



UC | Chile



CENTRO DE ASTROFÍSICA Y TECNOLOGÍAS AFINES



Stellar Populations Hid IN uvX project

Folio 3240344



The T-GEX Project I:

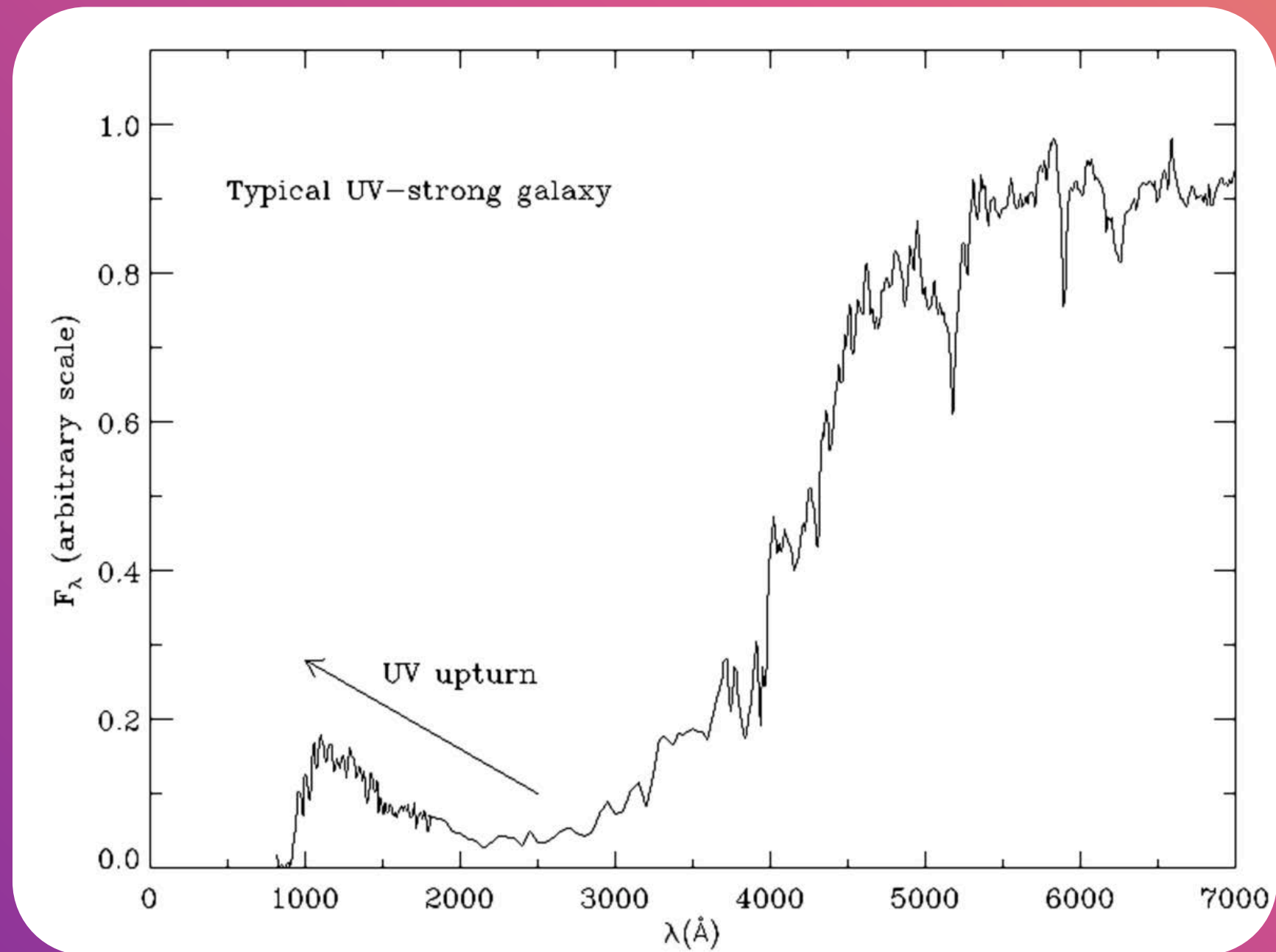
Hidden UV-bright FGK stars and the UV excess of
quiescent galaxies

Maria Luiza L. Dantas

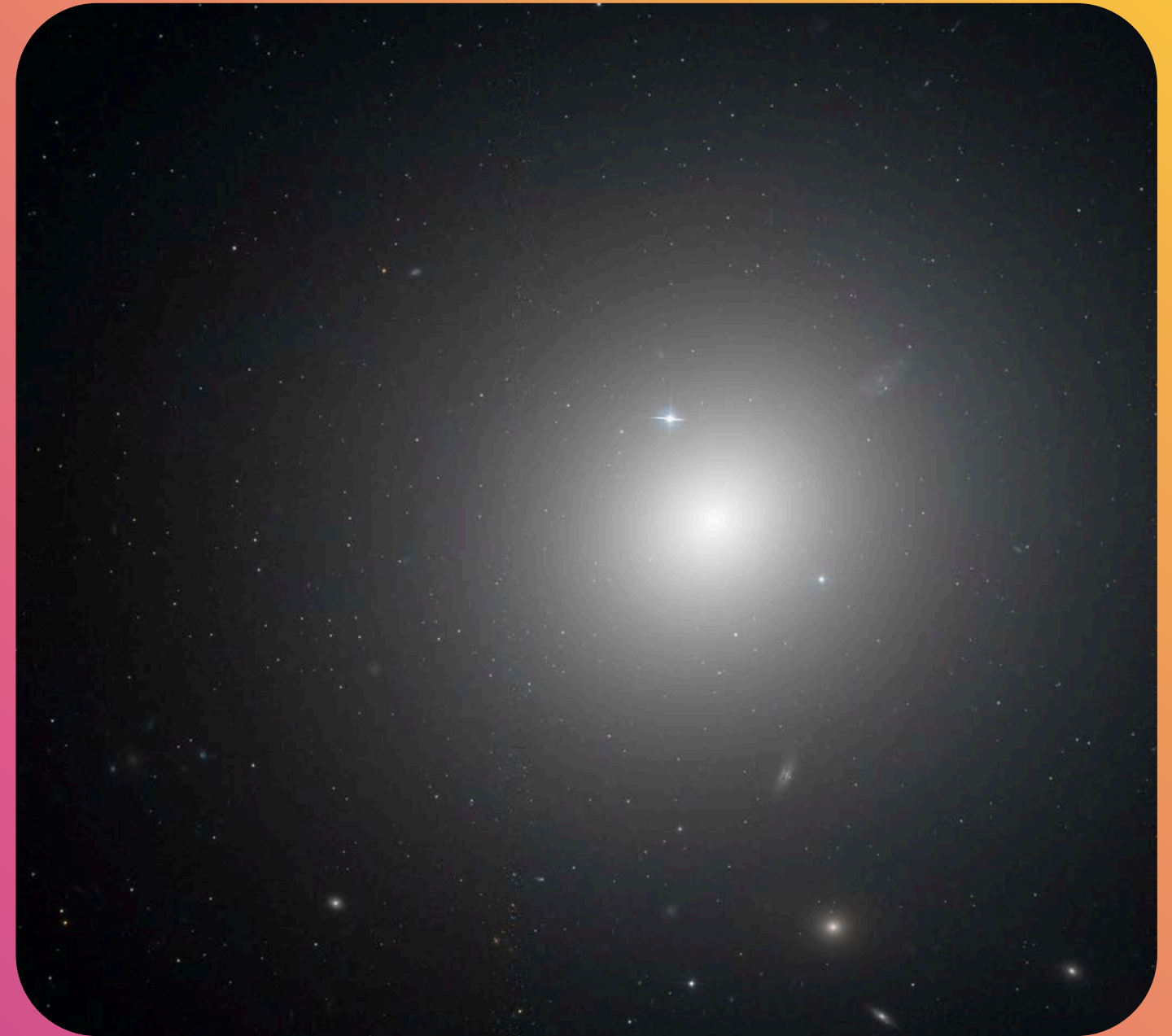
Fondecyt Postdoctoral Fellow

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What is the UV upturn?



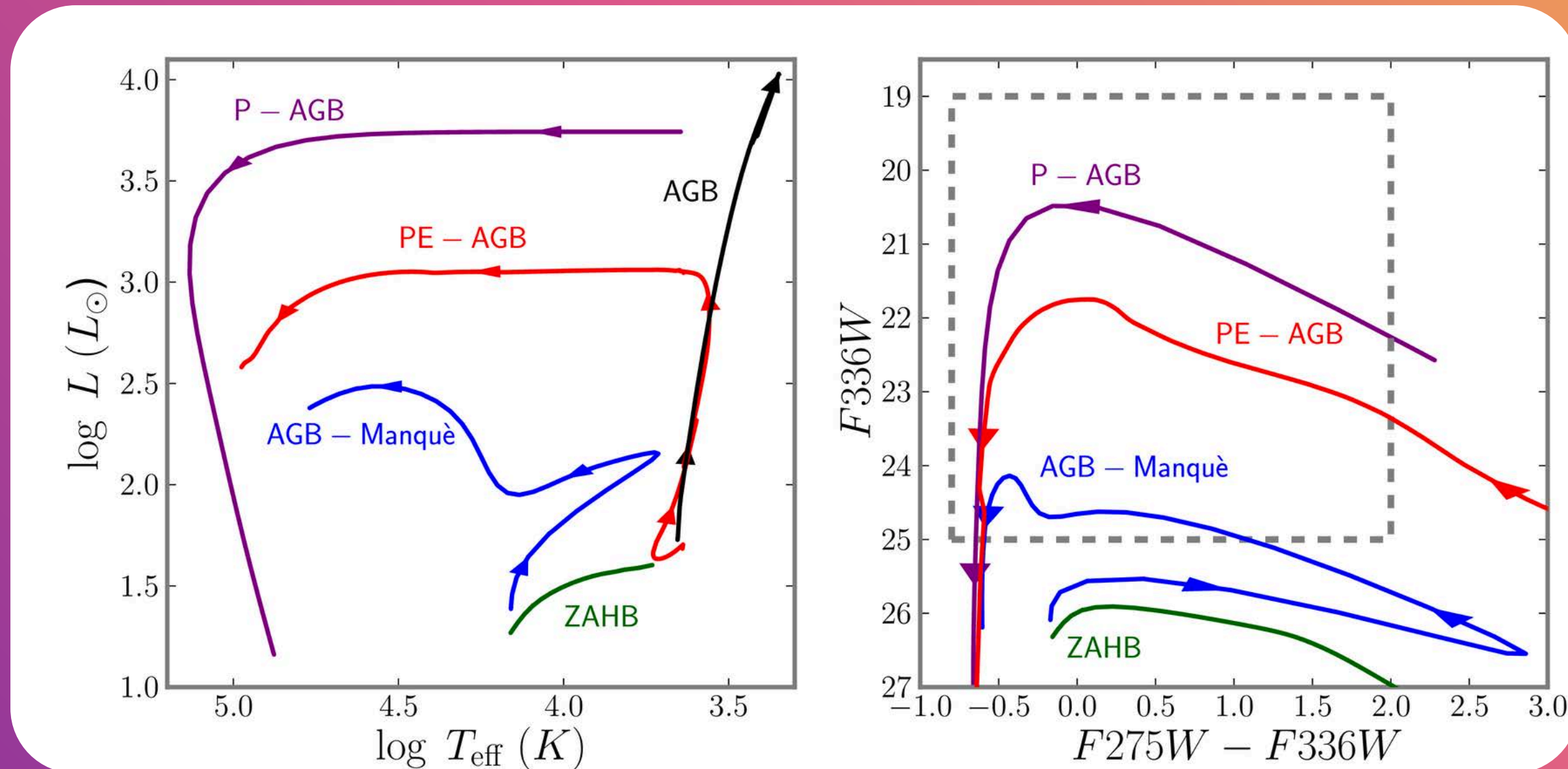
Yi et al. (2008)



NGC 1399, the BCG at the centre of the FORNAX cluster with strong UV (credits: HST; Brown et al., 2002).

The classic culprits of the UV upturn

- *Young stars (mostly OBA-type stars) → residual star formation;*
- Post-AGB stars and their decendents;
- Blue/extreme Horizontal Branch stars and their descendents;
- Binary systems in interactions;
- Hot white dwarfs.



Rosenfield et al. (2012)

The Milky Way as our Rosetta Stone

**What about regular Sun-like
stars *in the Galactic field*?**

**Could they contribute to the
UVX as well?**

The T-GEX series of papers



The T-GEX project

I. Stealth UV-bright Sun-like stars in the Galaxy as candidate contributors to the UV upturn

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ArXiv: 2607.27324

The focus of this talk!

ArXiv: 2609.19257

See D. Beltrán's
talk after this one!



The T-GEX project

II. Chrono-chemo-dynamic signatures of UV-bright FGK stars

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Received Month Day, 20XX

Sample construction: a panchromatic selection

Astrometry and optical phot

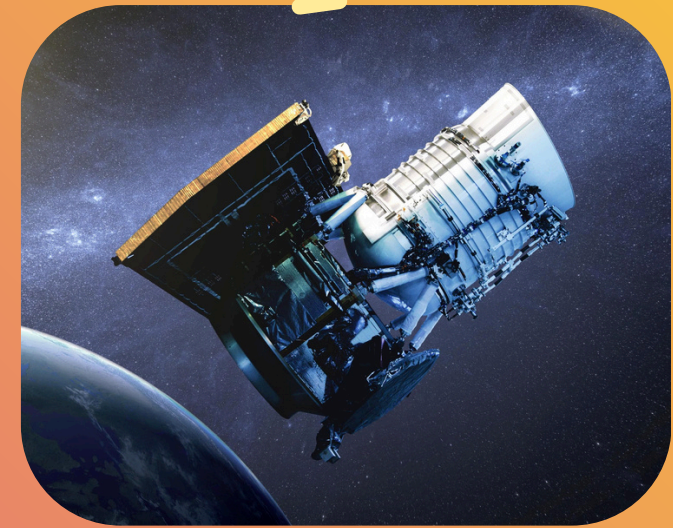
Optical high-res spec

UV phot

IR phot

IR phot

***Gaia* DR3 + *Gaia*-ESO DR5 + GALEX + 2MASS + ALLWISE**



- Several **quality flags** used to select better data, including the **removal of binaries!**
- Selection of high S/N based on Gaia-ESO (≥ 40);
- **Ages** calculated using **UniDAM**;
- **RESULT: 37 FIELD STARS WITH COMPLETE DATA!**

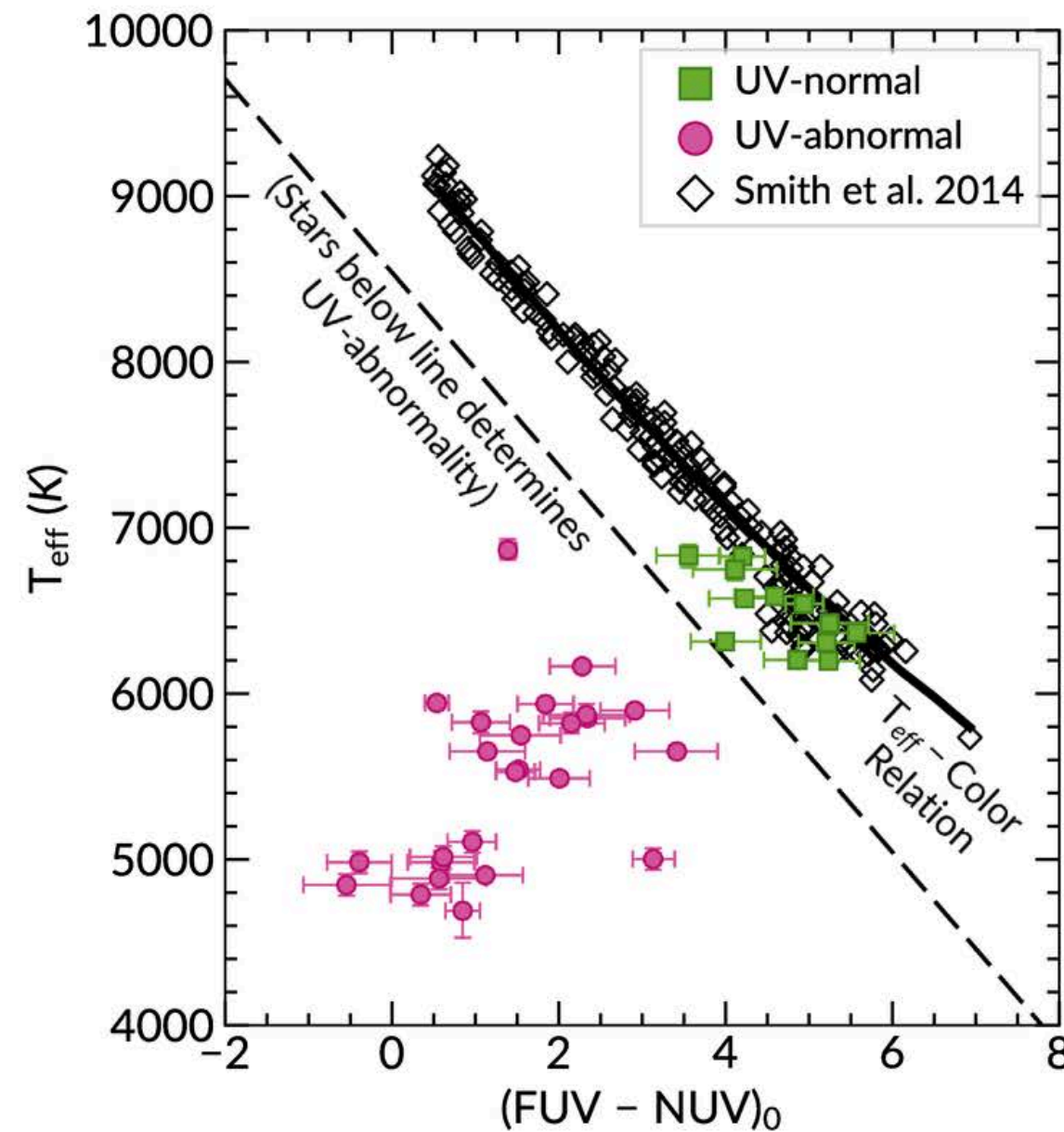
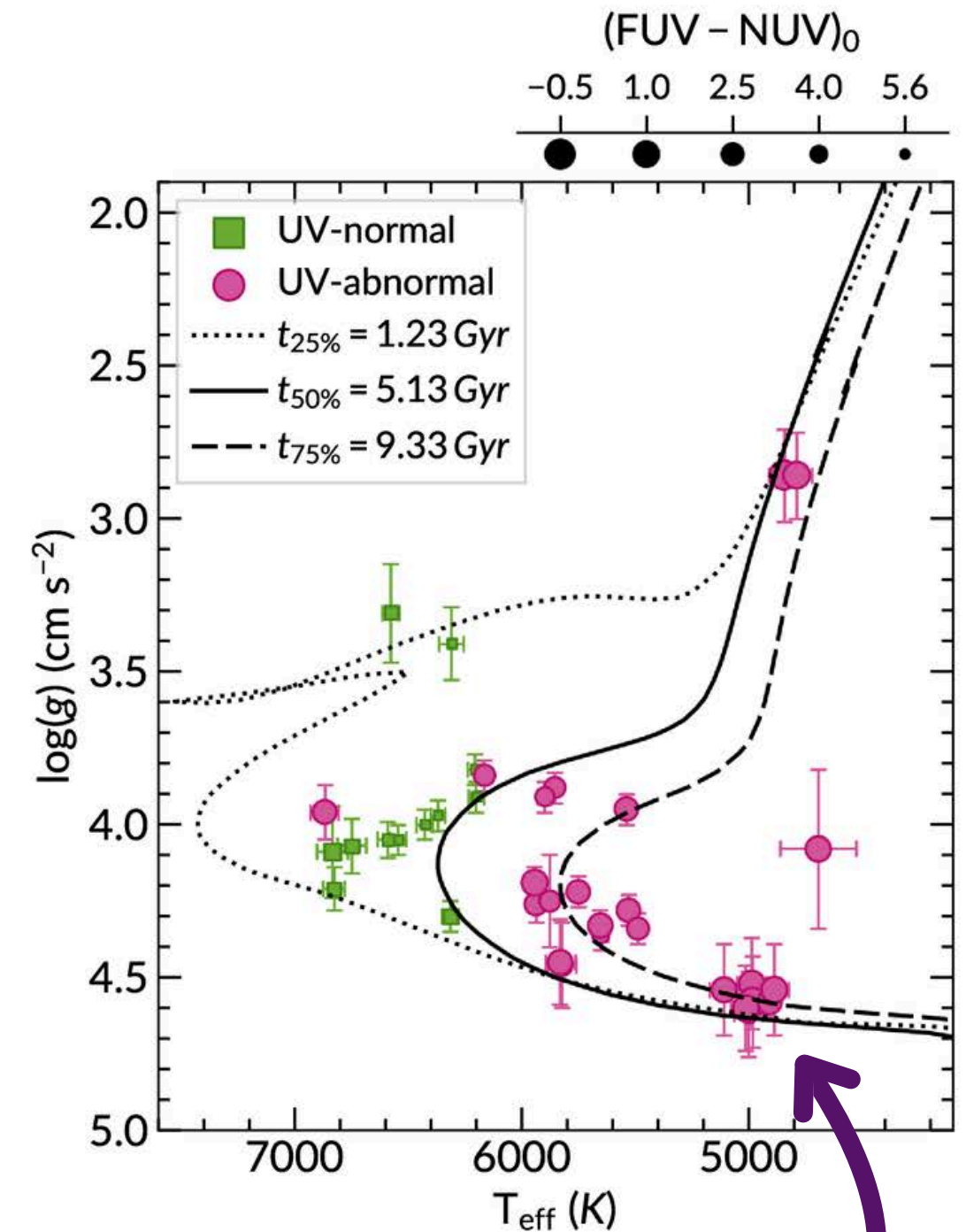
The Tiny ***Gaia*-ESO + GALEX** catalogue (**T-GEX**)



UV normality x UV abnormality

~2/3 of our sample
show **UV abnormality!**

Degenerate region for
age determination

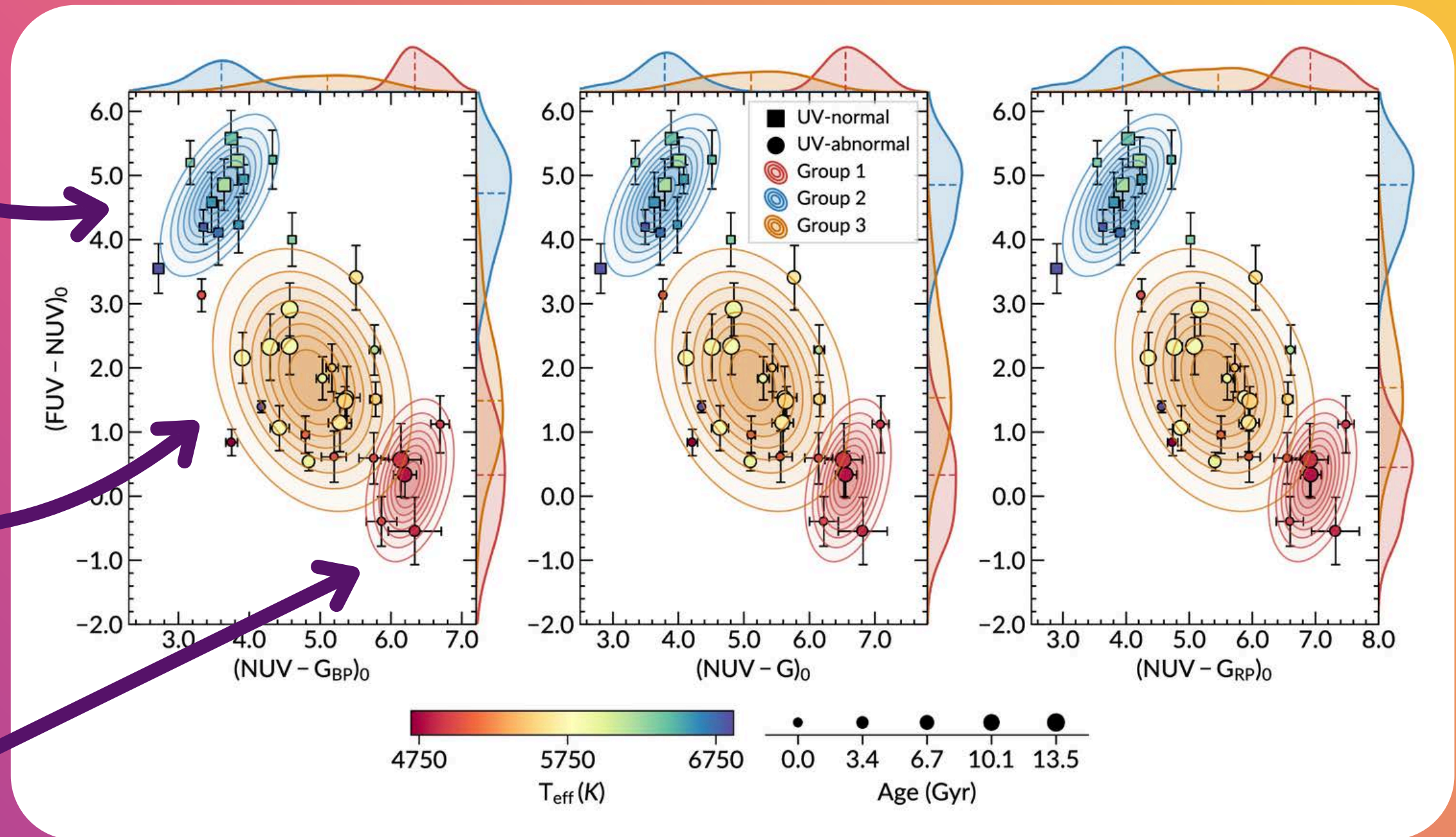


Yi et al. (2011)-inspired GMM stellar classification

UV-normal group
naturally clusters
separately (G2)

Intermediate
UV-abnormal
group (G3)

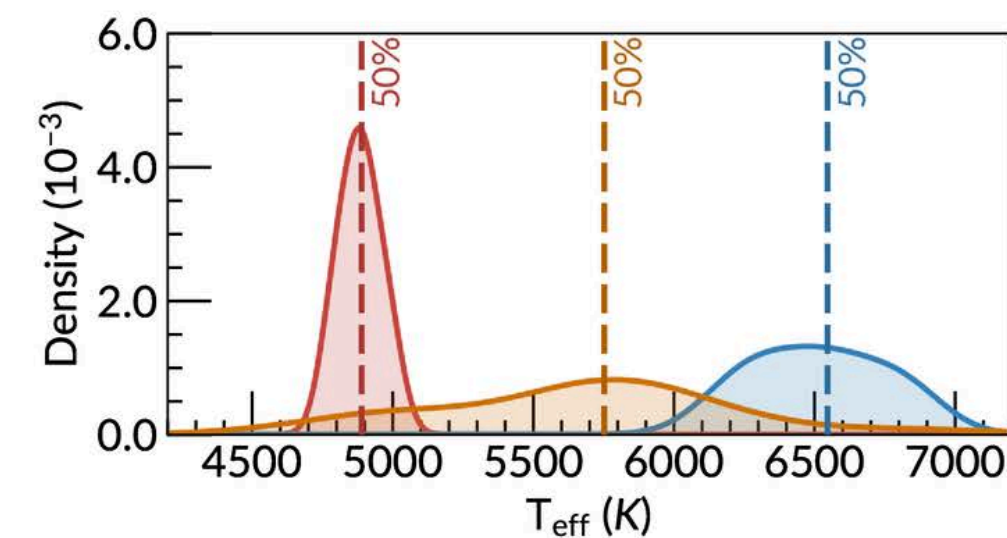
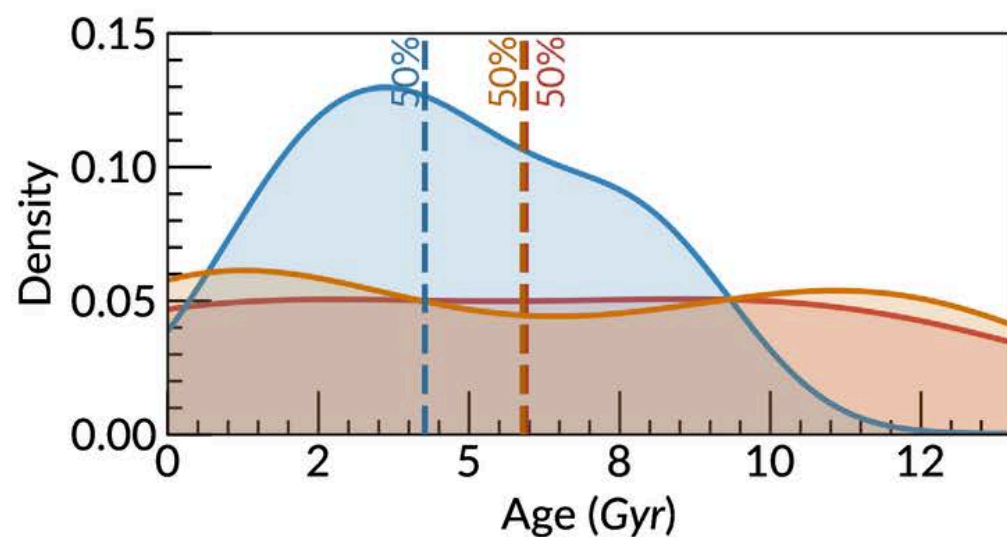
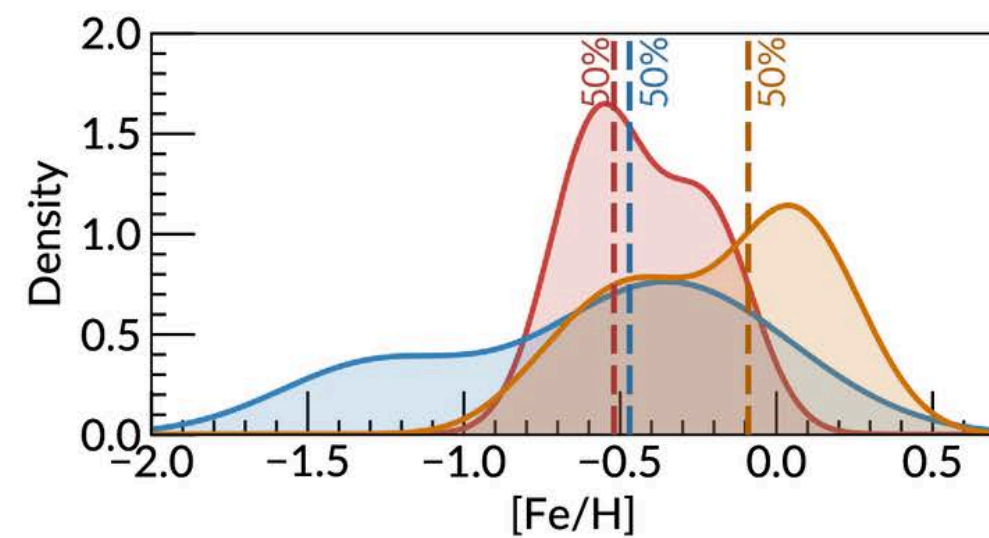
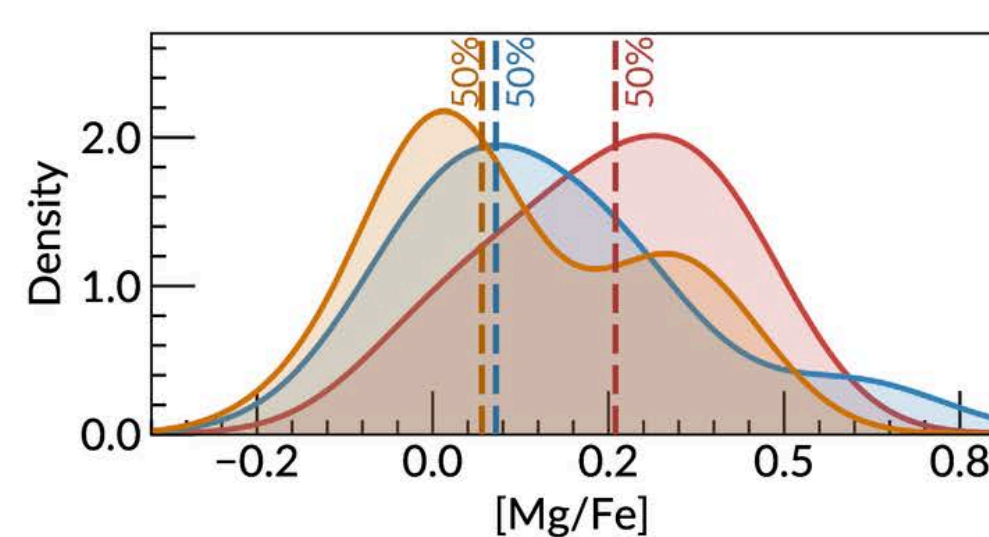
Extreme UV-
abnormal group
(G1)



Stellar parameter distributions for T-GEX

Cooler
(literally and
figuratively 😊)

Messy ages



Group 1 Group 2 Group 3

Metal-poor

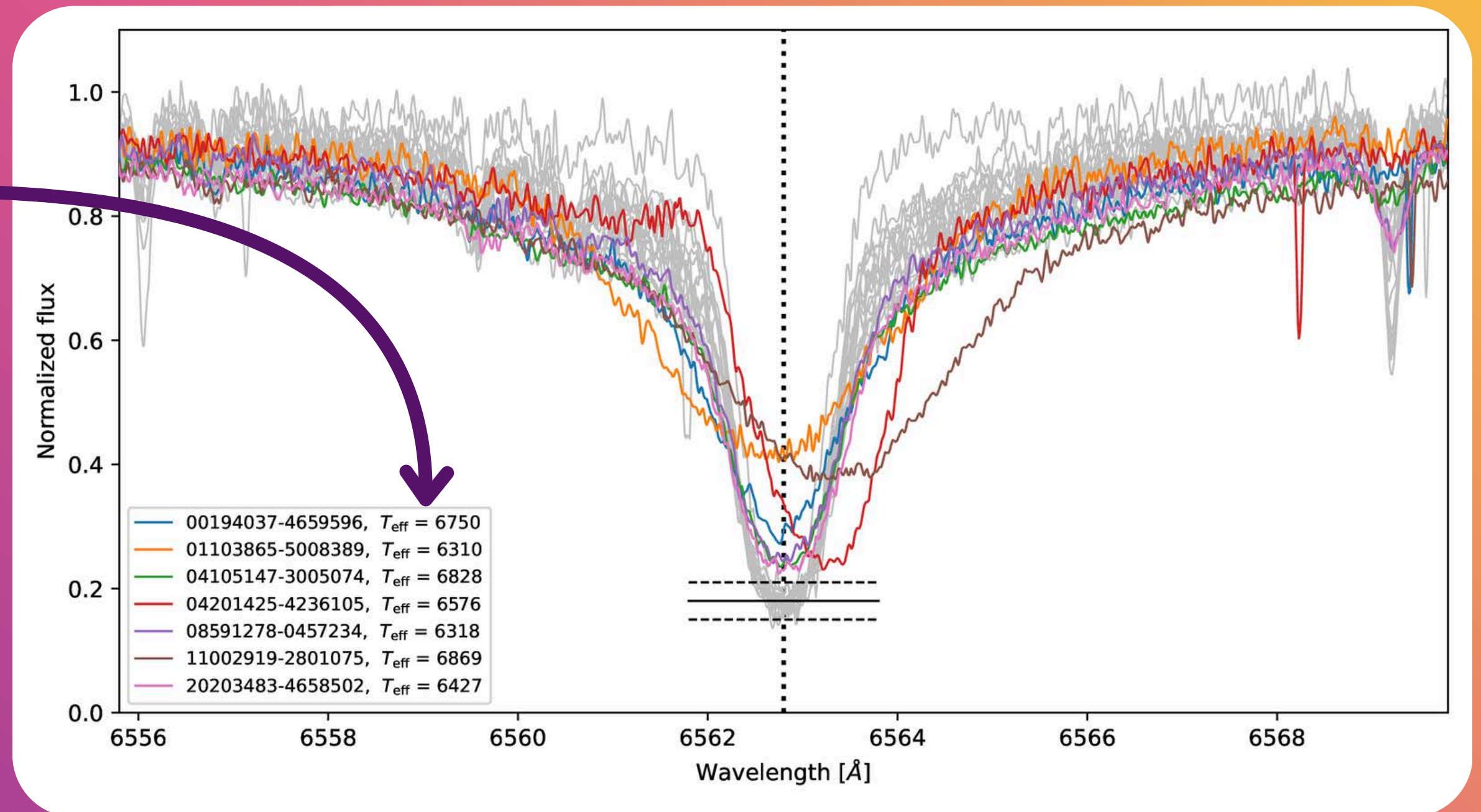
Alpha-enhanced!

Could chromospheric activity explain it?

Short answer: we don't know (yet)

Only hot UV-normal stars seem to have chromospheric activity

We submitted a new observational proposal to ESO's VLT/UVES (fingers crossed!)

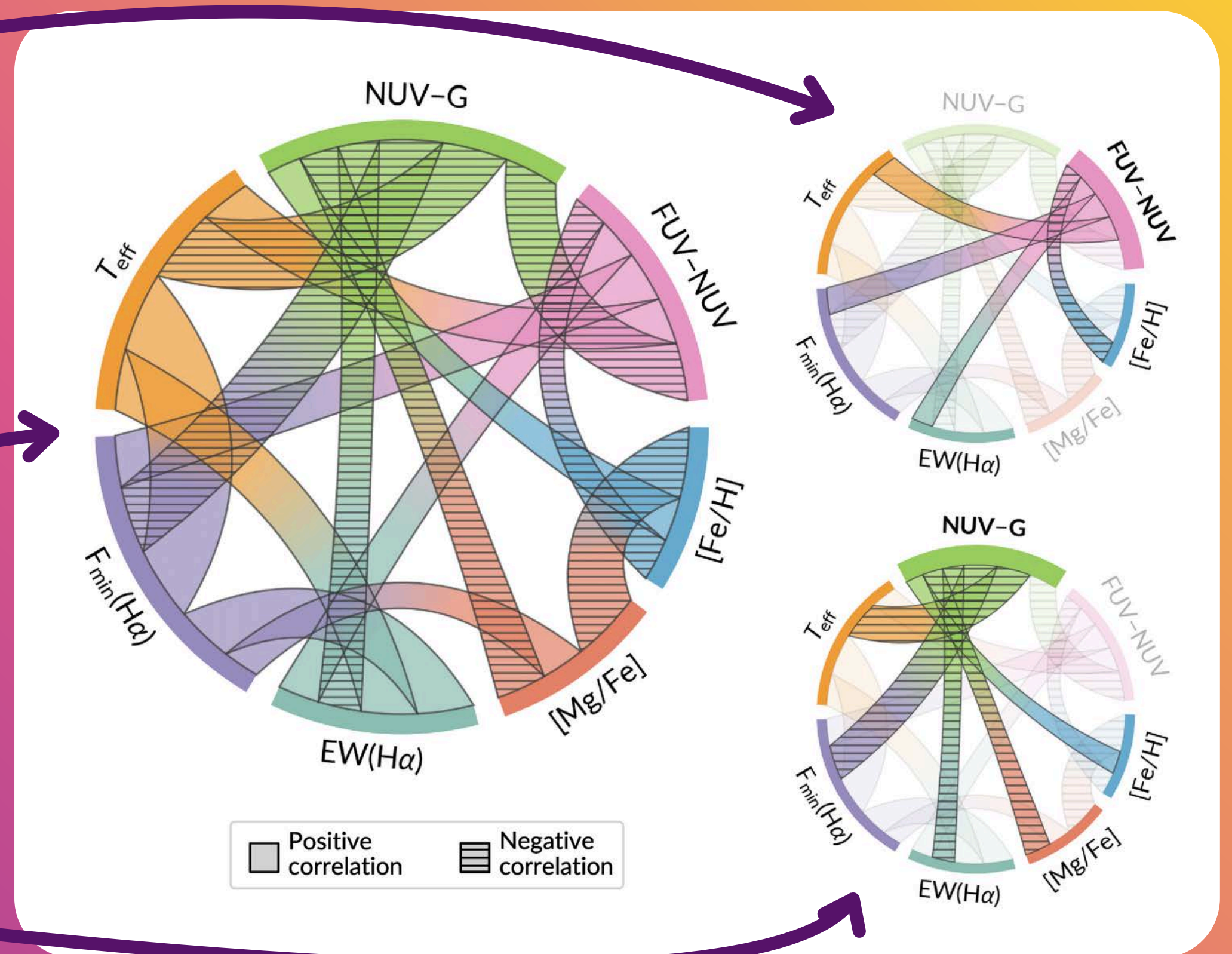


Global correlations with CACHAI

Main correlations between (FUV-NUV) and other stellar parameters

All (anti-)correlations with $|\rho| \geq 0.4$

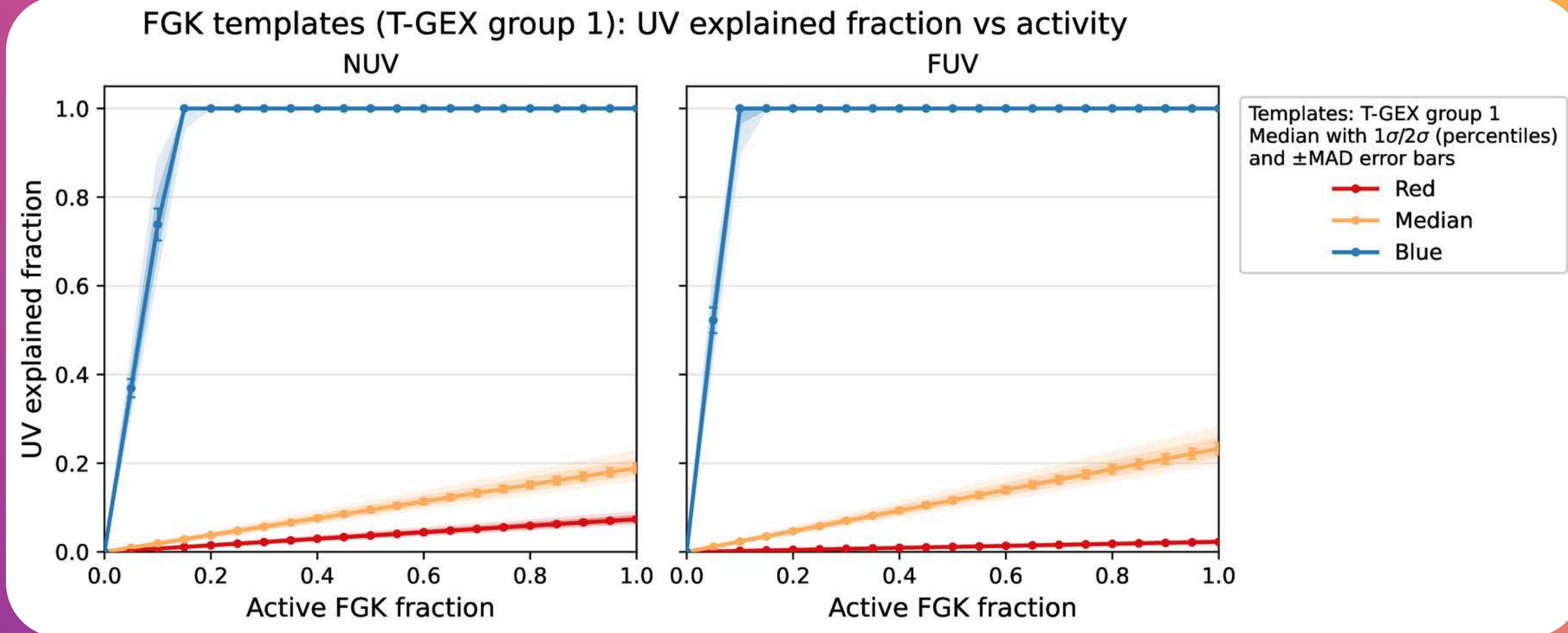
Main correlations between (NUV-G) and other stellar parameters



CACHAI package: Beltrán & Dantas
(2025, RNAAS; Vol. 9, Issue 8, id. 216)

Can these stars (at least partly) explain the UVX?

- We built a **pipeline** to estimate the contribution of T-GEX's UV-extreme stars in the UVX of quiescent galaxies;
- **UVX galaxies** used for this comparison selected in Dantas et al. (2020, 2021) using GAMA+GALEX+SDSS



Highly non-linear!



Take home message (just before T-GEX II...)

 Let's keep in touch:
mlldantas@protonmail.com

- We detect 37 **UV-bright FGK stars** with $\sim 2/3$ showing **UVX**;
- The UV-bright stars are not simply random FGK outliers: **they preferentially occupy cooler, more metal-poor and alpha-enhanced regimes. Ages vary, but the best solutions favour older values especially due to the results from T-GEX II paper (given the chemical enrichment)!**
- **Chromospheric activity does not provide an obvious explanation** for the UV excess; its physical origin remains open and requires dedicated spectroscopy
- Even a **modest fraction of UV-extreme FGK stars** can **contribute substantially** to the **integrated UV emission** of quiescent galaxies, with a **strongly non-linear response**.
- **A new piece of the UV-upturn puzzle:** apparently **ordinary Sun-like stars**, a stellar population largely absent from the UV-upturn picture **until now**.
- **A FANTASTIC science case** for the upcoming UV instruments (e.g. UVEX, CASTOR, HWO) in the next decades!