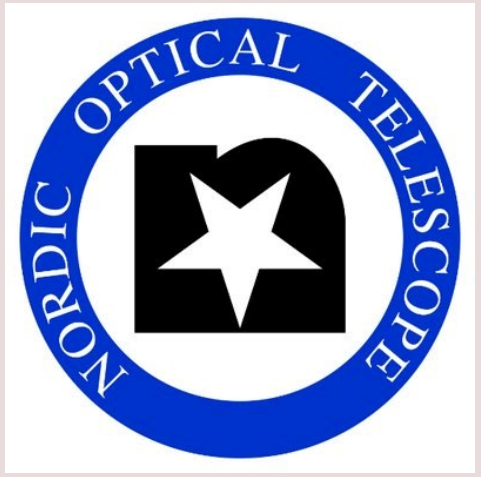
SPECTROSCOPIC OBSERVATIONS

List of Am stars: *Renson & Manfroid (2009)*, *Skiff (2009)*

HRS

ESPRESSO
UVES
HARPS
FEROS

ELODIE
SOPHIE



FIES

927
spectra

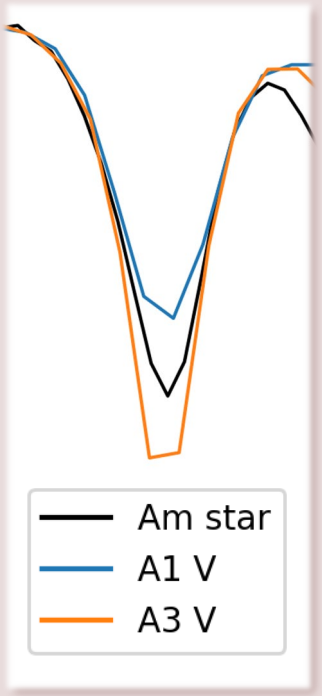
397
objects

Normalization: *SUPPNet*

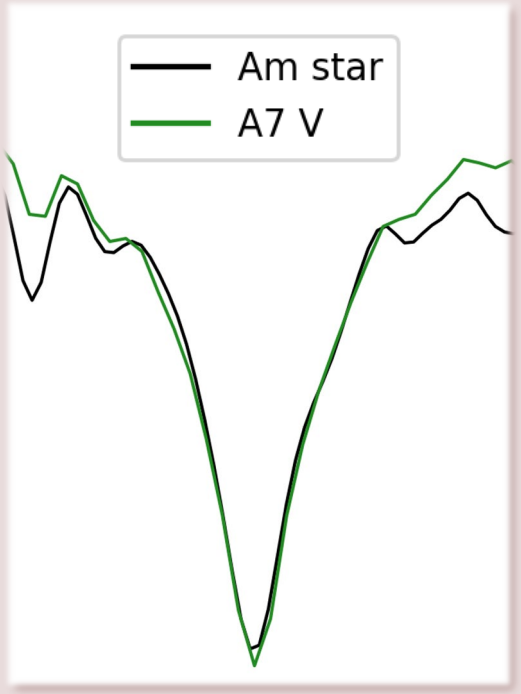
https://rozanskit.com/suppnet/

SPECTRAL CLASSIFICATION

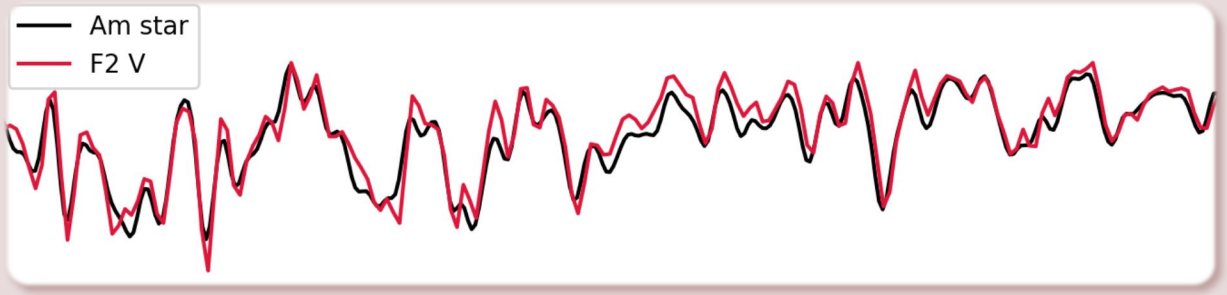
Ca II K



Balmer line (Hδ)



Metallic lines



MKCLASS (Richard O. Gray)

www.appstate.edu/~grayro/mkclass

Results:

- 210 Am
- 54 Ap
- 6 HgMn
- 1 ρ Pup
- 126 chemically "normal" B, A, F stars

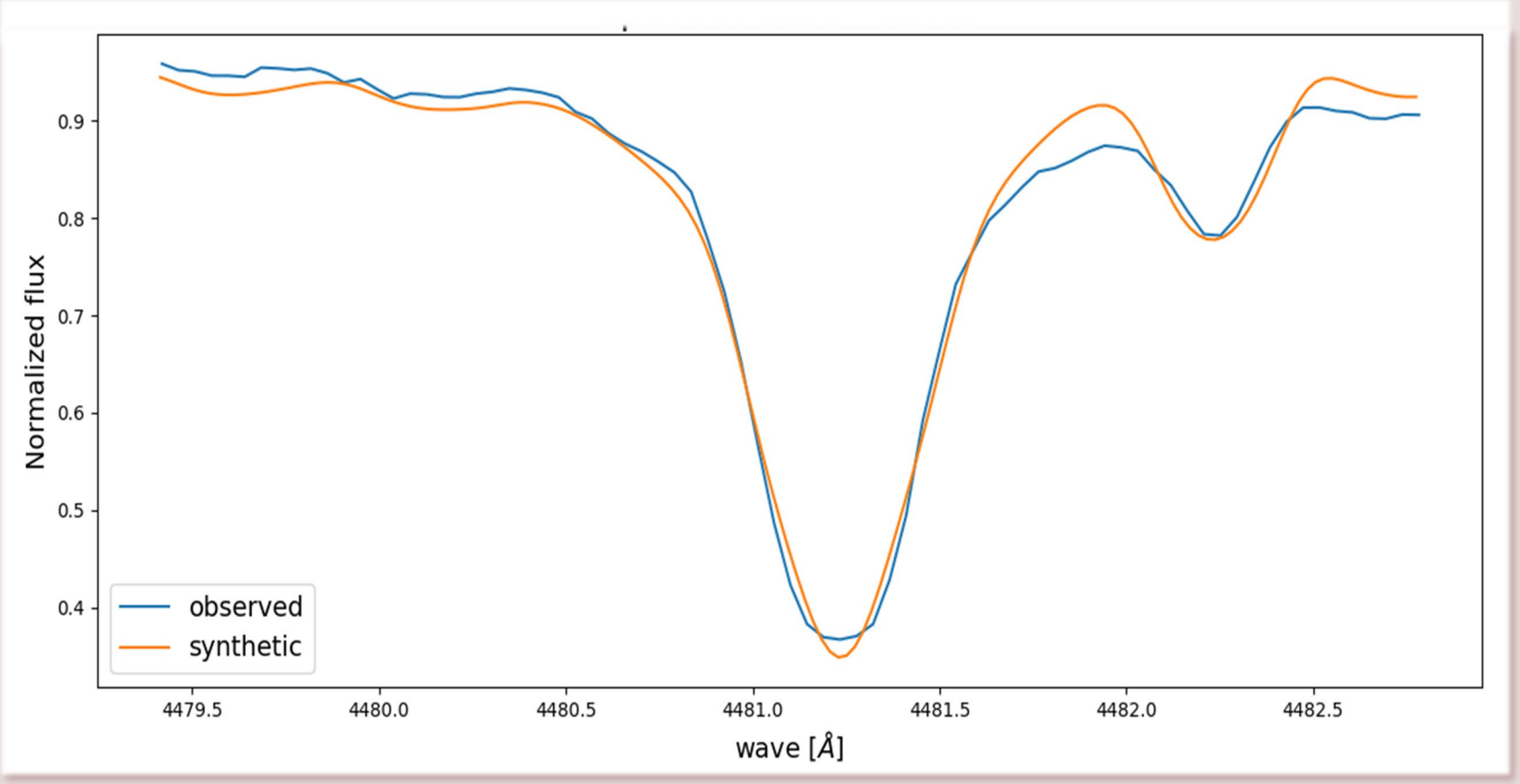
SPECTRAL ANALYSIS

1. Atmospheric parameters:
   - effective temperature $T_{\rm eff}$
   - surface gravity log$g$
   - detailed chemical composition
   - microturbulence ξ
   - vsin$i$

2. Method and codes:
   Method: spectral synthesis
   Kurucz's codes: atmospheric models & spectra
   Fiorella Castelli: atomic data

ATMOSPHERIC PARAMETERS

PROJECTED ROTATIONAL VELOCITY

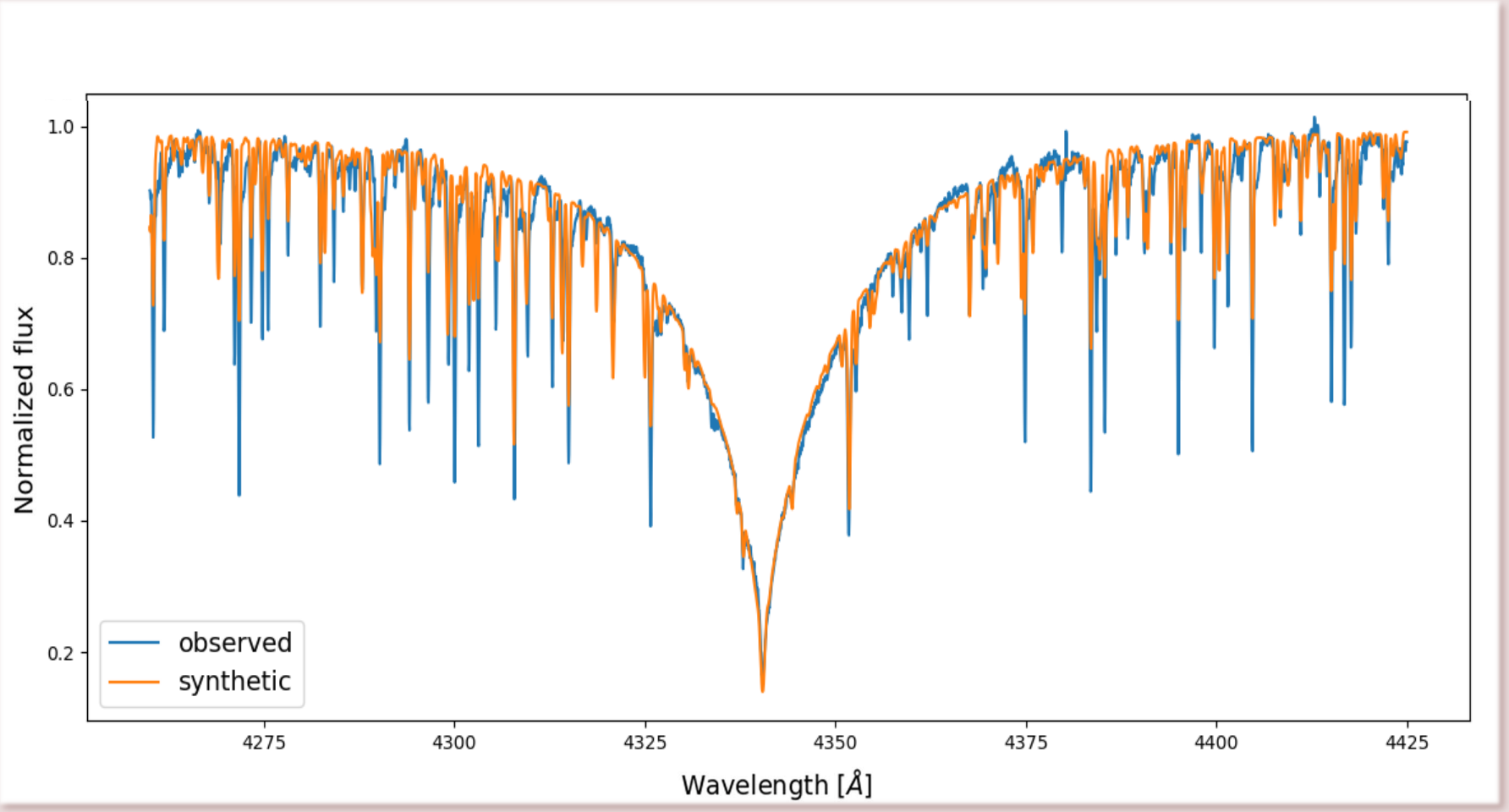


TYC 0103-01463-1

$v \sin i = 15$ km/s

ATMOSPHERIC PARAMETERS

EFFECTIVE TEMPERATURE, SURFACE GRAVITY



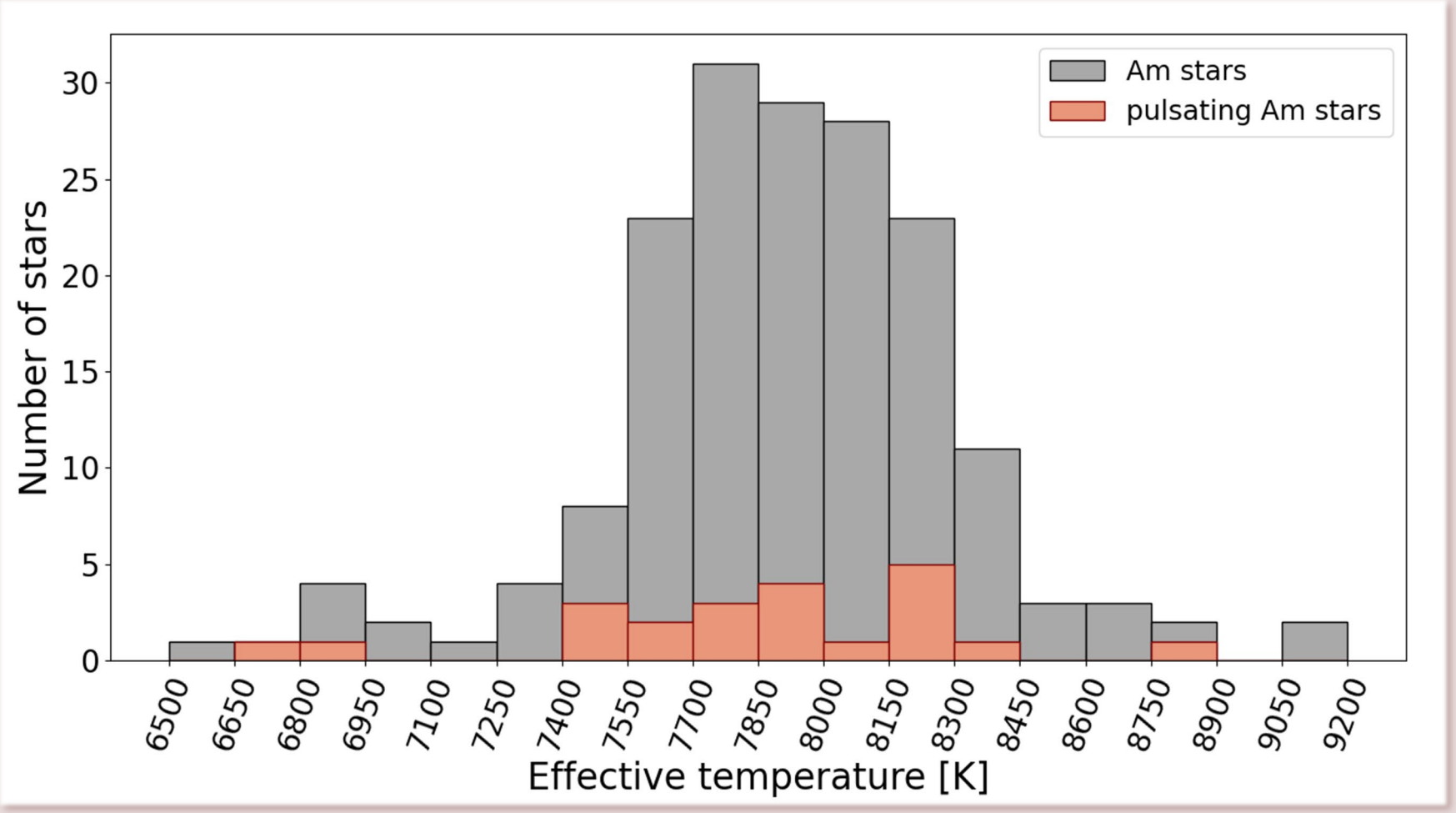
TYC 0103-01463-1

$T_{eff} = 8140$ K

$\mathrm{Log}g = 4.0$

$v\sin i = 15$ km/s

ATMOSPHERIC PARAMETERS



Smalley et al. (2017): 6900 – 7600 K

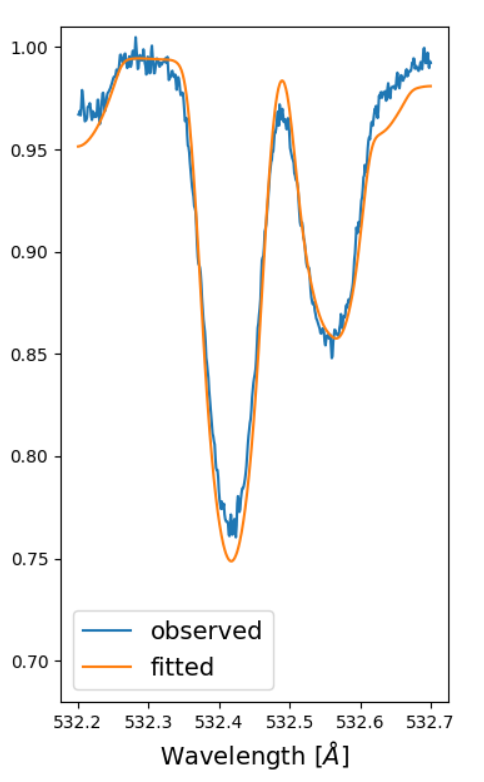
ATMOSPHERIC PARAMETERS

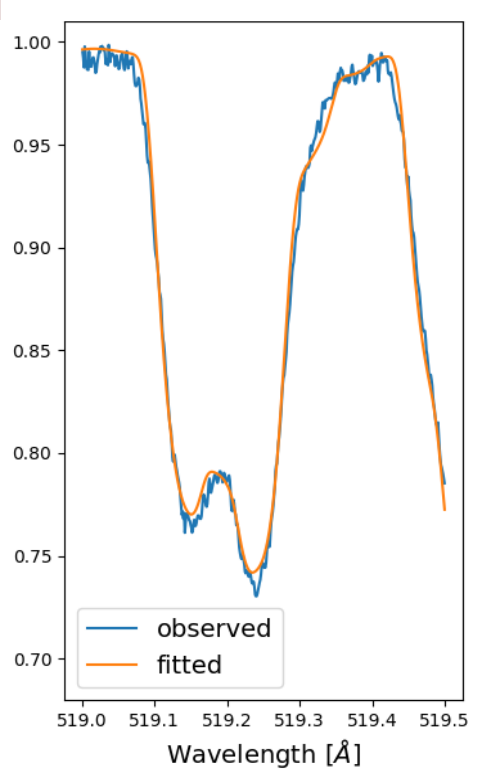
SURFACE GRAVITY

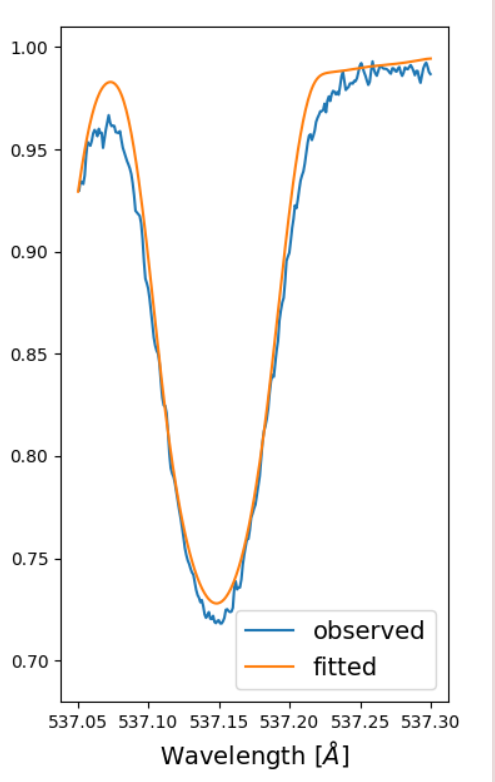
MICROTURBULENCE

PROJECTED ROTATIONAL VELOCITY

Fe I, Fe II







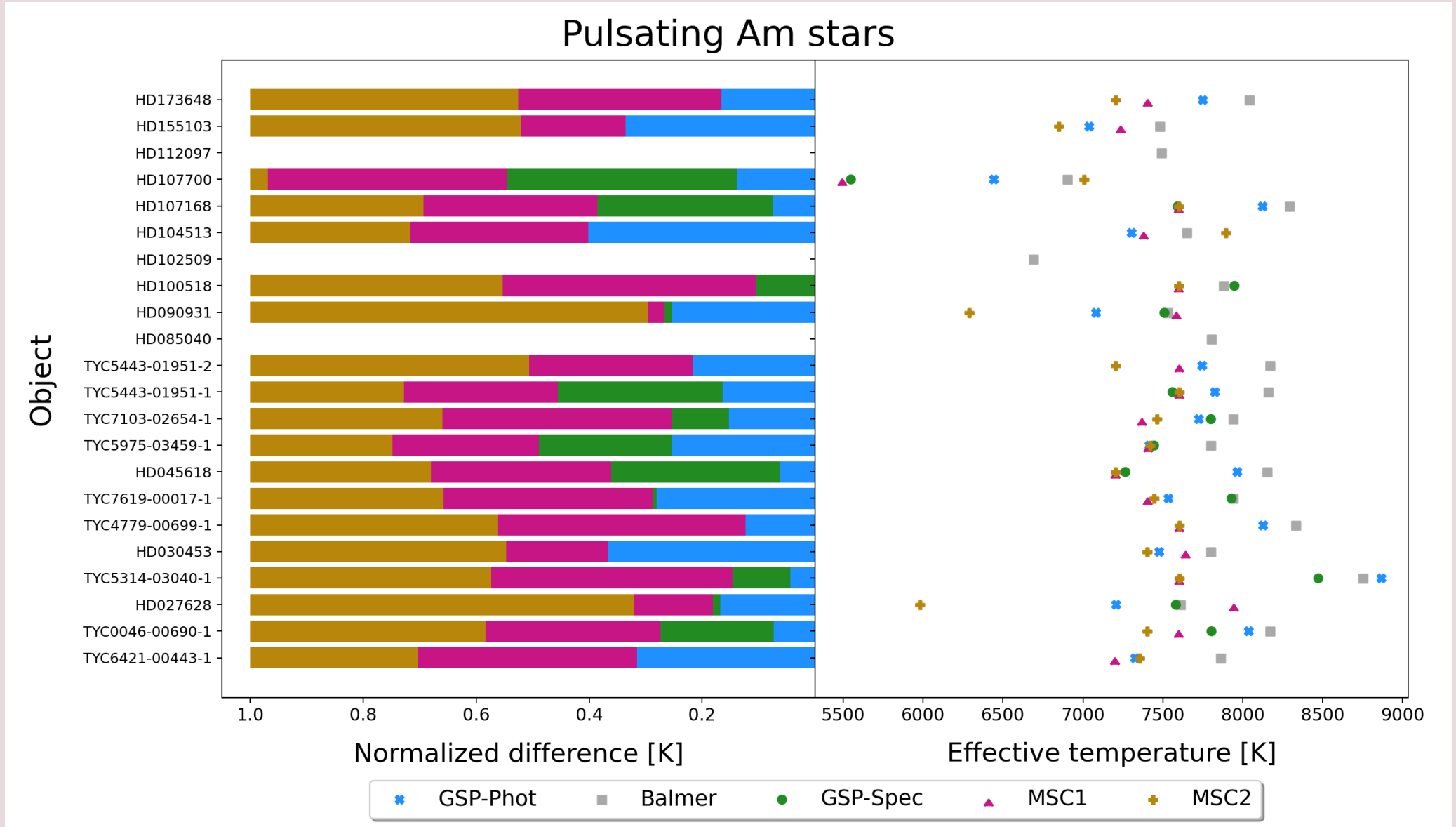
$\log g = 4.54$

$[\mathrm{Fe/H}] = 0.35$

$v \sin i = 31$ km/s

$v_{mic} = 3.7$ km/s

ATMOSPHERIC PARAMETERS



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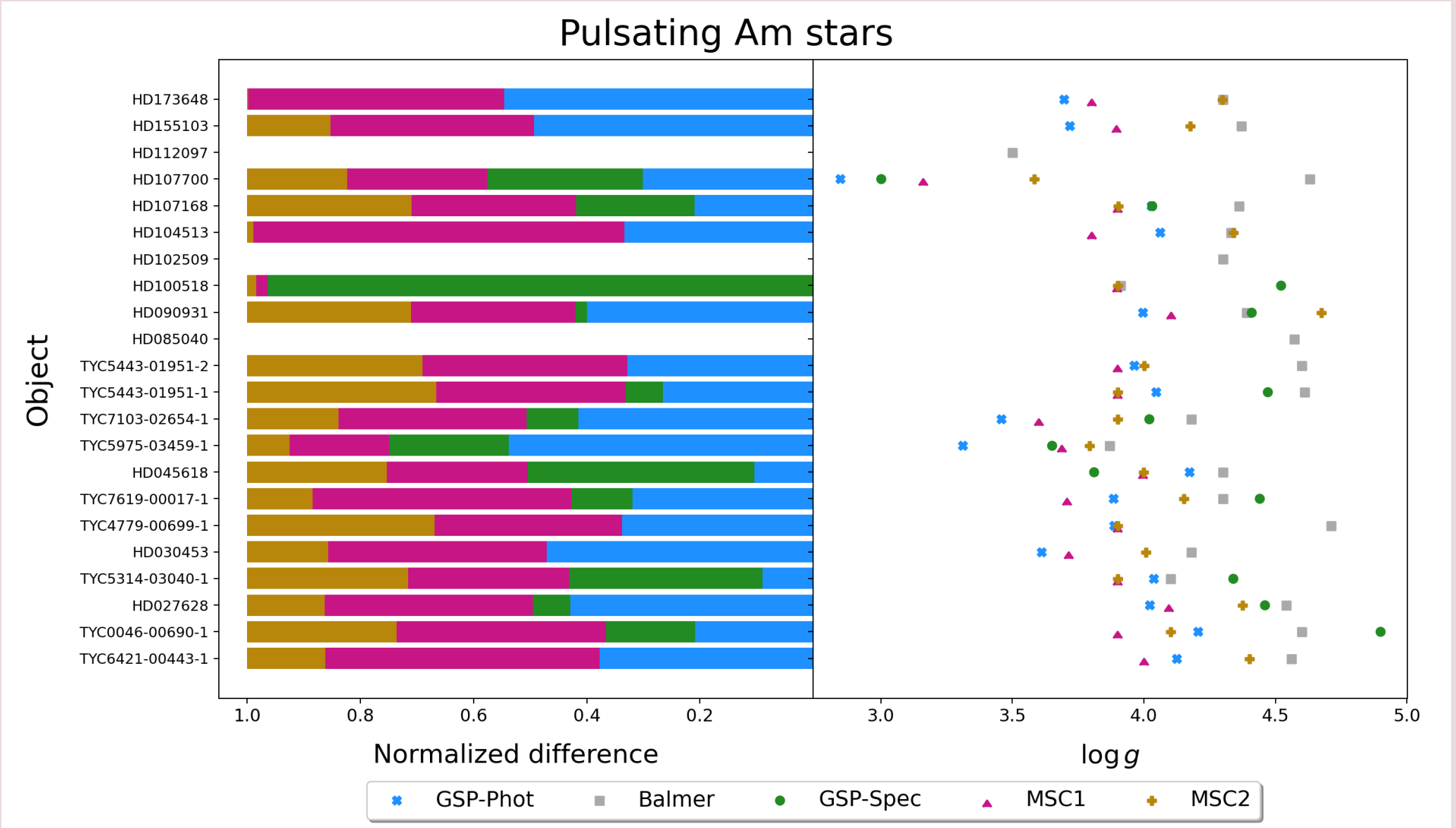
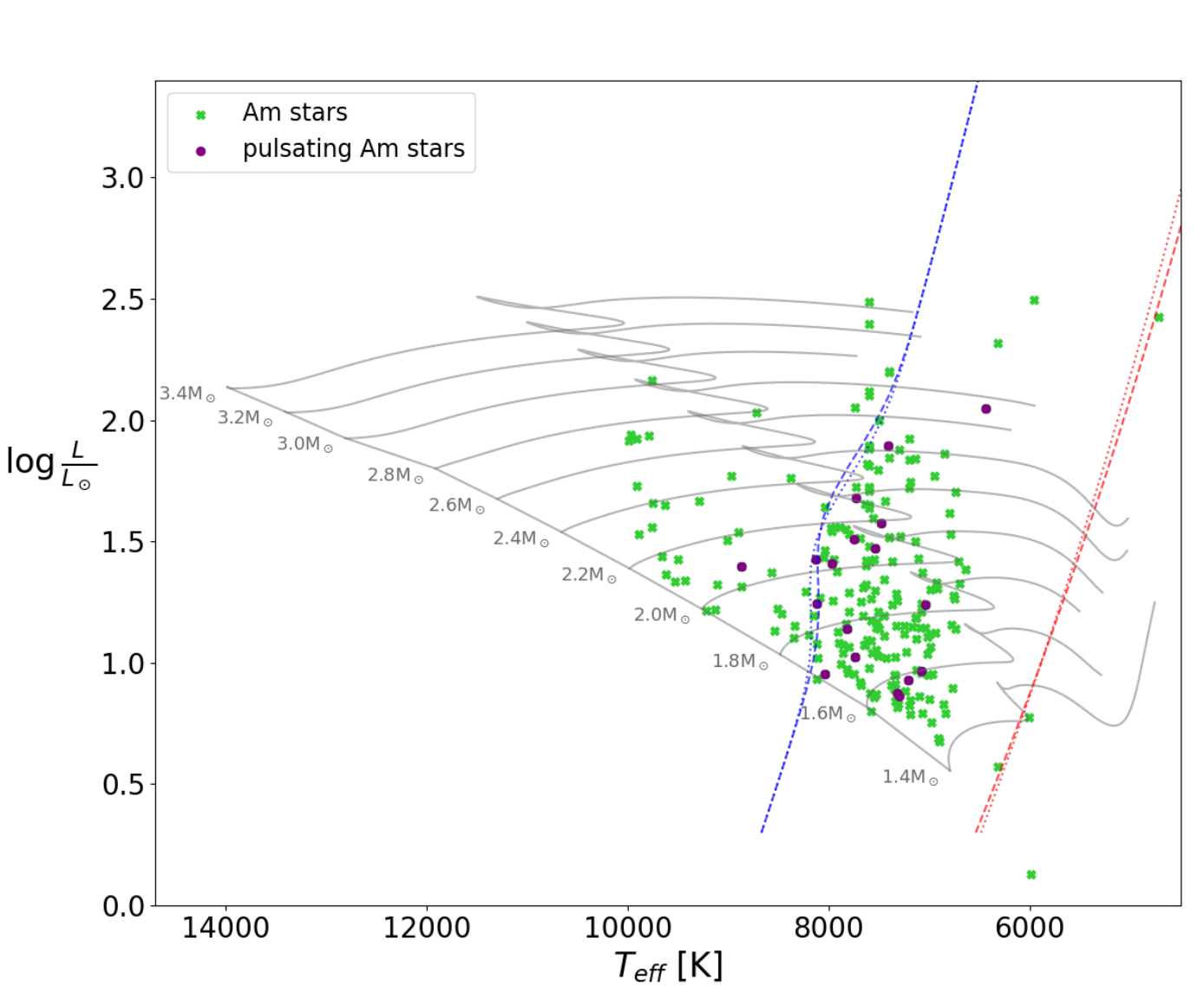


PRELIMINARY RESULTS



Evolutionary tracks
Grigahcène et al. (2005)

δSct instability strip
Xiong et al. (2016)
--- radial
· · · non-radial

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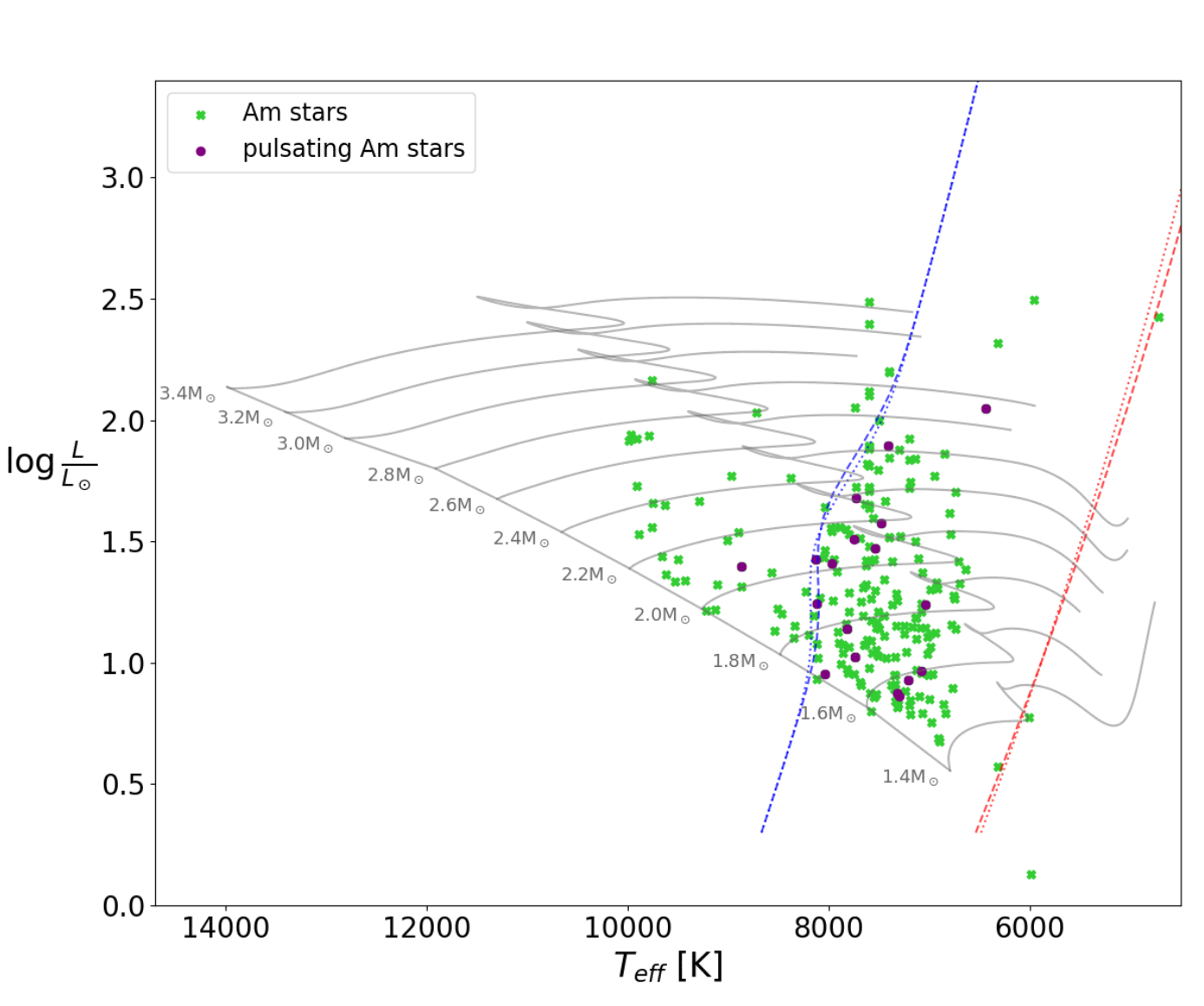

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High-resolution spectroscopy: atmospheric parameters and chemical abundances

Pulsation analysis: photometric data (collaboration with Victoria Antoci, Barry Smalley, Simon J. Murphy)

Why Am stars pulsate?

- Atmospheric parameters
- Chemical abundances
- Rotational velocity
- Binarity

Thank you for your attention