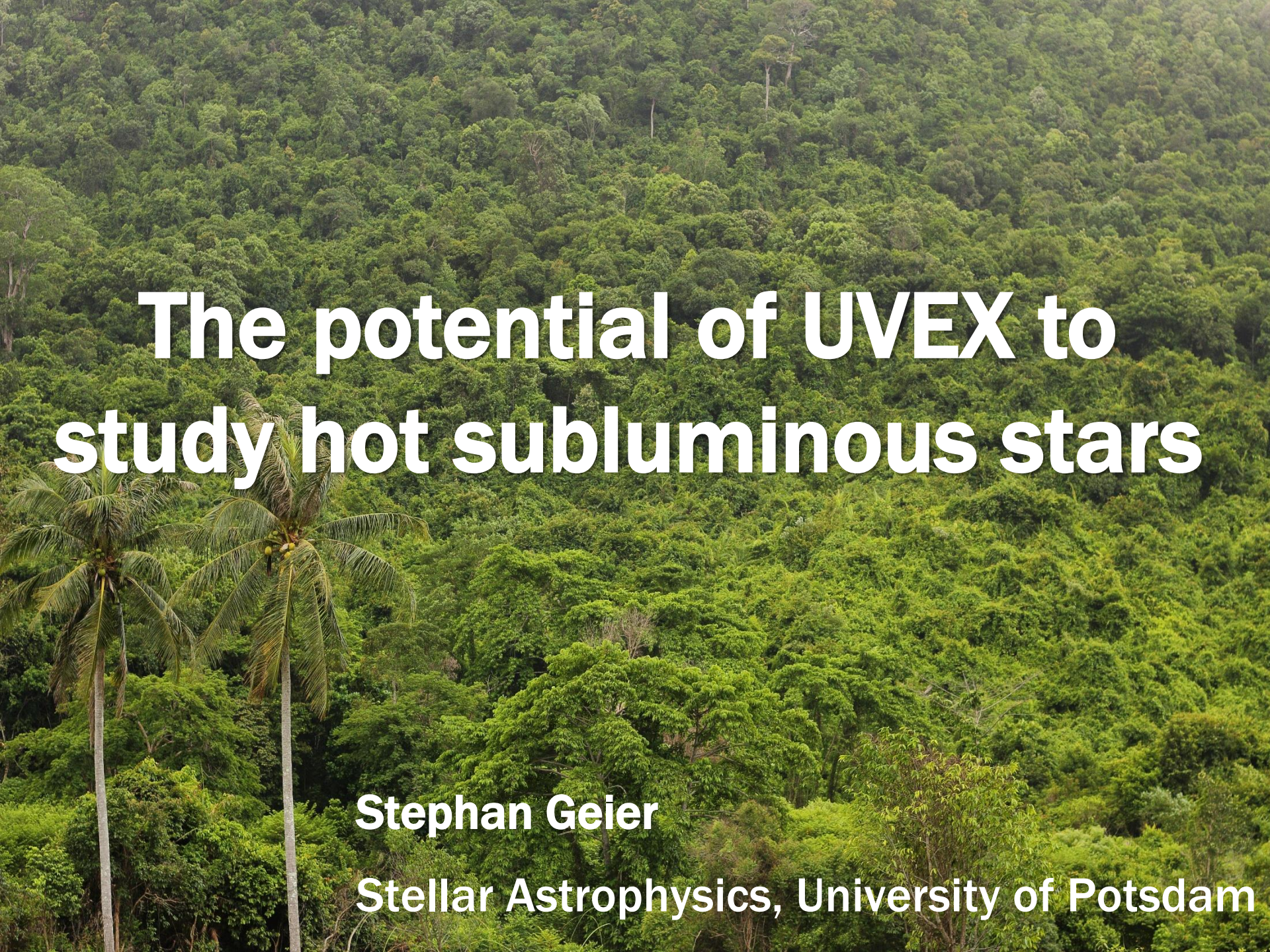
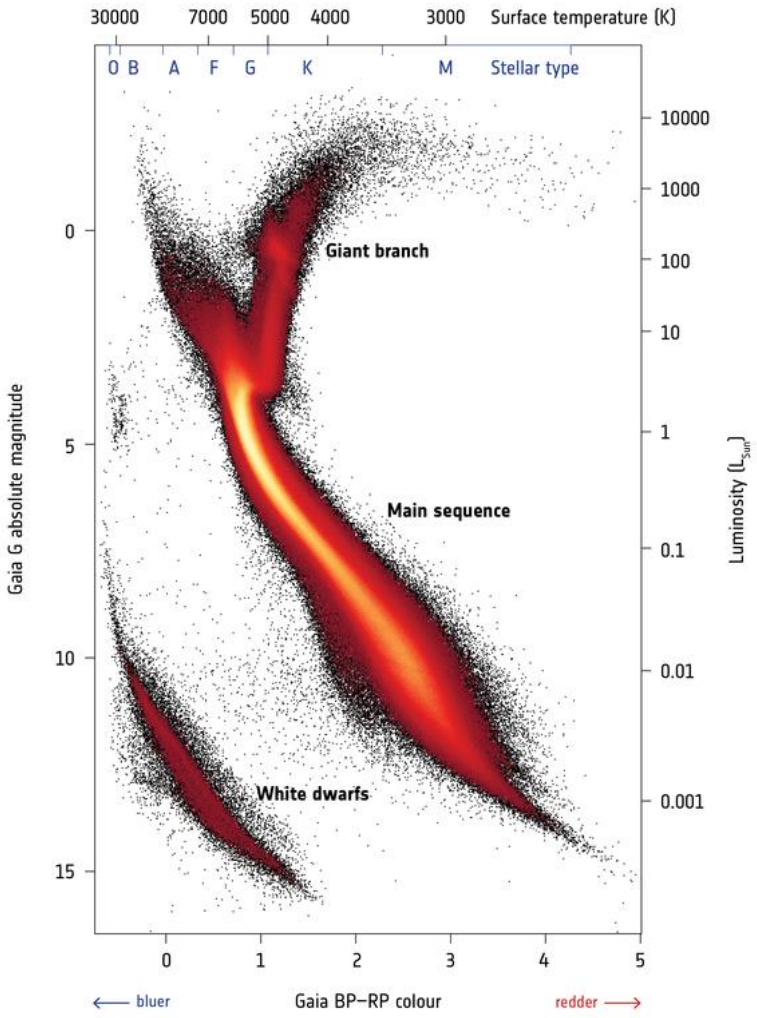


The potential of UVEX to study hot subluminous stars

Stephan Geier

Stellar Astrophysics, University of Potsdam

Hot subluminous stars



Situated between MS and WDs in the HR-diagram

Spectral types (sd)O/B/A

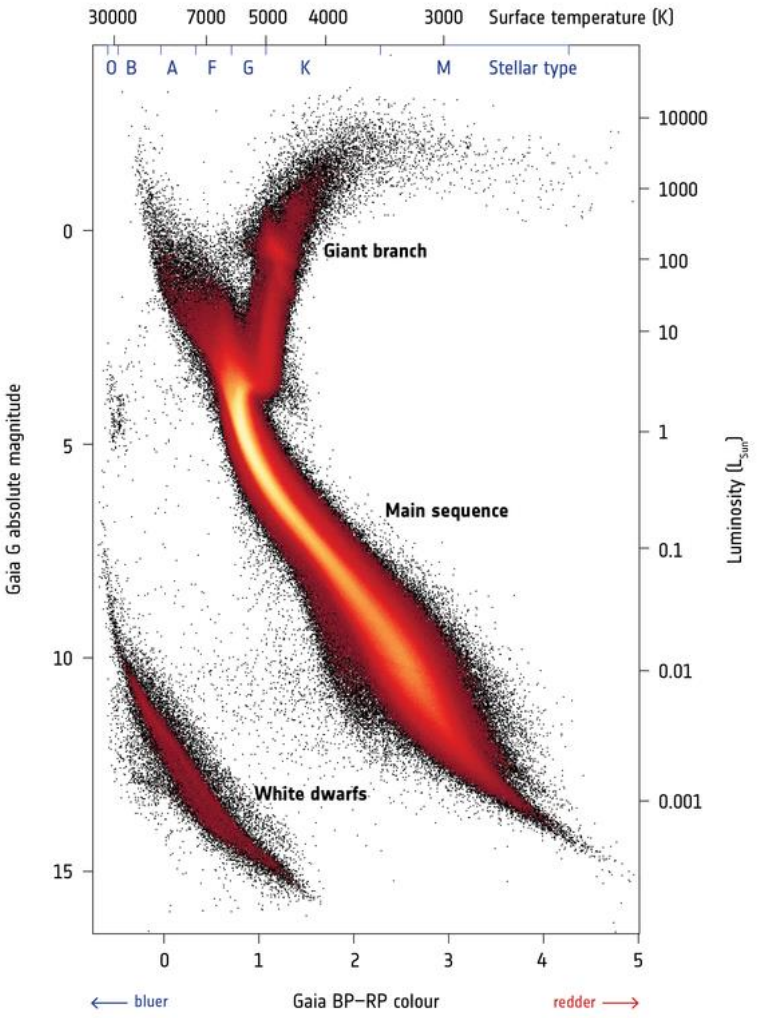
$$T_{\mathrm{eff}} \sim 10000 - 100000\ \mathrm{K}$$

$$L \sim 10 - 1000\ M_{\odot}$$

Flux maximum in the UV

ESA/Gaia/DPAC

Hot subluminous stars



97% of all stars ($\lesssim 8\ M_\odot$) pass through this region

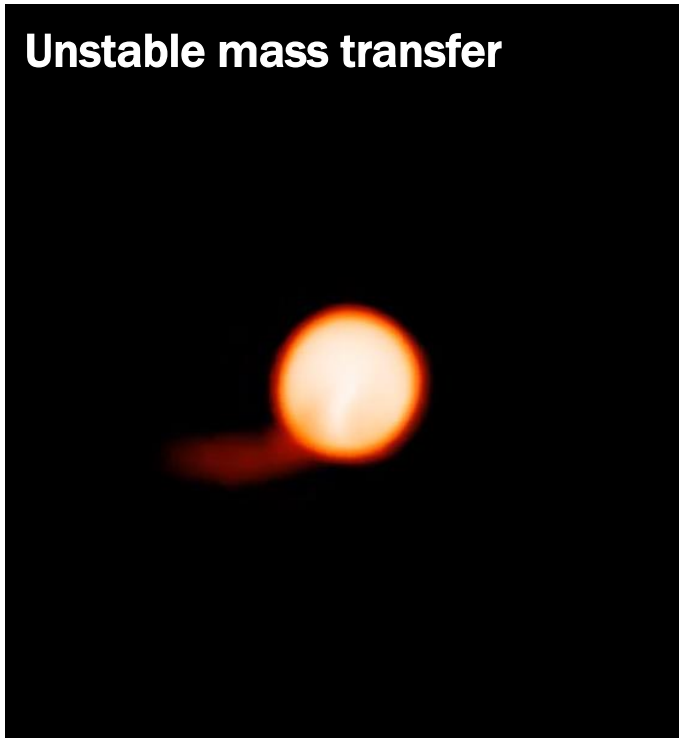
$\longrightarrow$ Fast evolution (post-AGB)

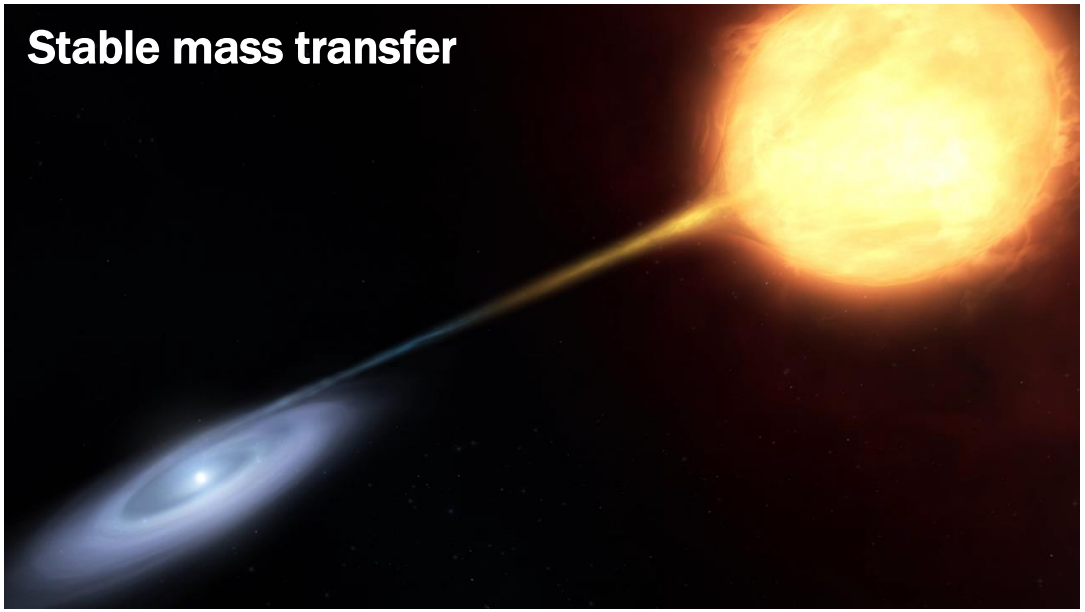
$\longrightarrow$ Peculiar evolution

$\longrightarrow$ **Binary interactions**

ESA/Gaia/DPAC

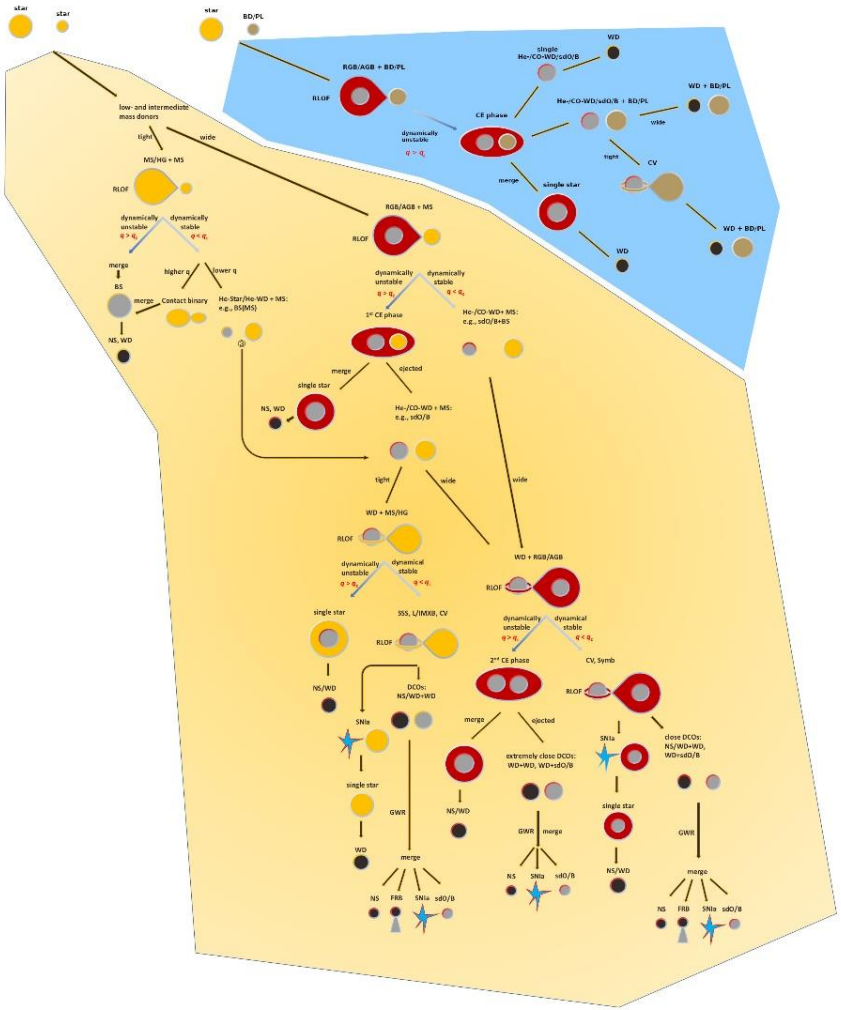
Hot subluminous stars





ESO, M. Kornmesser; ESO, L. Calcada; Youtube/Thomas Reichardt

Hot subluminous stars



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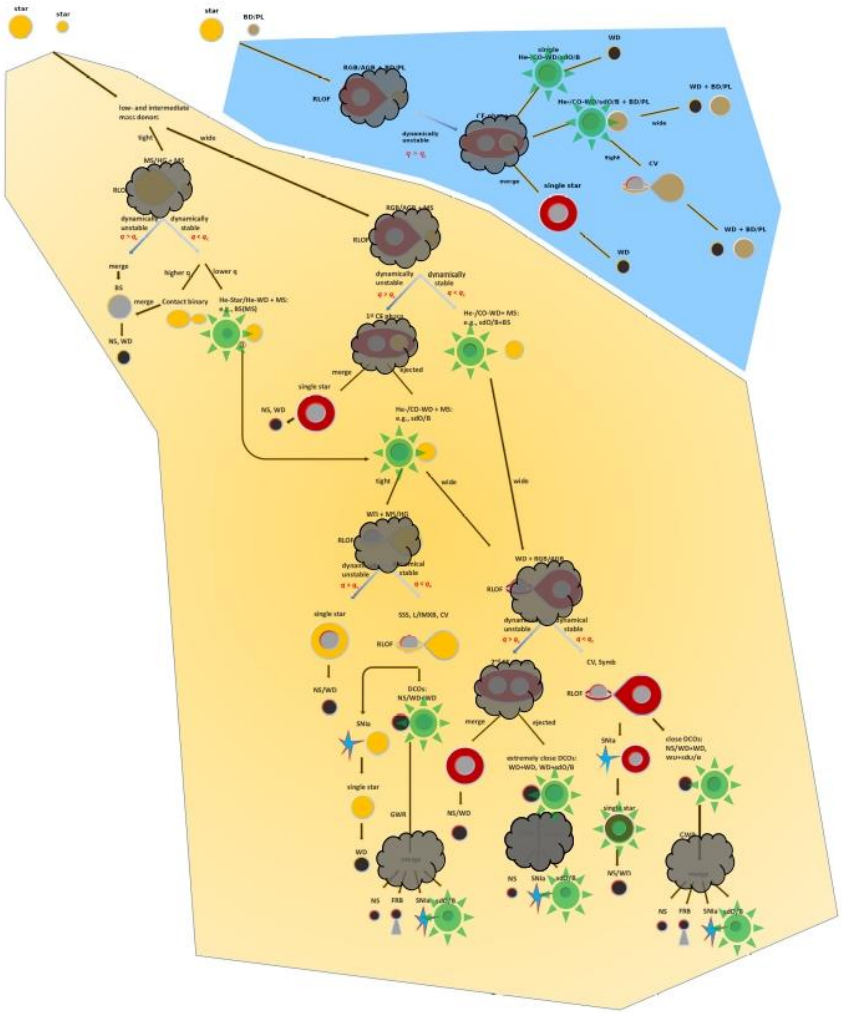
Han et al. 2020, RAA, 20, 161 modified by Geier

Hot subluminous stars



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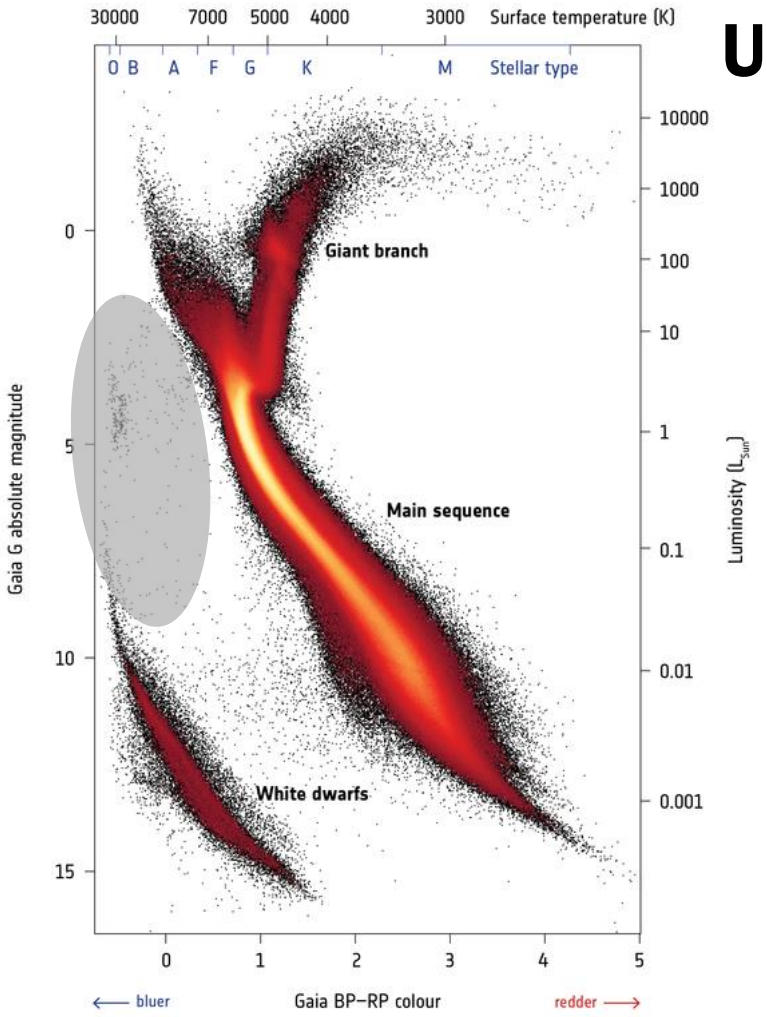


Uncharted territory

ESA/Gaia/DPAC

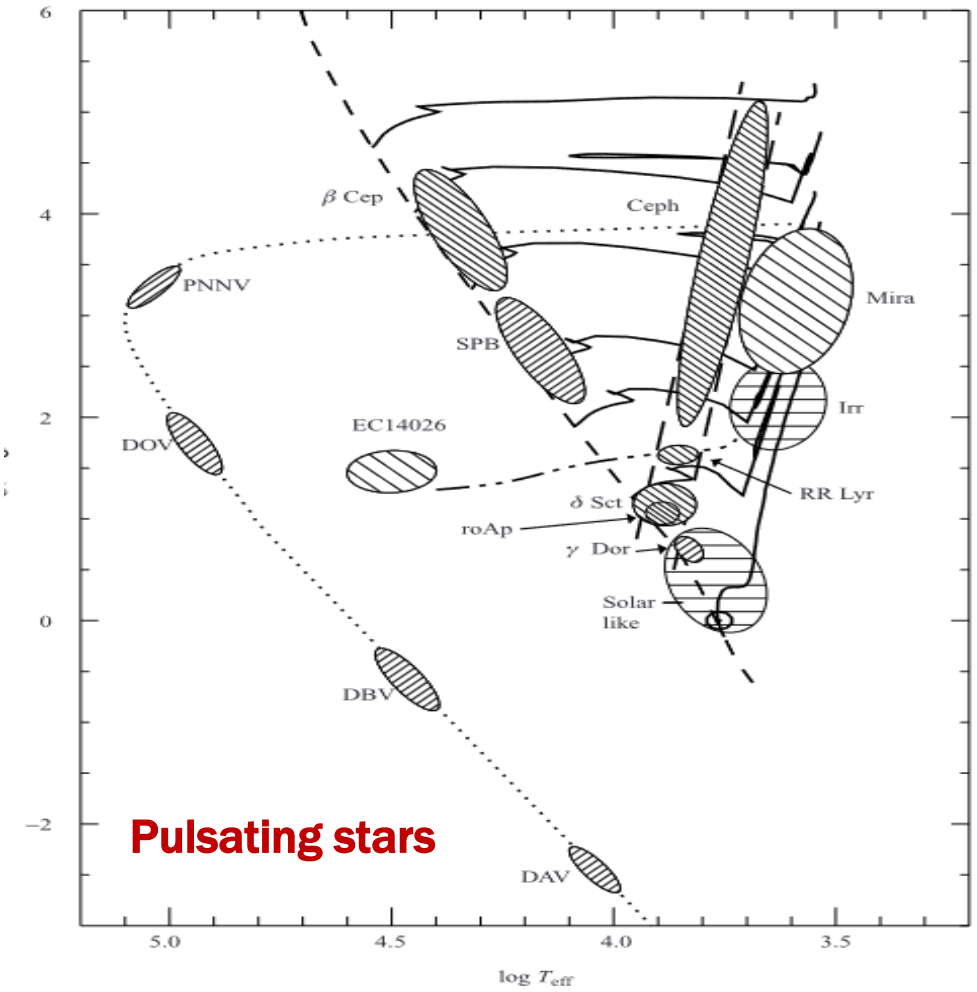
The origin of new species

19 new types of objects discovered in the last 20 years

(pre-)ELM (2003, 2004)
HVS sdO (2005)
sdB+BD (2011)
He-sdOBV (2011)
Heavy metal He-sdOB (2011)
ELMV (2012)
EL CVn (2013)
sdOV in GCs (2016)
BLAP (2017)
HVS WDs (2018)
Compact BLAP (2019)
Accreting sdOB+WD (2020)
Disk sdB (2021)
sdOBH (2022)
Co-sdO (2022)
He-sdO close binaries (in prep.)
sdB+WD astrometric binaries (in prep.)
Single intermediate mass He-sdO (in prep.)

Dmitry Makeev/Wikimedia Commons; Freepik.com

The origin of new species



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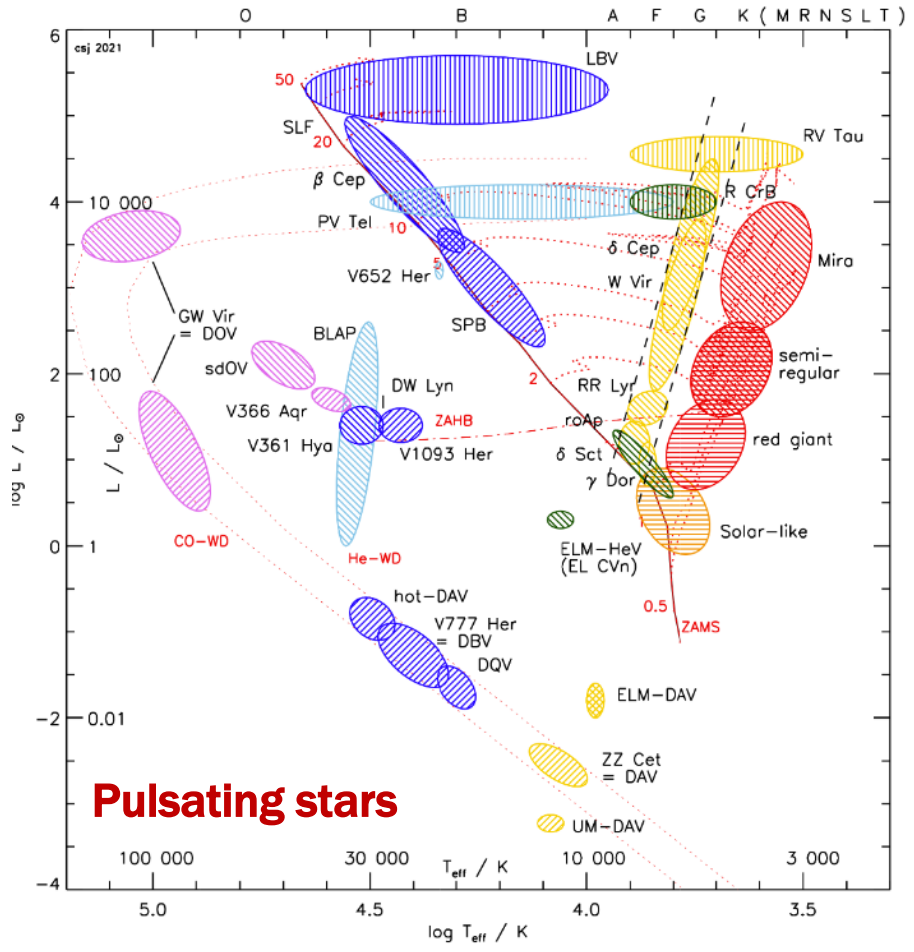
Kurtz 2005, J. Astrophys. Astr. 26, 12

The origin of new species



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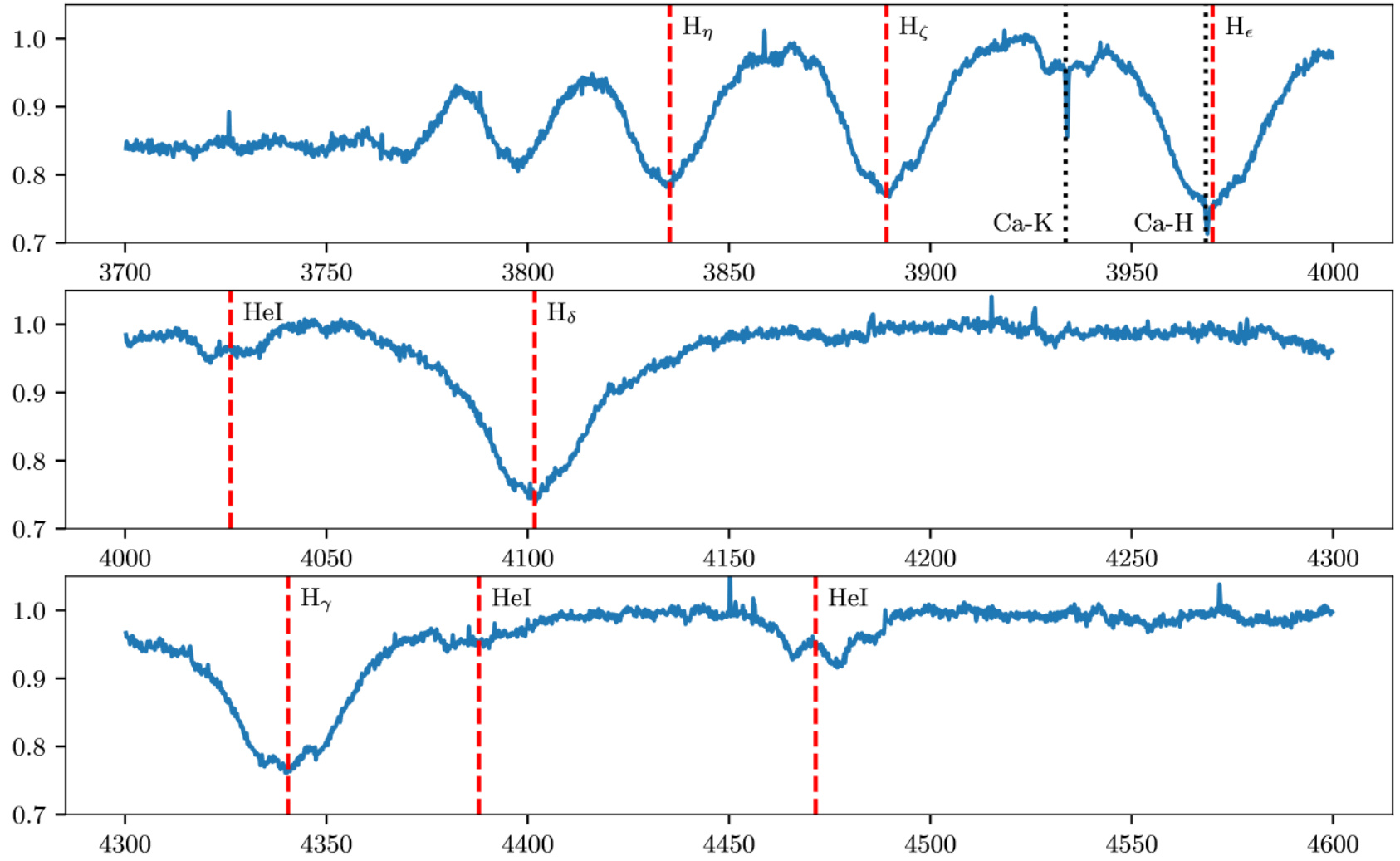
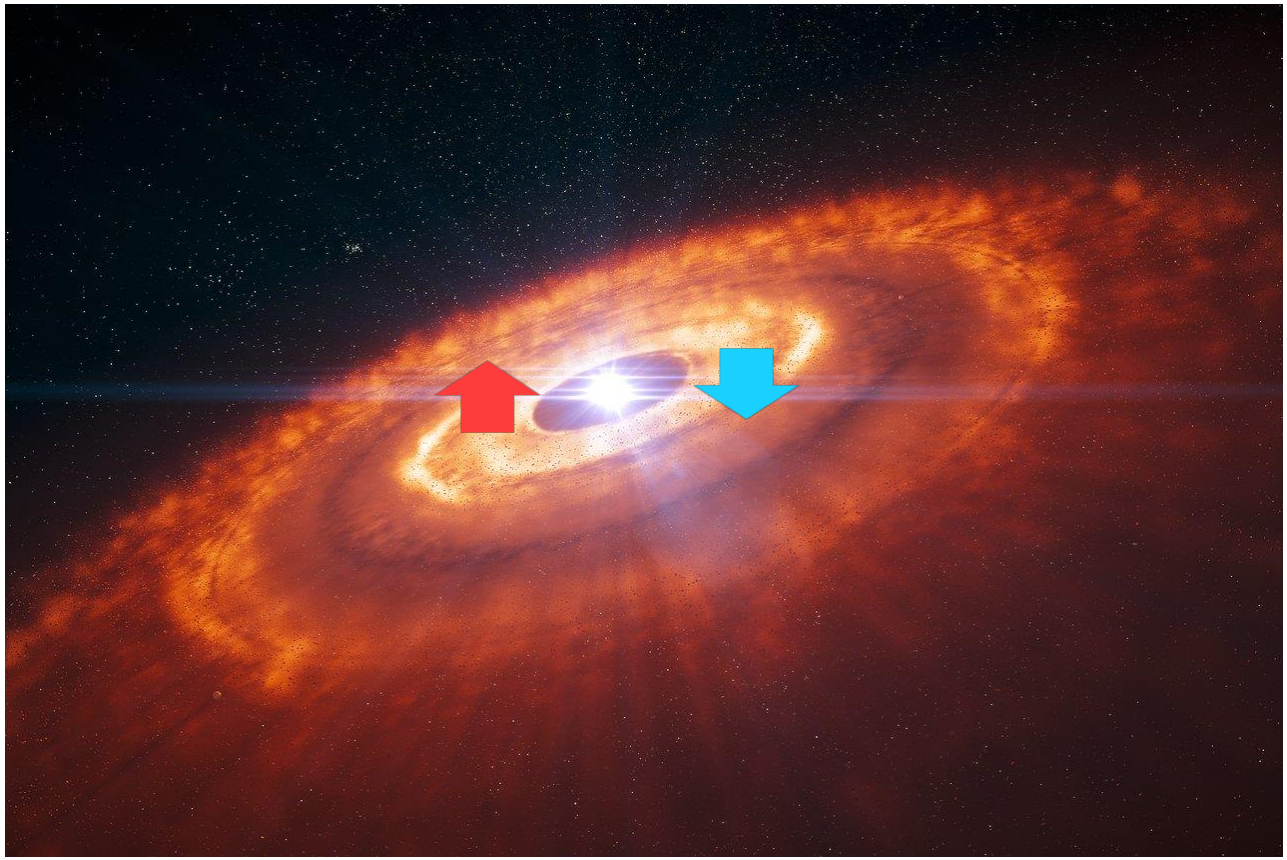
Kurtz 2022, ARA&A, 60, 31

Merger products?



Vos et al. 2021, A&A, 655, 43

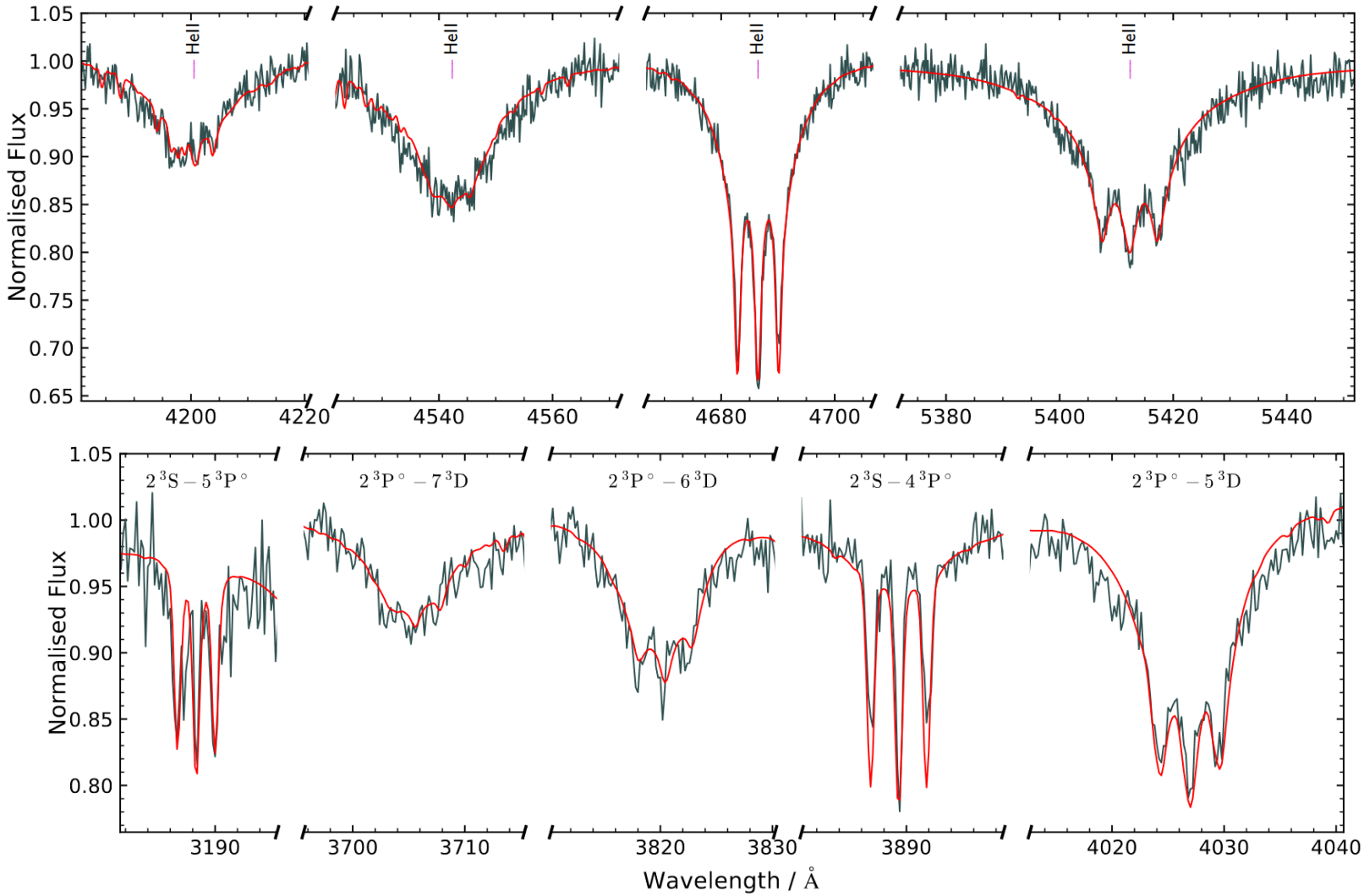
Merger products?



Disc from the merger process?

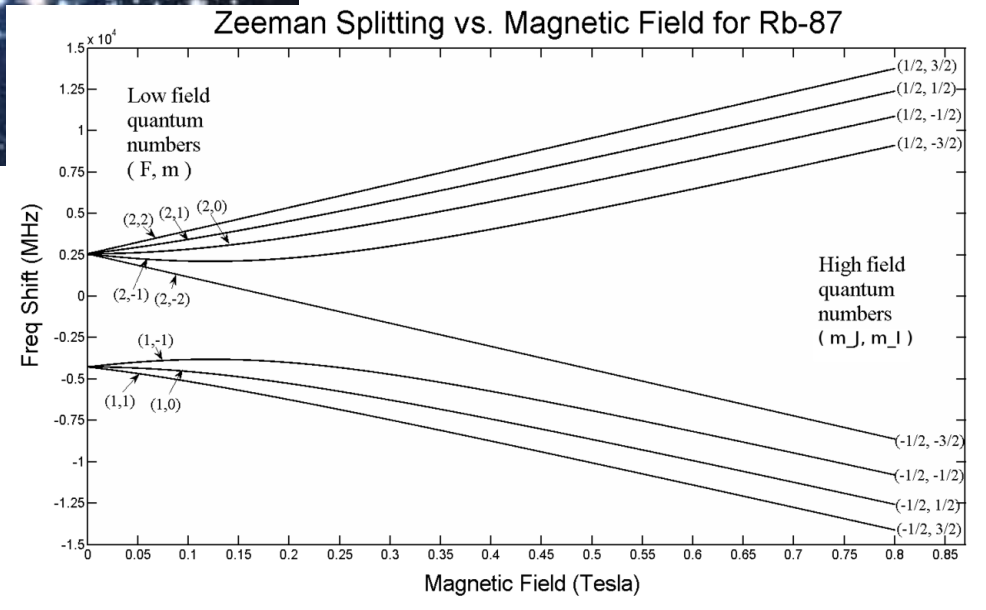
ESO/L. Calcada

Merger products?



Dorsch et al. 2022, A&A, 658, L9

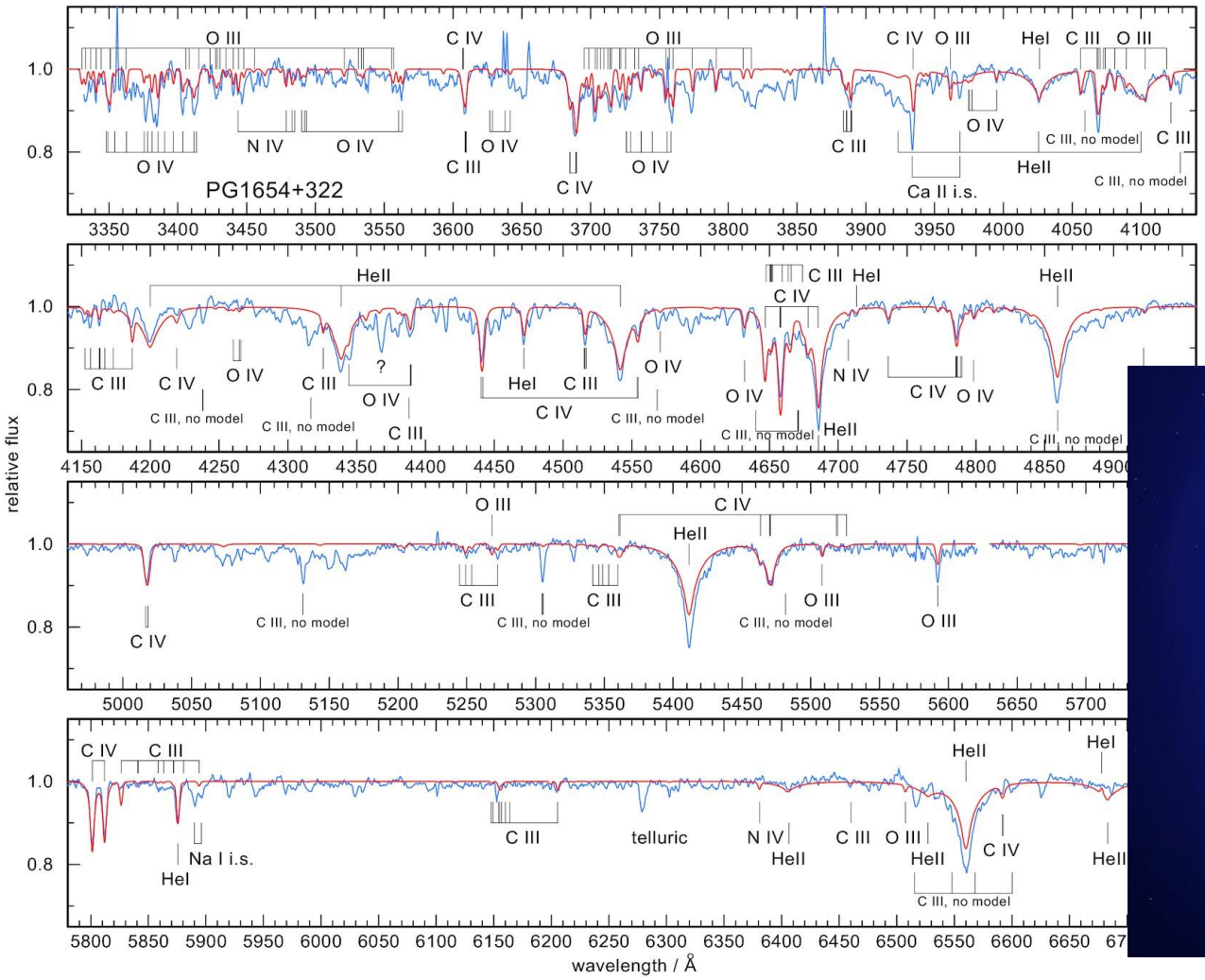
Merger products?



Magnetic fields

L. Calcada/ESO, Dansk14/Wikipedia

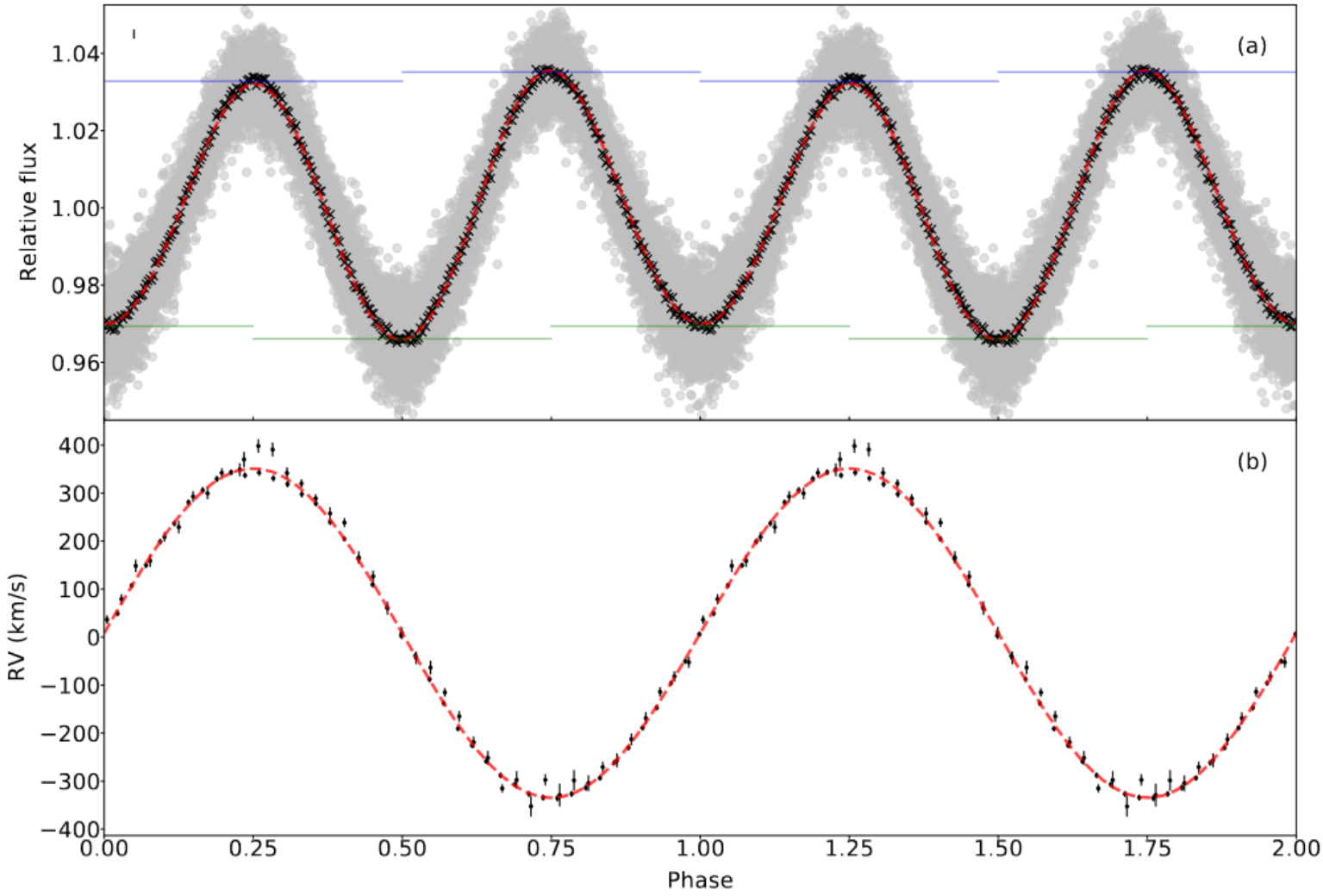
Merger products?



Ashes of merged companions

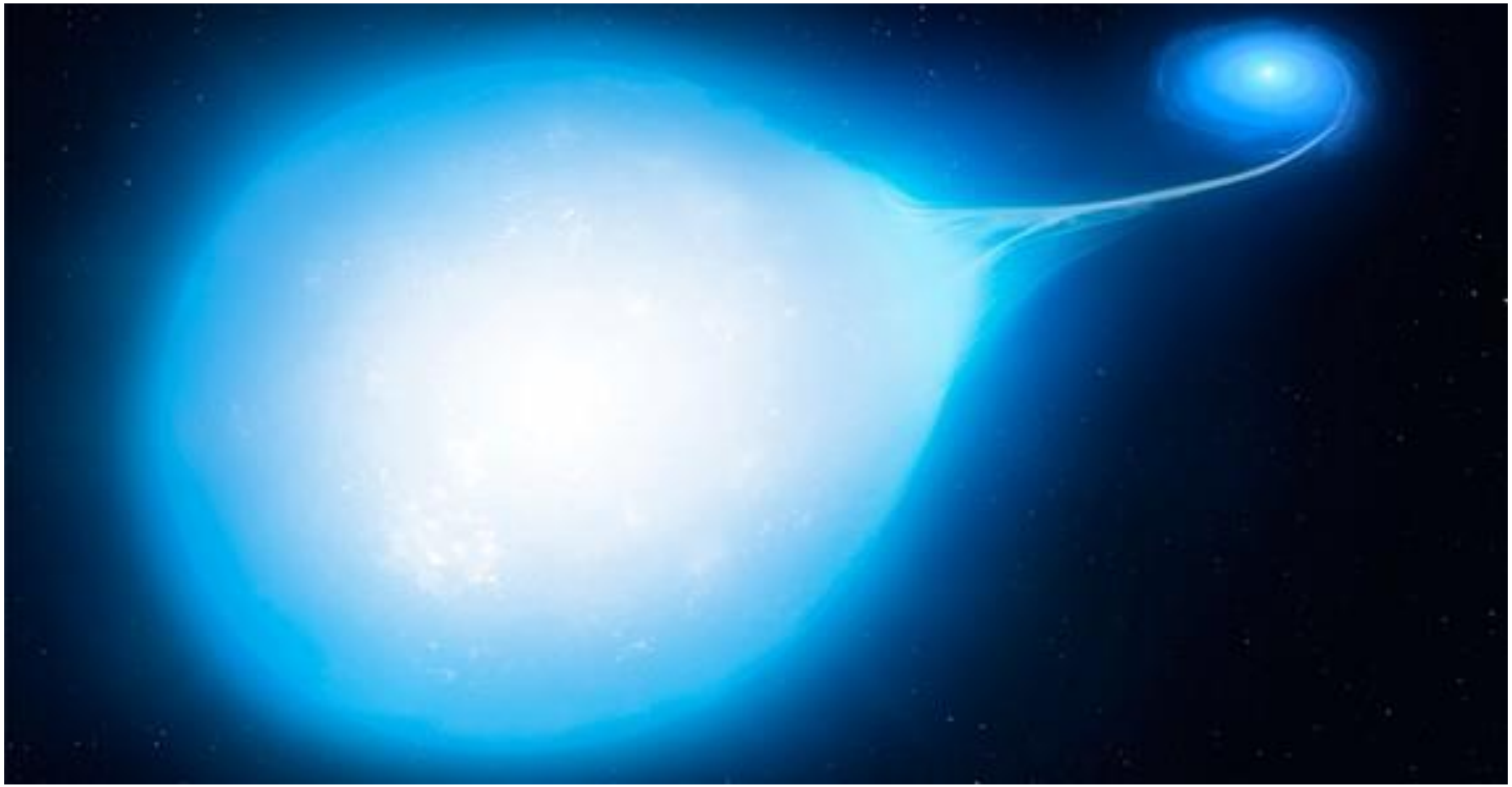
Werner et al. 2022, MNRAS, 511, L66; Mashable News

Supernova type Ia progenitors



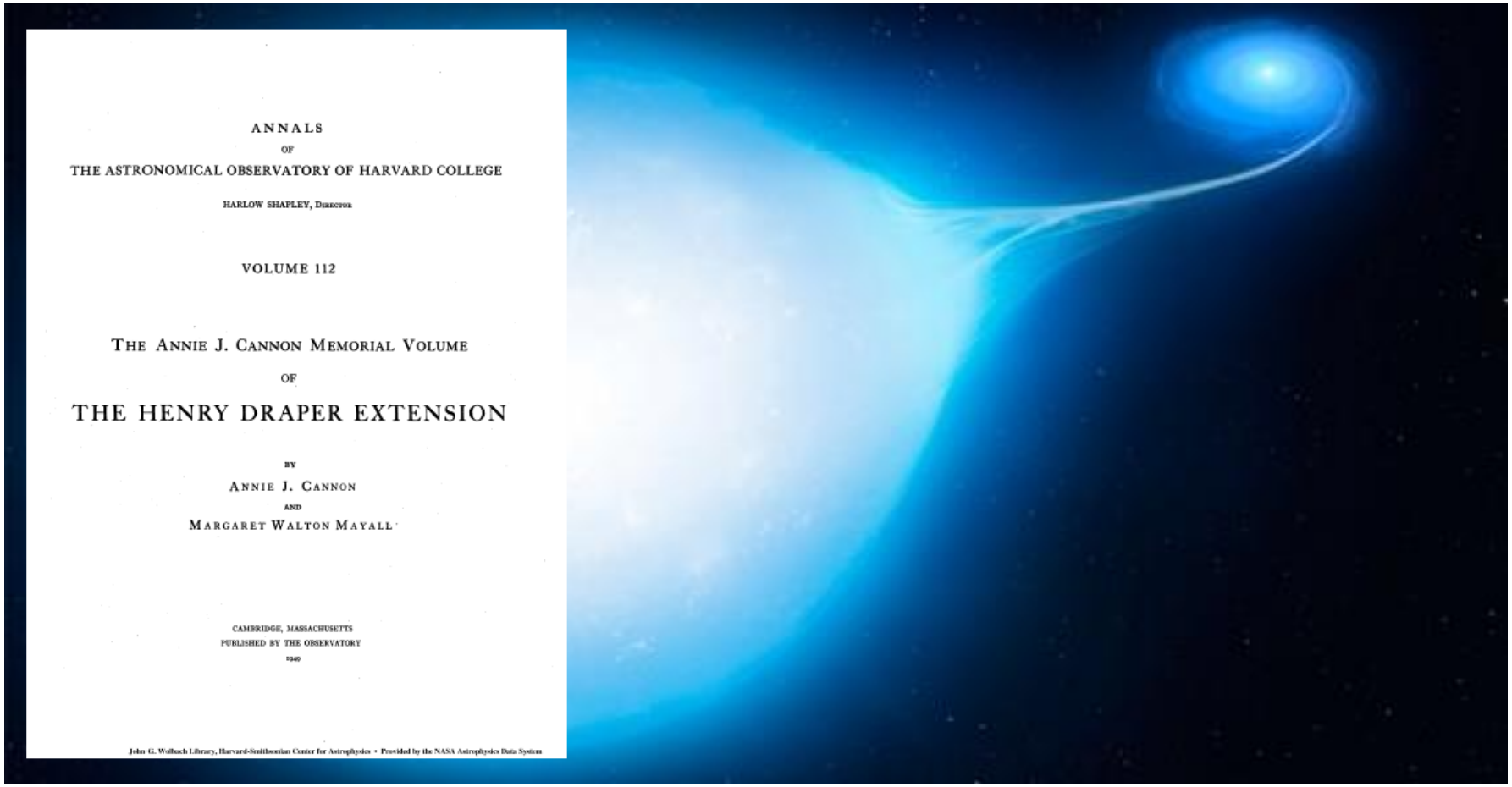
Pelisoli et al. 2021,Nature Astronomy, 5, 1052

Supernova type Ia progenitors



University of Warwick/Mark Garlick

Supernova type Ia progenitors



University of Warwick/Mark Garlick

New type of binary system

The first massive compact companion in a wide orbit around a hot subdwarf star

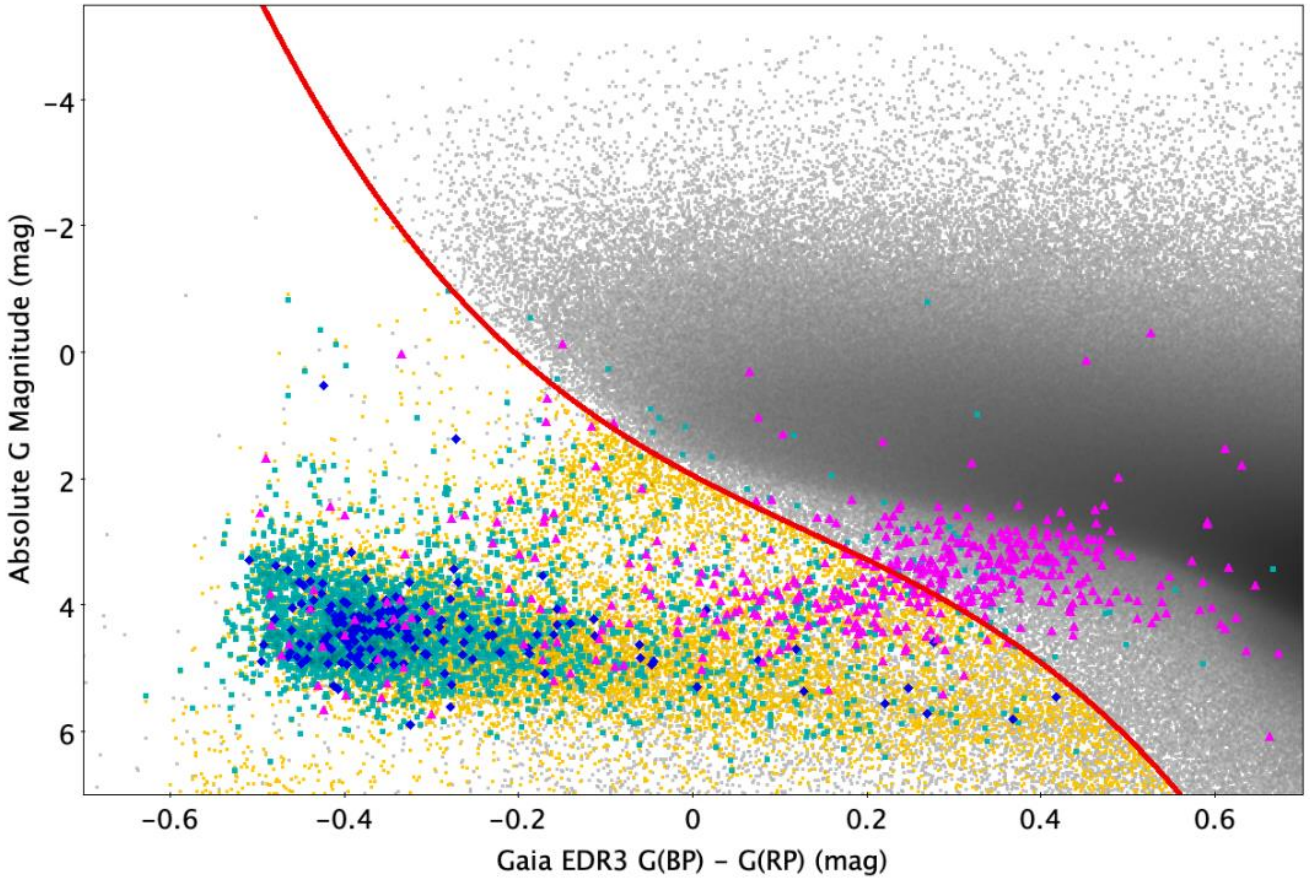
S. Geier[1], M. Dorsch[1,3], H. Dawson[1], I. Pelisoli[2], J. Munday[2], T. R. Marsh[2], V. Schaffenroth[1], and U. Heber[3]

[1] Institut für Physik und Astronomie, Universität Potsdam, Haus 28, Karl-Liebknecht-Str. 24/25, D-14476 Potsdam-Golm, Germany
[2] Department of Physics, University of Warwick, Conventry CV4 7AL, UK
[3] Dr. Karl Remeis-Observatory & ECAP, Astronomical Institute, Friedrich-Alexander University Erlangen-Nuremberg, Sternwartstr. 7, D 96049 Bamberg, Germany

Received Accepted

https://astro-apps.org/BinaryStarSystem/index.html; Geier et al. in prep.

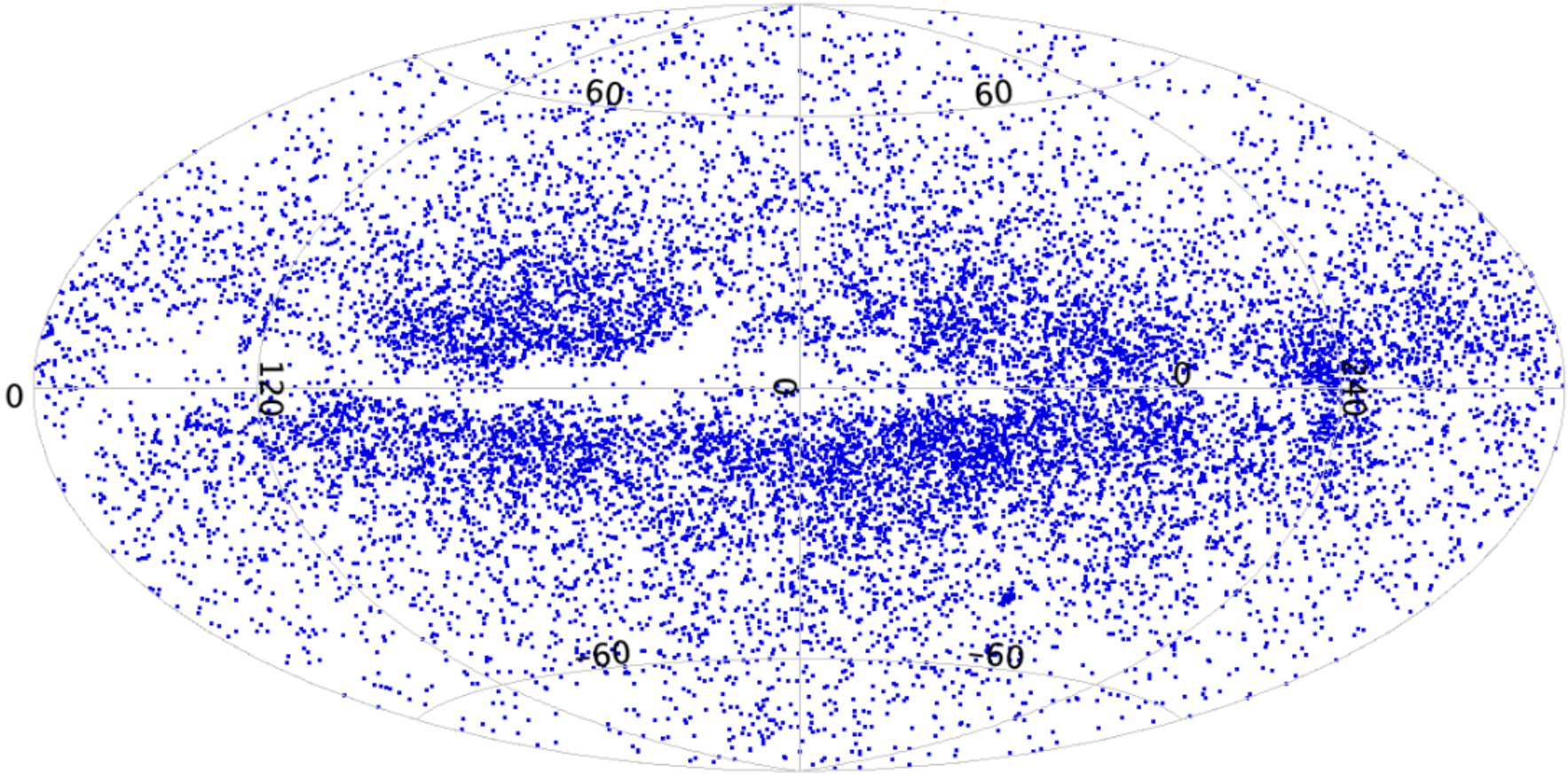
UVEX and hot subluminous stars



Target selection would benefit from UV-photometry

Culpan et al. 2022, A&A, 662, 40

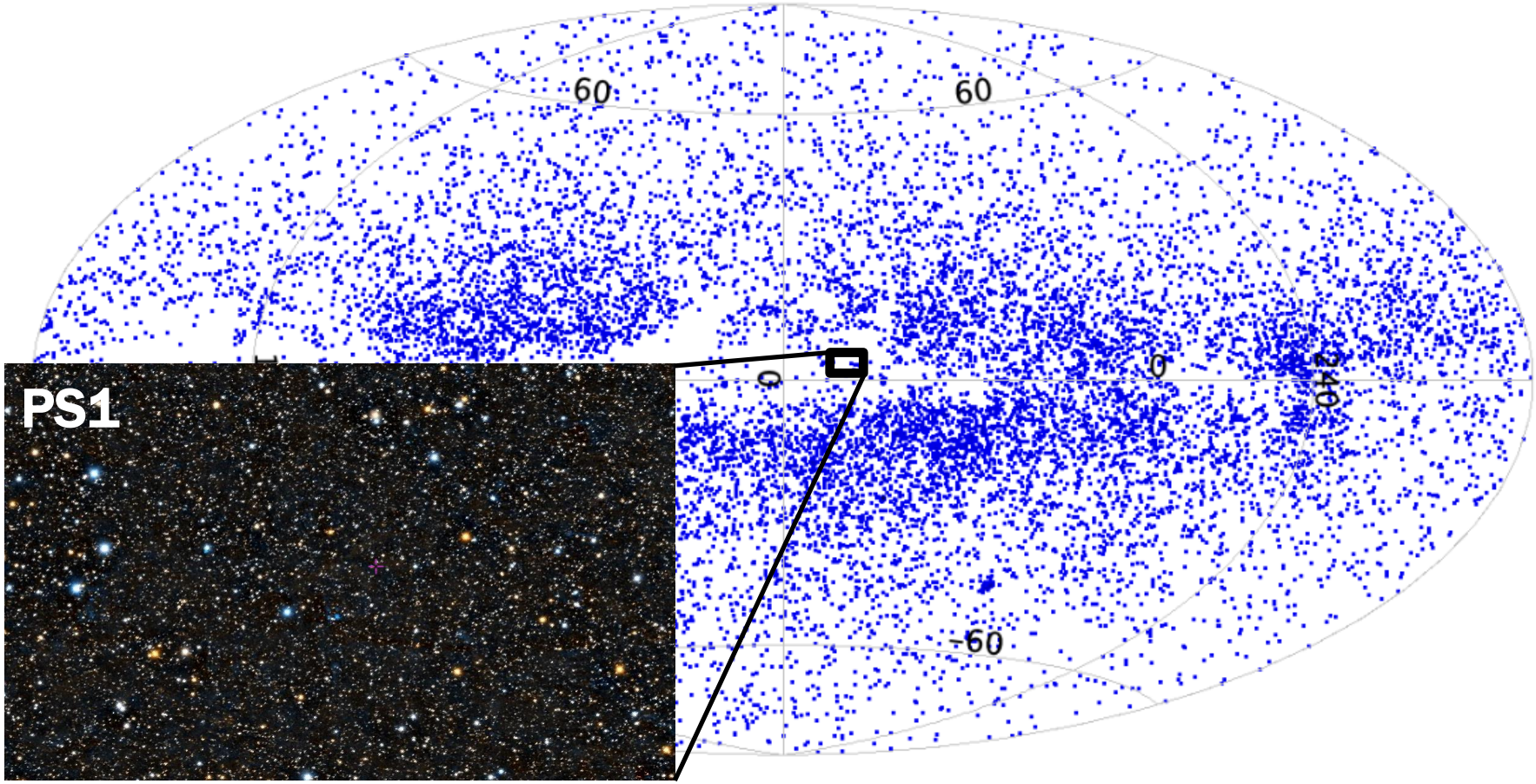
UVEX and hot subluminous stars



Gaia selection incomplete at low galactic latitudes

Culpan et al. 2022, A&A, 662, 40

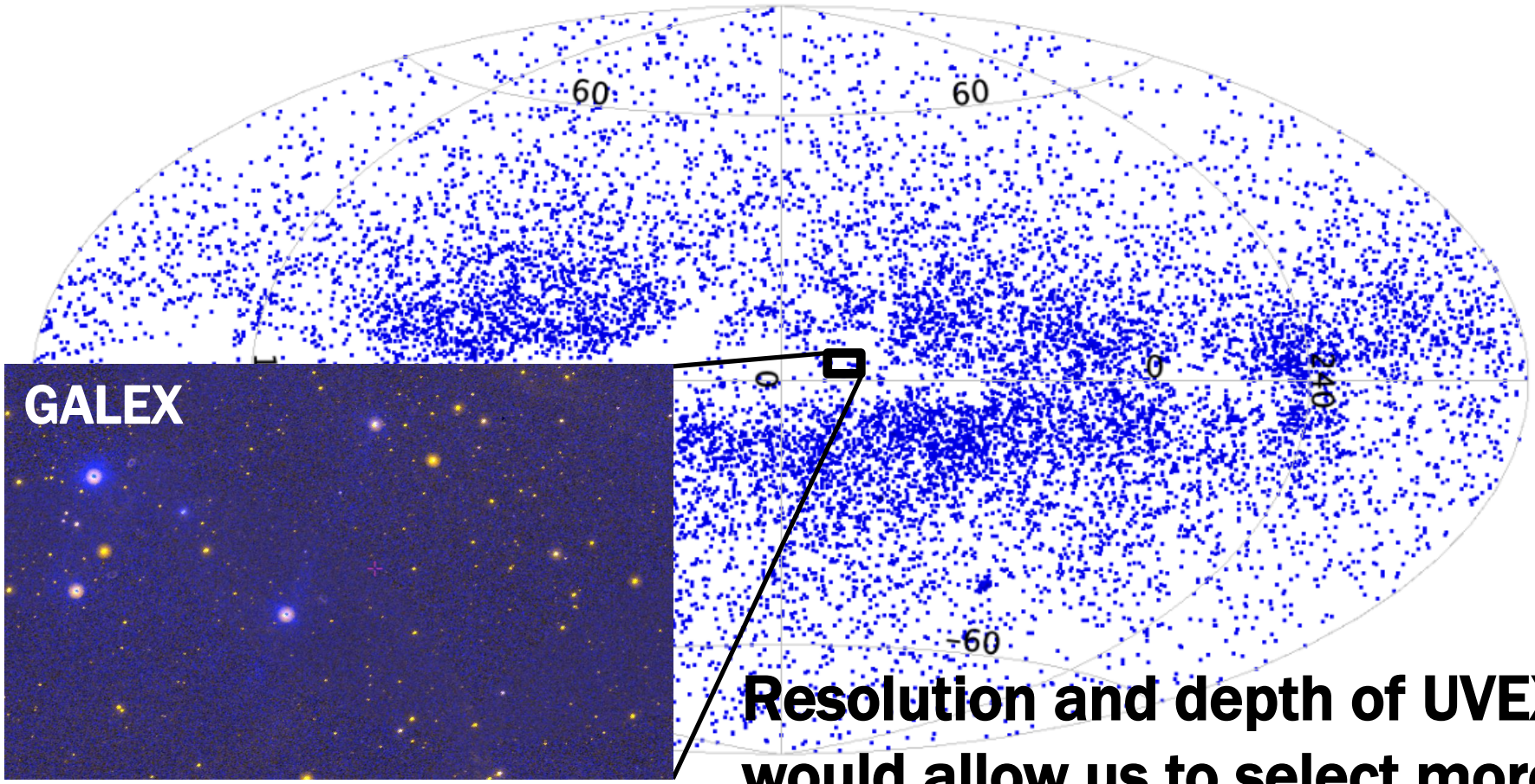
UVEX and hot subluminous stars



Crowding and reddening

Culpan et al. 2022, A&A, 662, 40

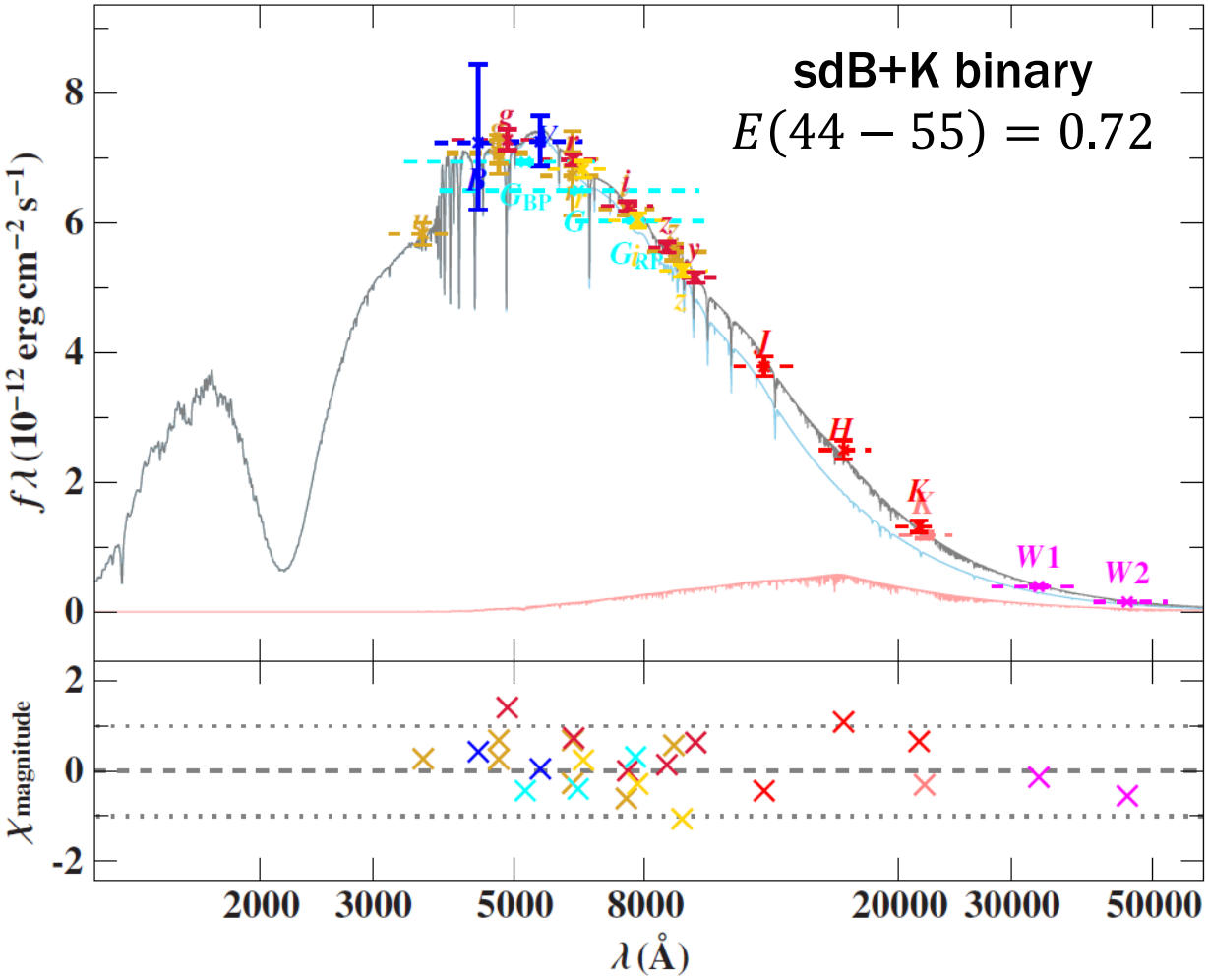
UVEX and hot subluminous stars



Resolution and depth of UVEX would allow us to select more complete samples

Culpan et al. 2022, A&A, 662, 40

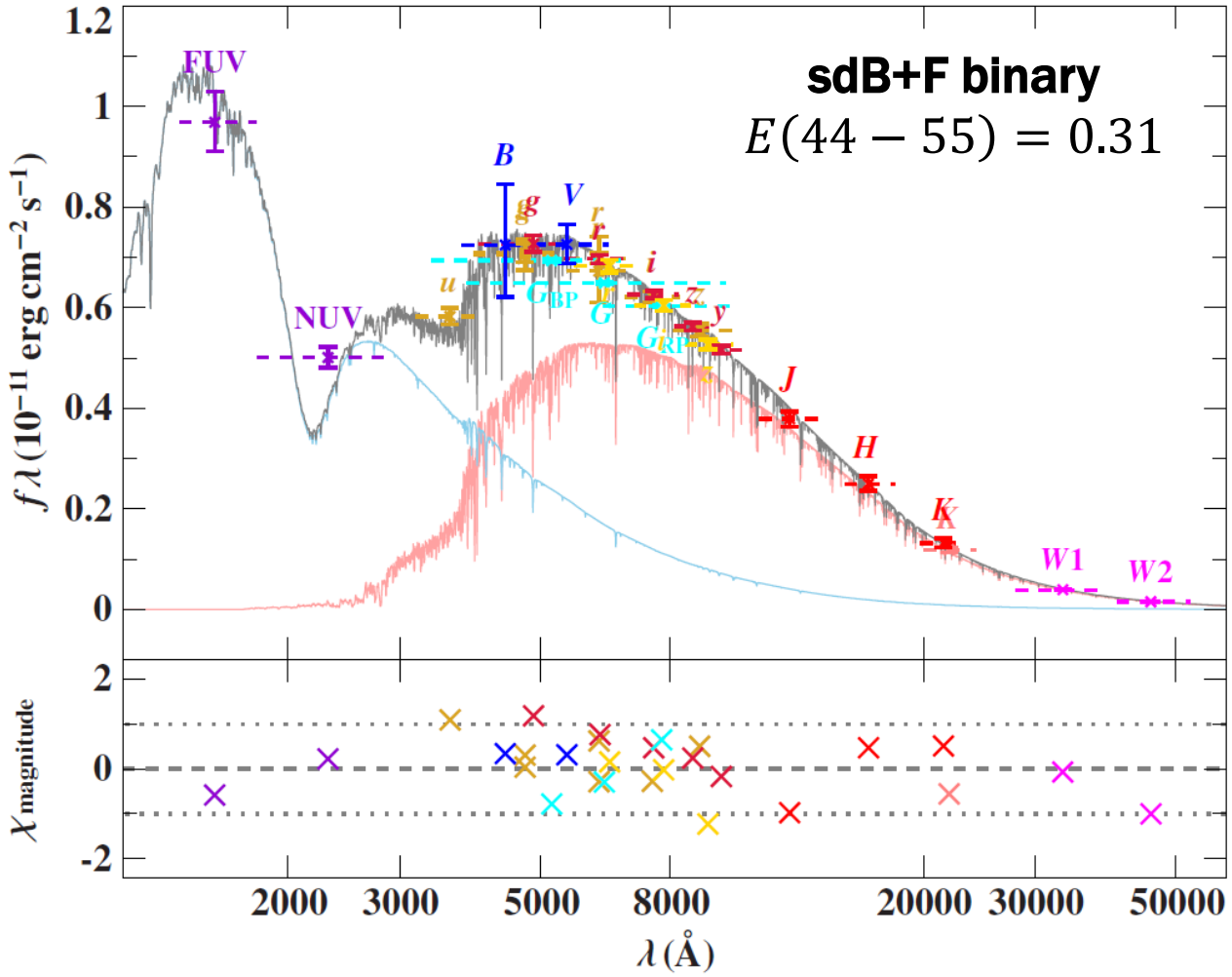
UVEX and hot subluminous stars



Spectral energy distributions of hot stars benefit extremely from UV photometry

Dorsch et al. 2020, A&A, 643, 22

UVEX and hot subluminous stars



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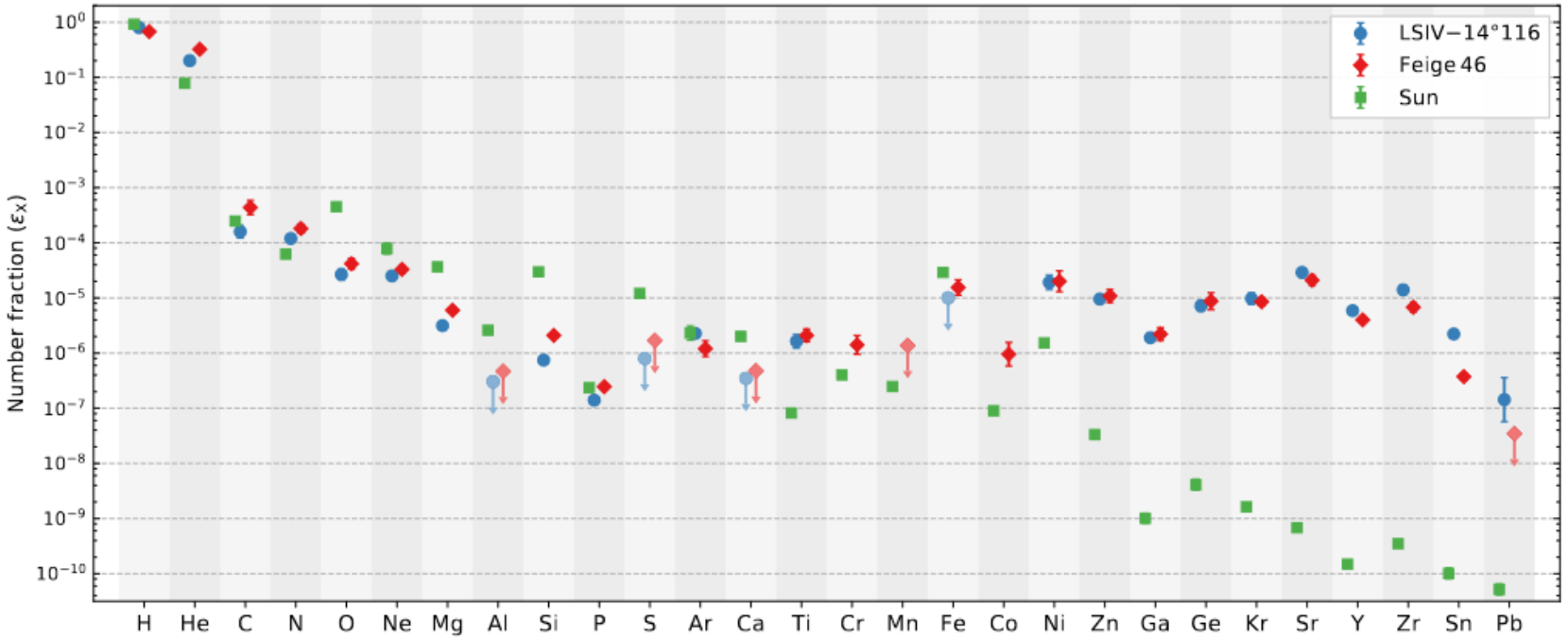
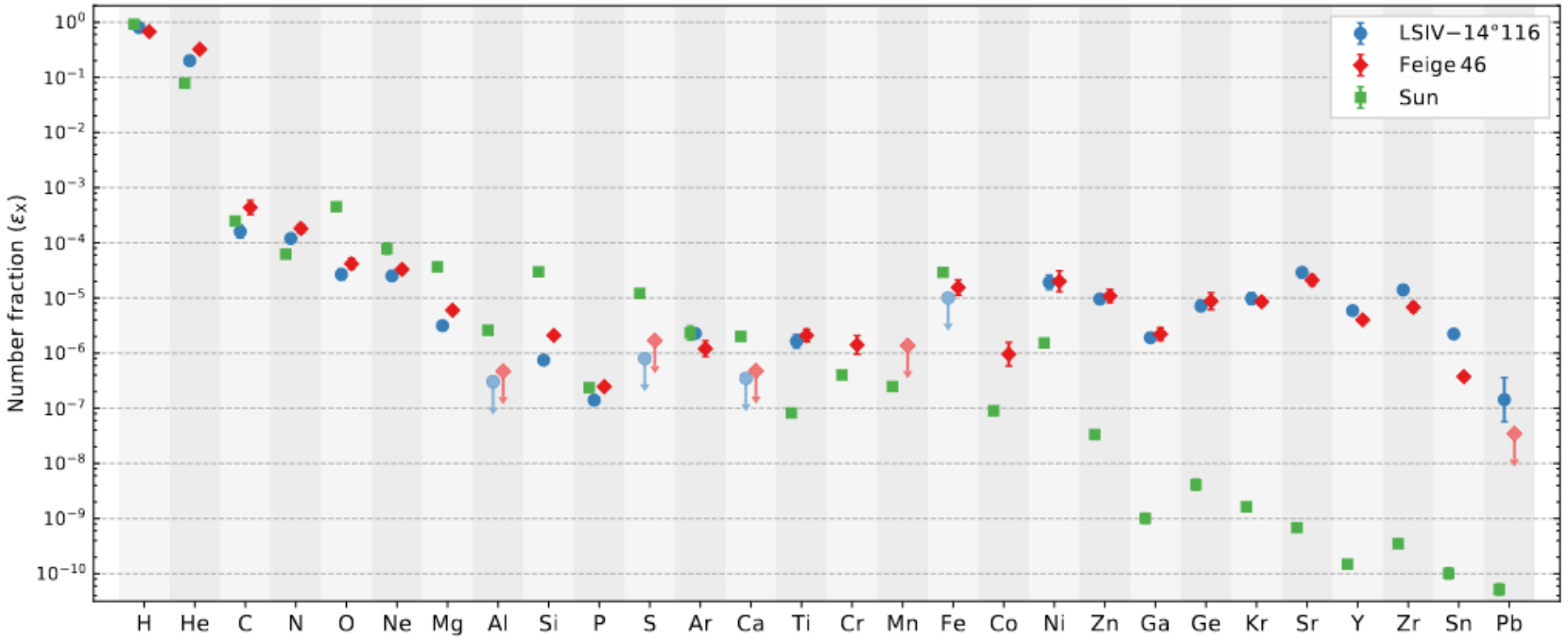


Hot subluminous stars often show peculiar abundance patterns (mixing of processed material, stripping, diffusion or pollution from mass transfer)

Dorsch et al. 2020, A&A, 643, 22

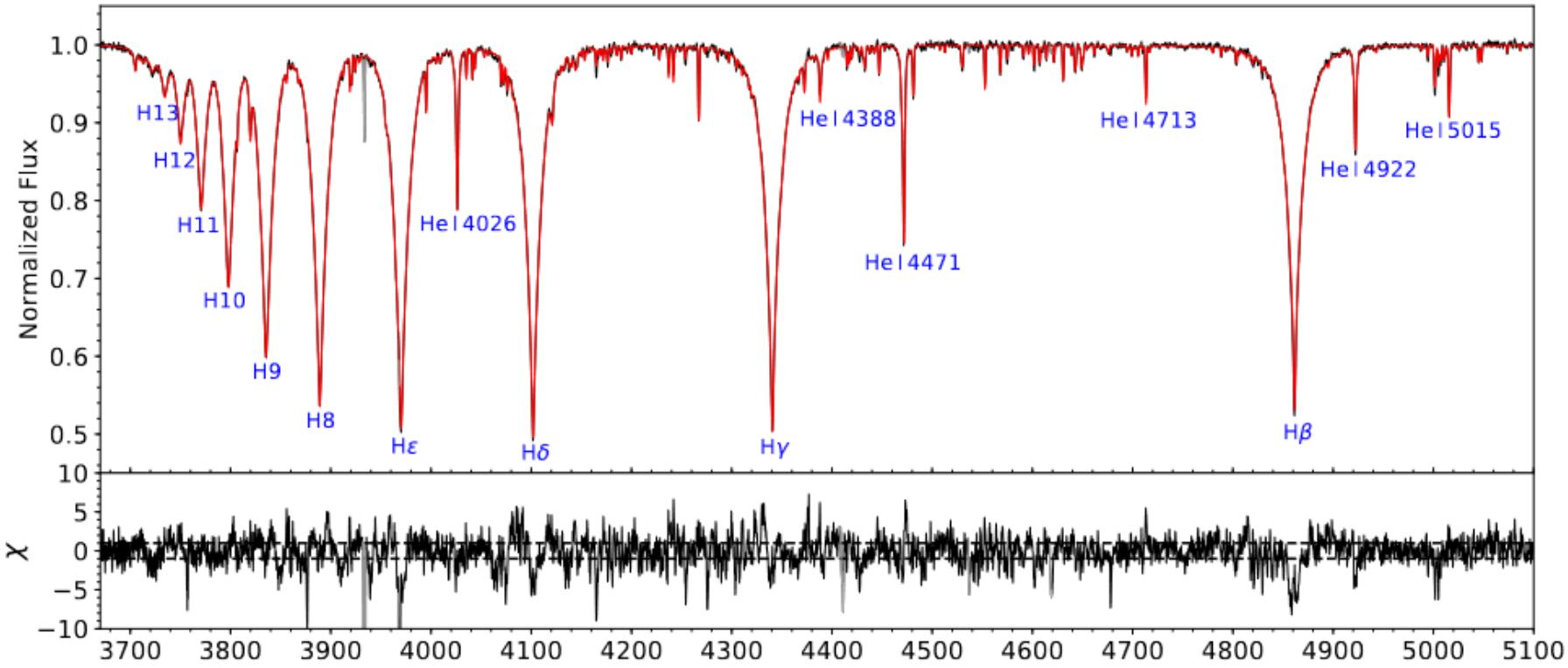
UVEX and hot subluminous stars



Crucial tracers to understand their formation and evolution

Dorsch et al. 2020, A&A, 643, 22

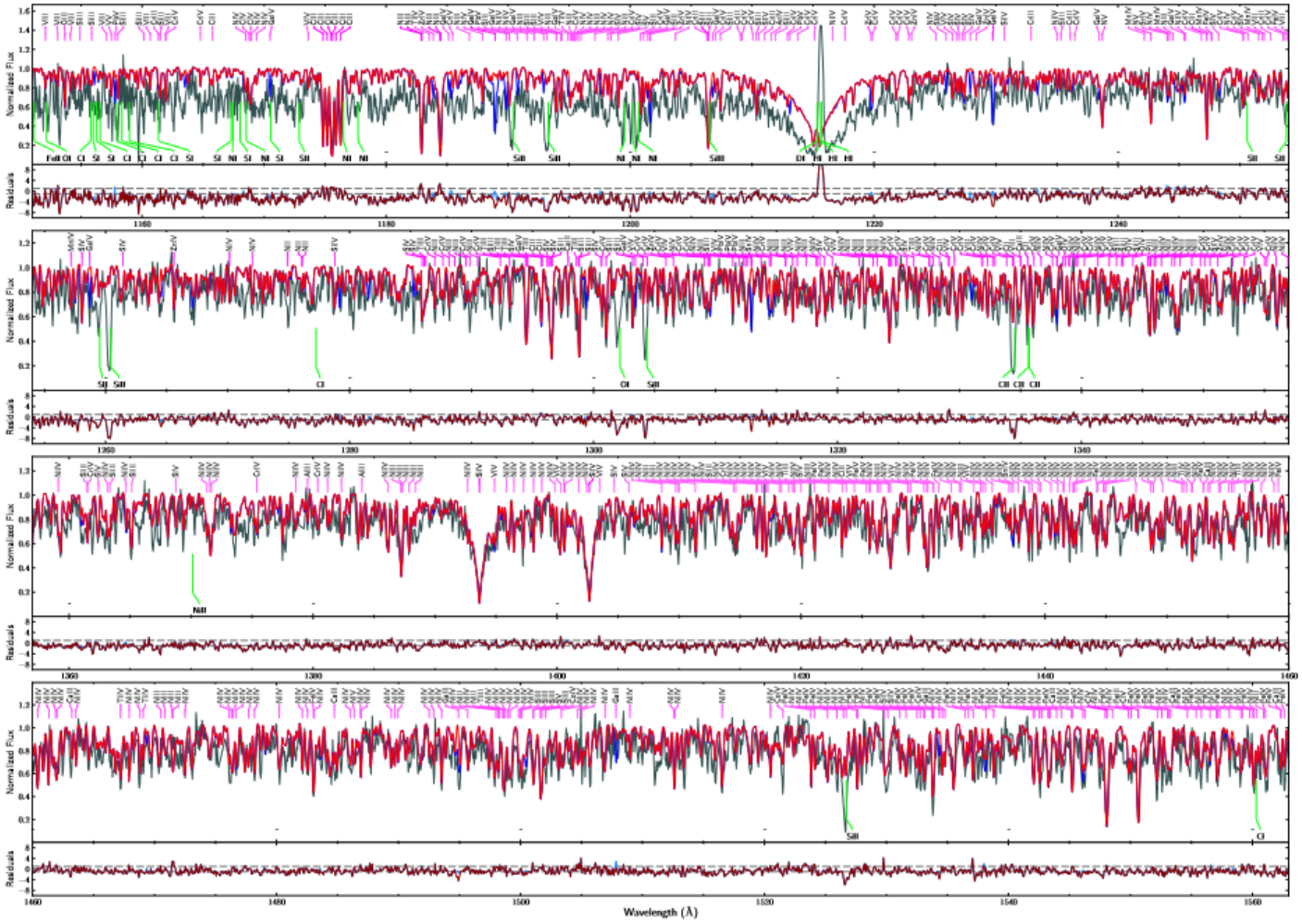
UVEX and hot subluminous stars



Optical spectra often ill-suited to determine abundances and ionisation equilibria (temperatures) of heavy metals

Schaffenroth et al. 2021, MNRAS, 501, 3847

UVEX and hot subluminous stars



UV spectra are essential

Dorsch et al. 2019, A&A, 630, 130

UVEX and hot subluminous stars

UVEX spectra $(R \sim 1000)$

→ "Metallicity" based on iron/nickel forest

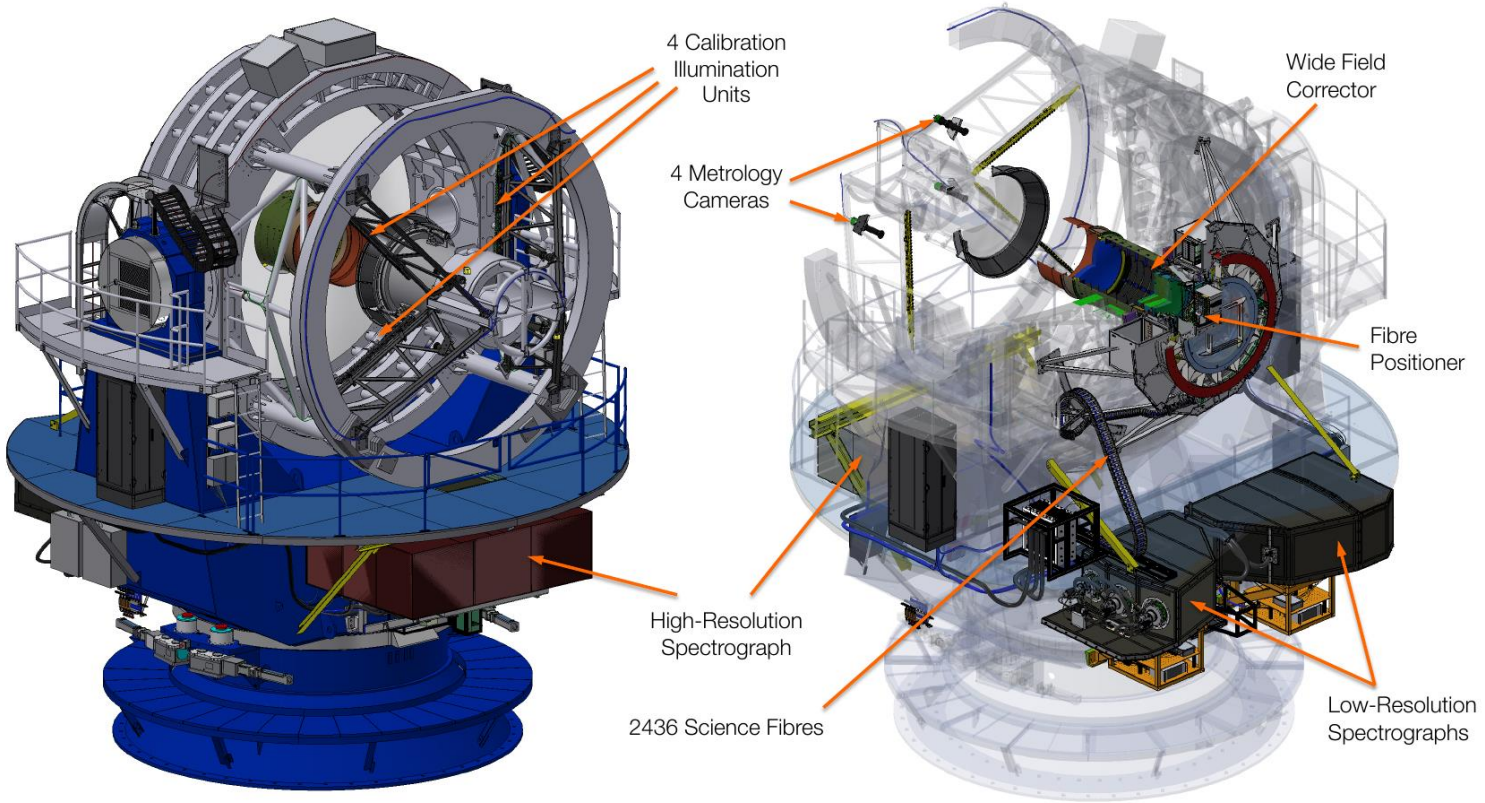
→ CIV emission features indicative of stellar winds

→ Determination of reddening parameter $(2175\ \text{Å}$ **bump)**

→ Well-calibrated extremely useful for SED analyses

Dorsch et al. 2019, A&A, 630, 130

UVEX synergies



4MOST HSD sub-survey (2024-2029)

UVEX synergies

BlackGEM

BlackGEM (2023-2028)

https://astro.ru.nl/blackgem/

https://screenrant.com/avatar-frontiers-pandora-release-date-before-new-movie/ (9.3.23)