Stellar variability, stellar multiplicity: periodicity in time & motion” June 6-8, 2023, Sofia, Bulgaria

Laurent Eyer, University of Geneva

Sofia, Bulgaria

June 6-8, 2023

Conference summary

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Summary of the Gaia results

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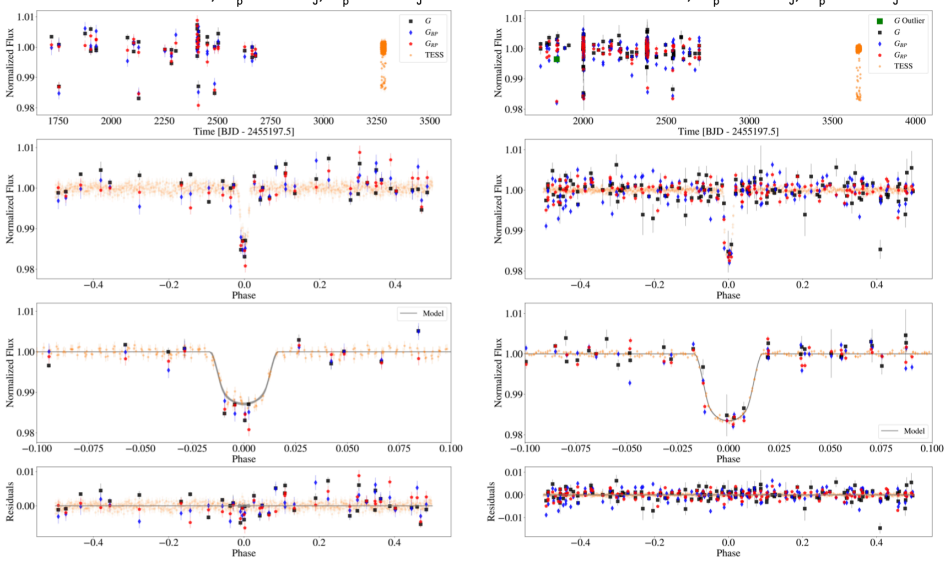

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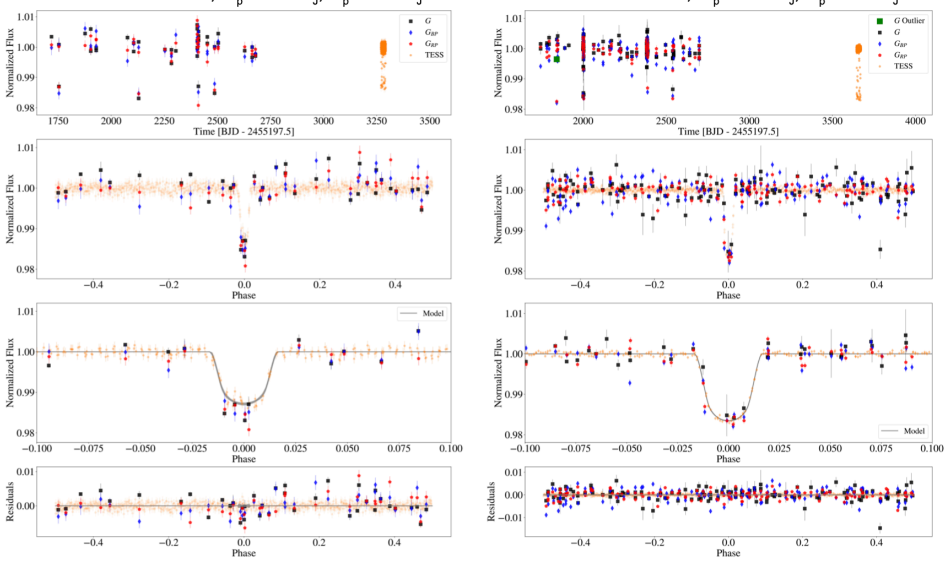

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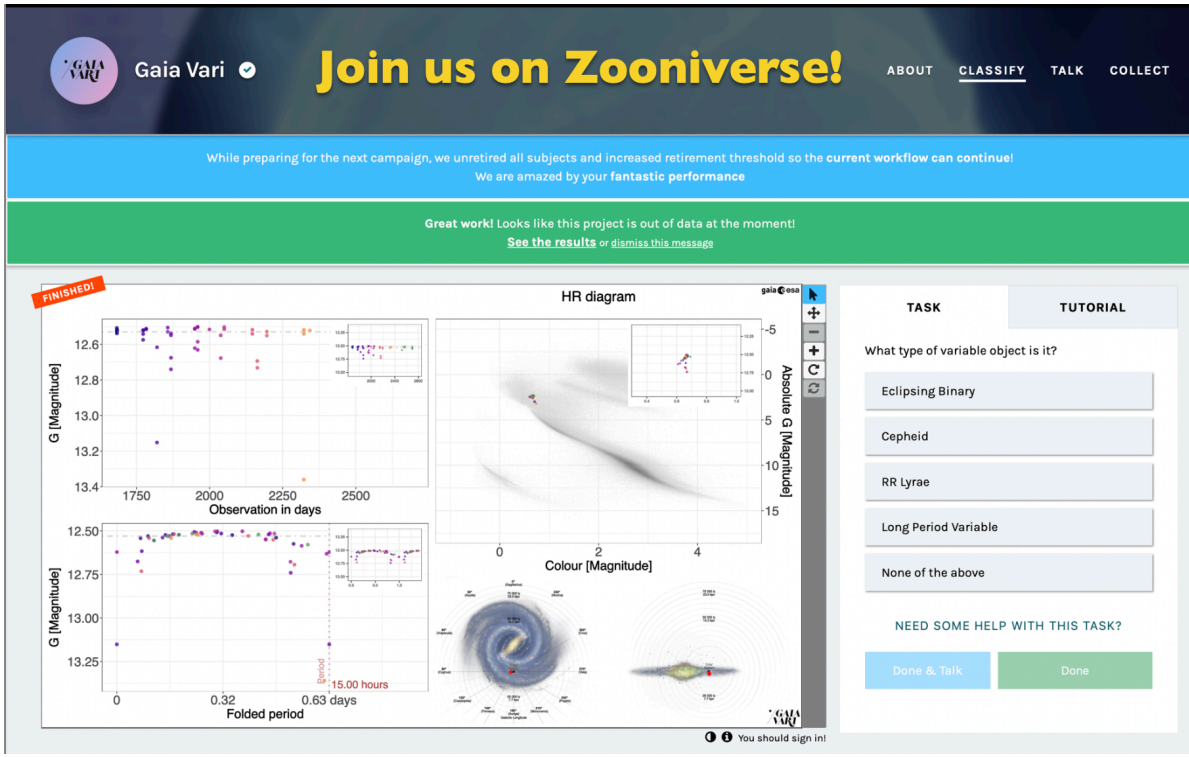

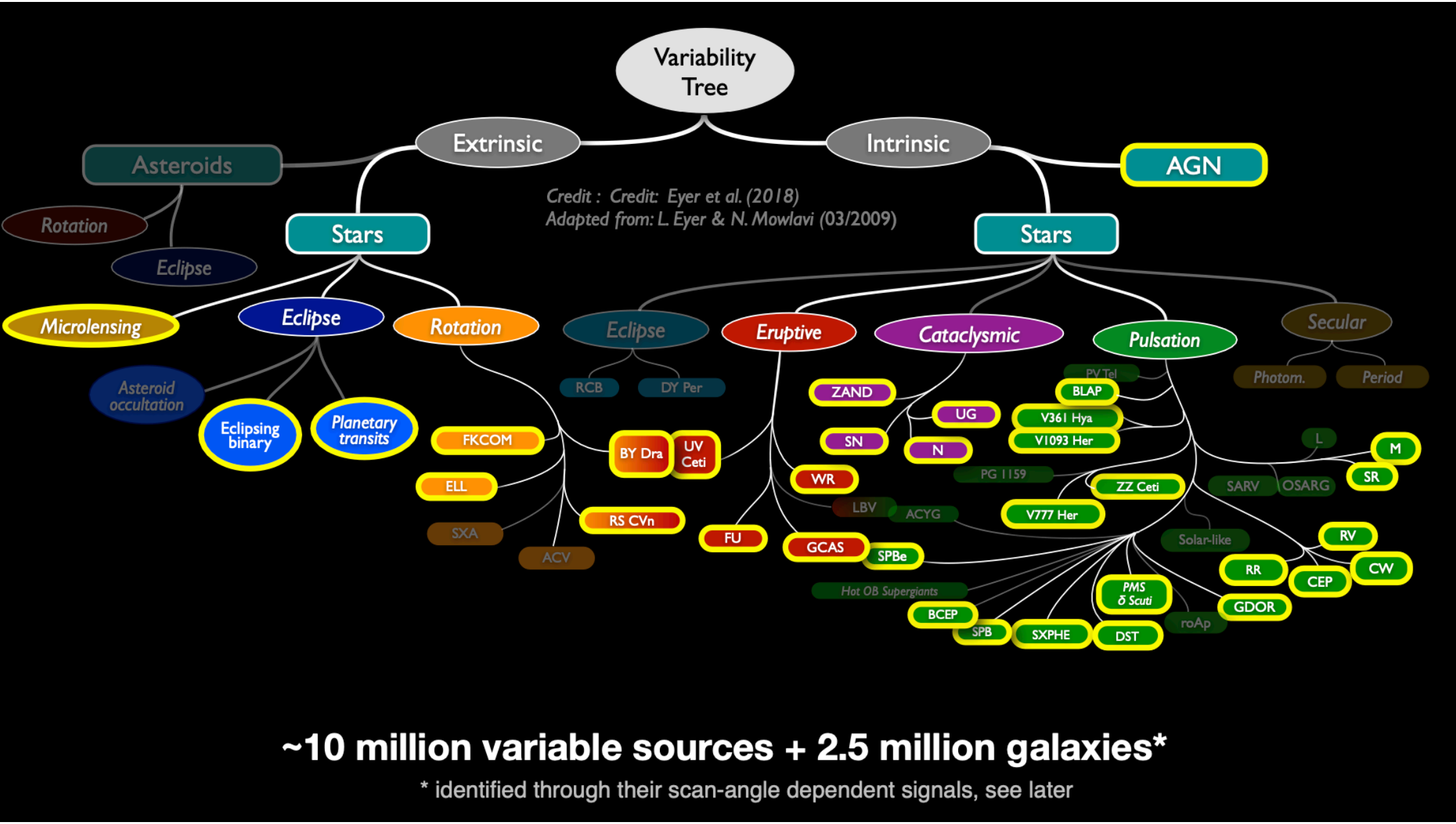

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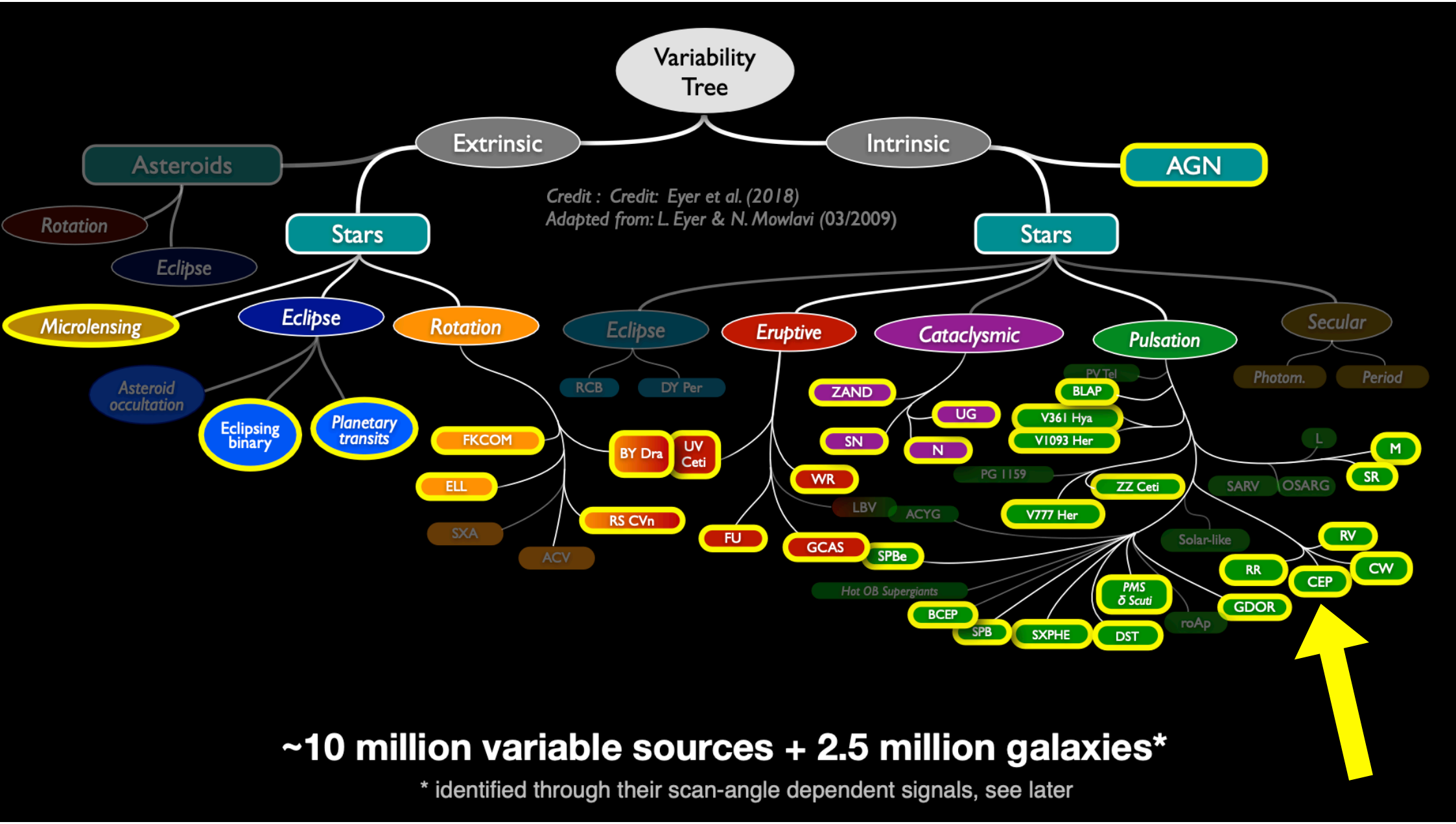
* identified through their scan-angle dependent signals, see later



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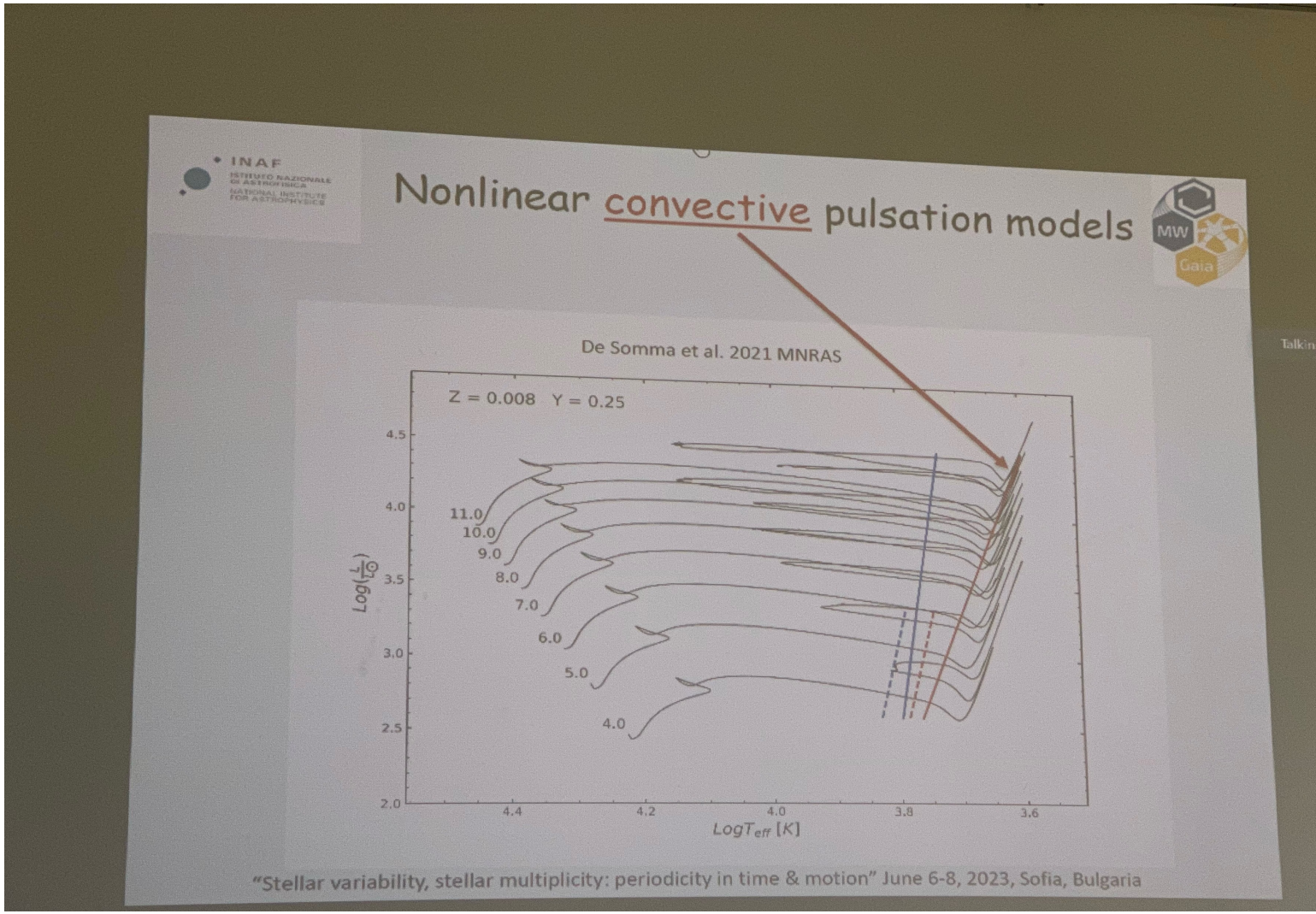

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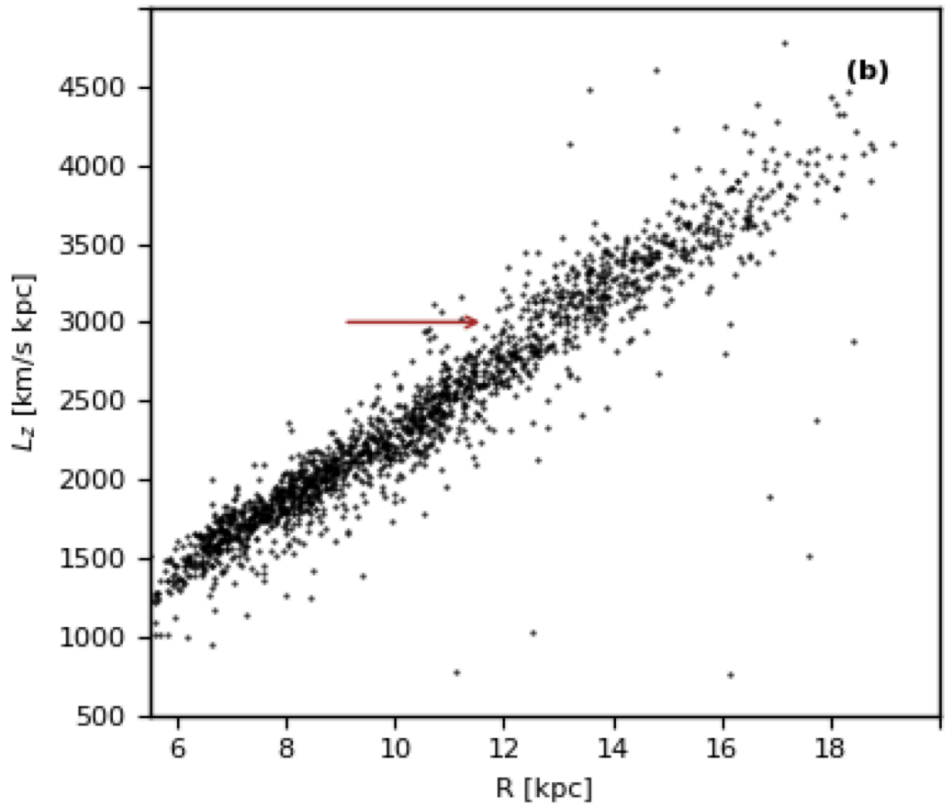

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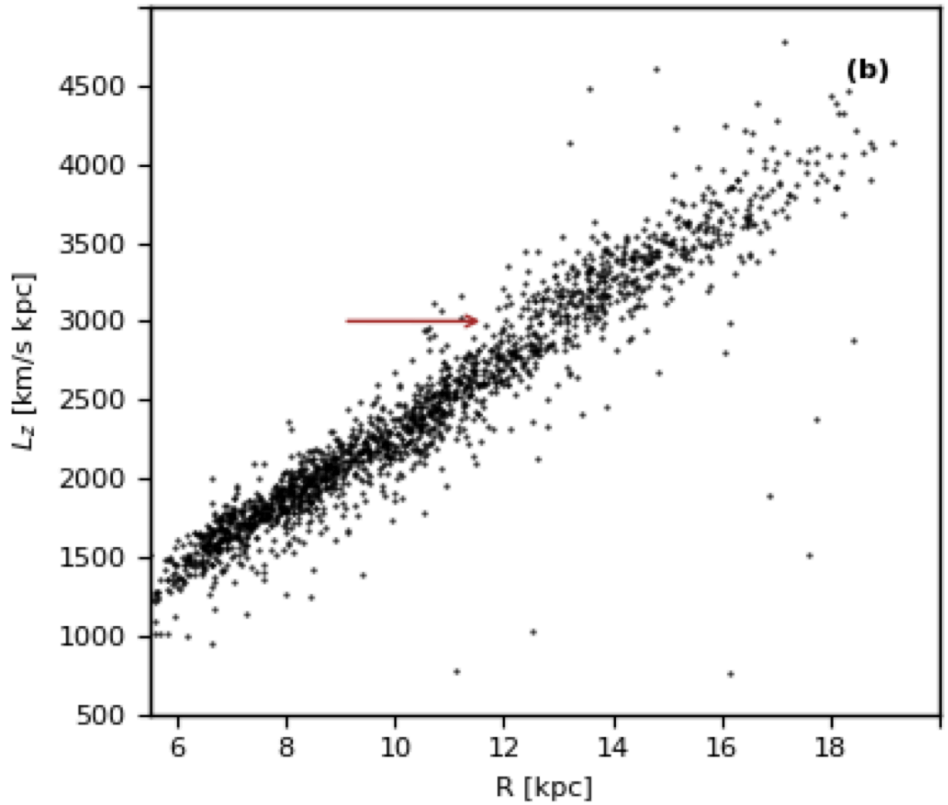

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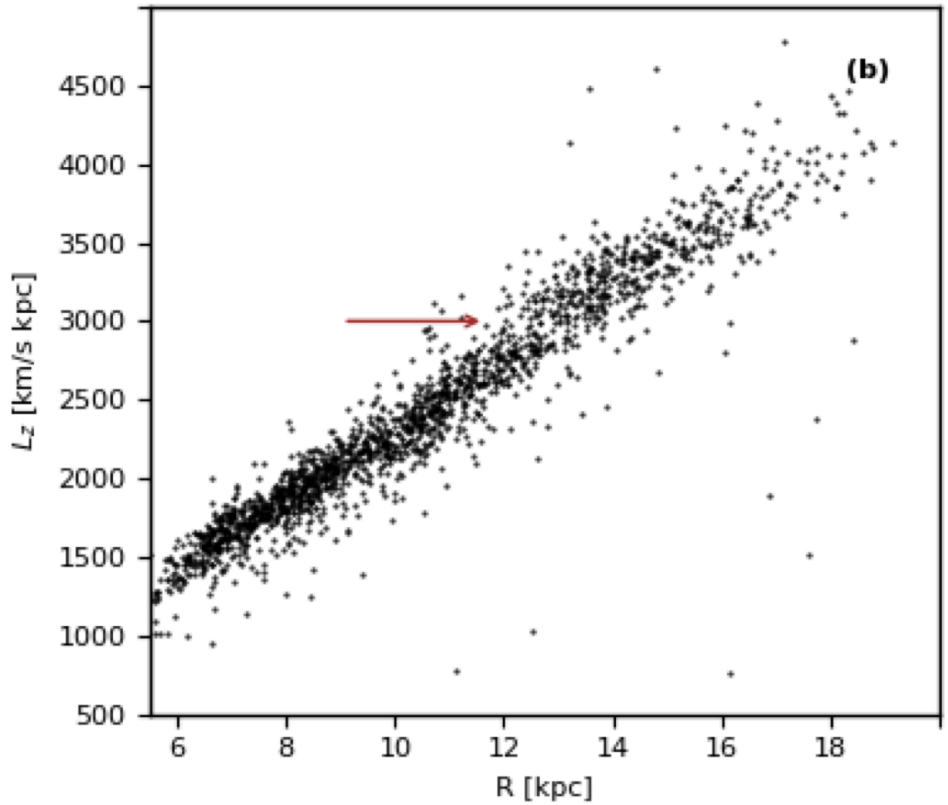

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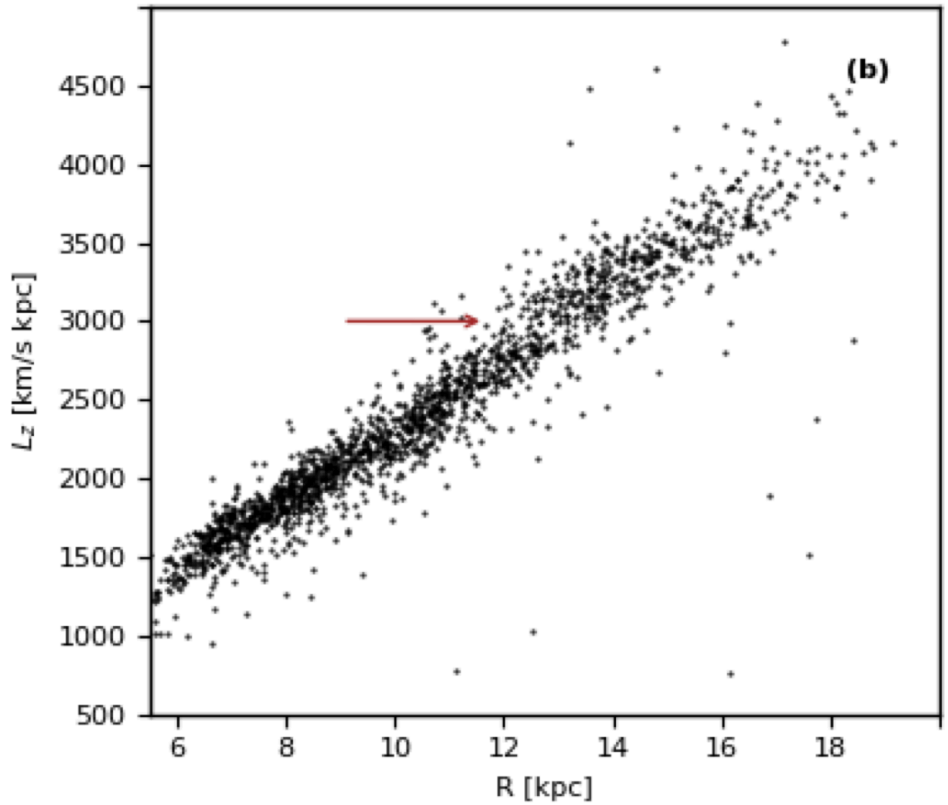

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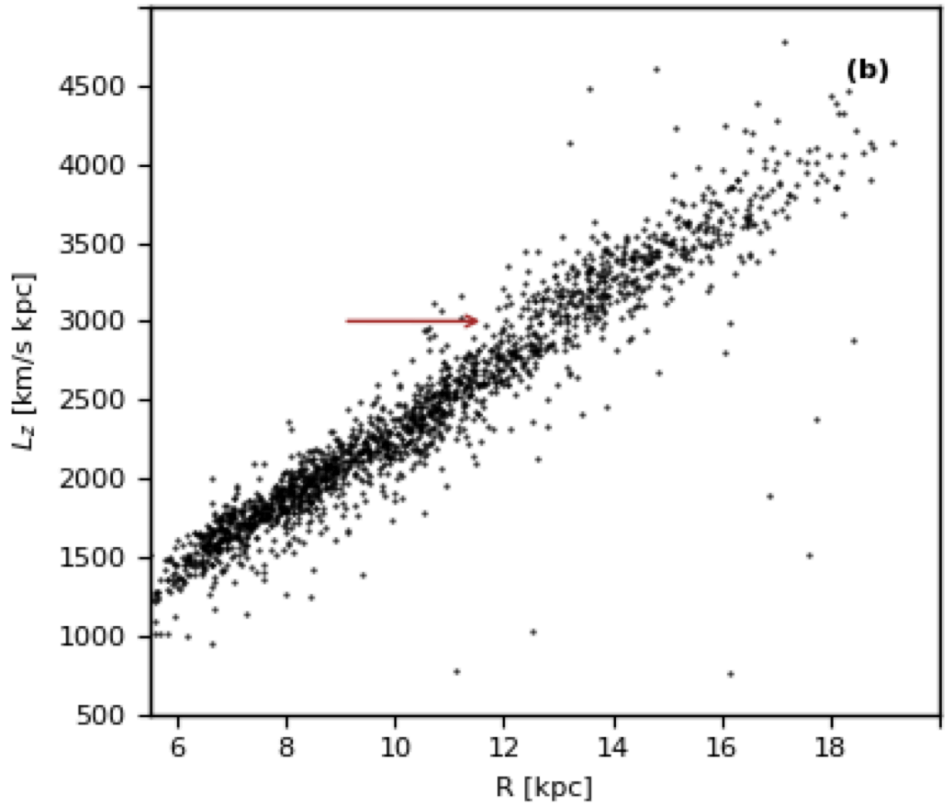

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  - star formation in multiple
  - spiral arm segments

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- Teresa Sicignano: artillery developed on Classical Cepheids are applied to Type II Cepheids

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Cepheids in Clusters

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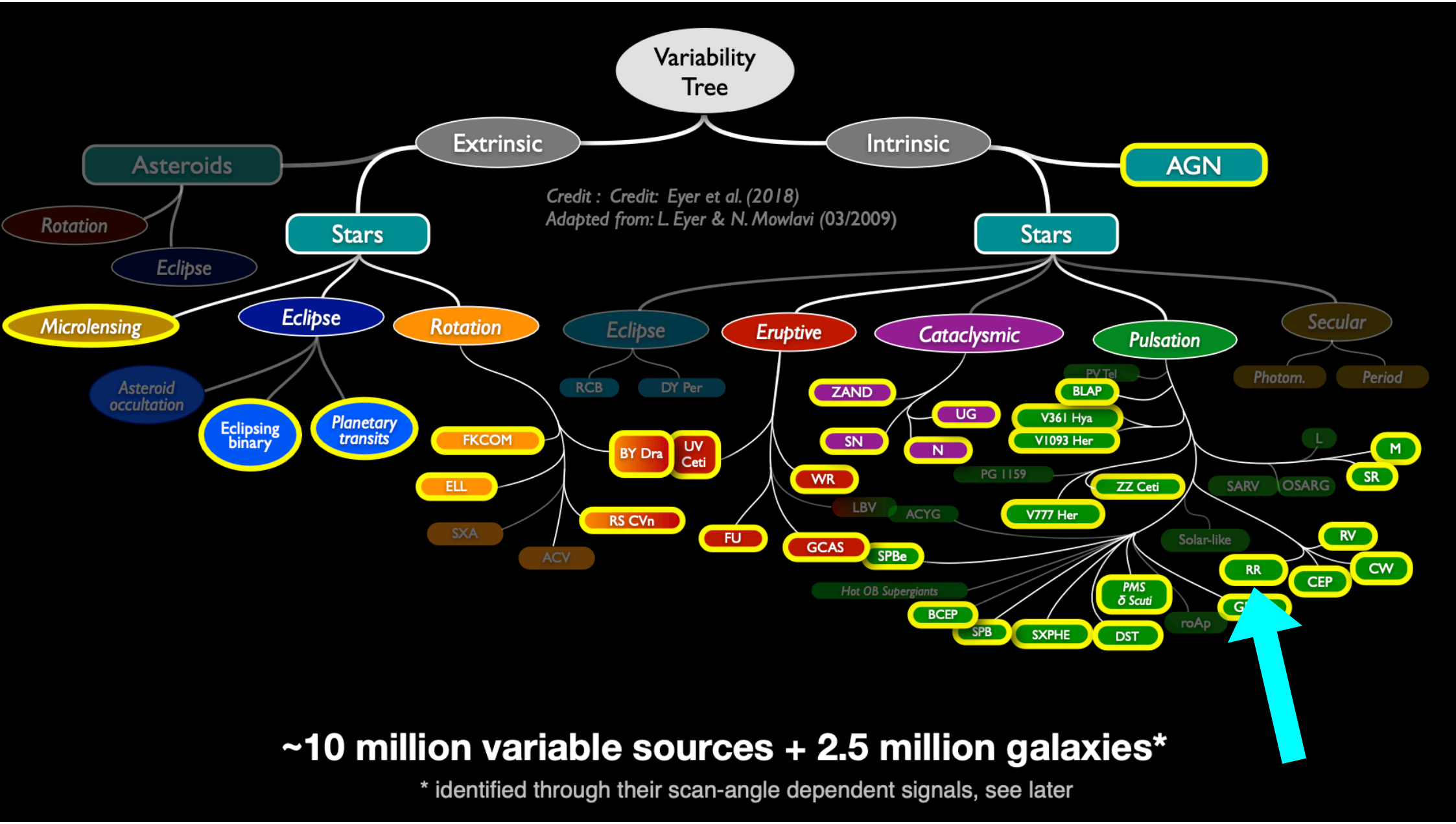
Variability Tree
Extrinsic
Intrinsic
Asteroids
AGN
Credit : Credit: Eyer et al. (2018)
Adapted from: L. Eyer & N. Mowlavi (03/2009)
Rotation
Eclipse
Stars
Stars
Microlensing
Eclipse
Rotation
Eclipse
Eruptive
Cataclysmic
Pulsation
Secular
Asteroid occultation
Eclipsing binary
Planetary transits
FKCOM
ELL
SXA
ACV
RS CVn
RCB
DY Per
BY Dra
UV Ceti
FU
WR
GCAS
SPBe
Hot OB Supergiants
ZAND
SN
N
UG
LBV
ACYG
PV Tel
BLAP
V361 Hya
V1093 Her
PG 1159
V777 Her
ZZ Ceti
BCEP
SPB
SXPHE
DST
PMS δ Scuti
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Solar-like
Photom.
Period
L
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OSARG
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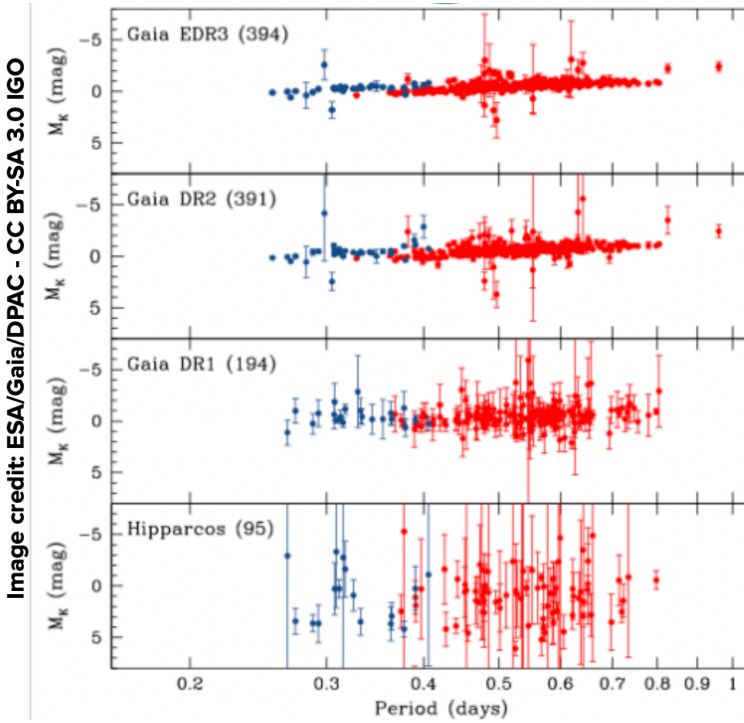

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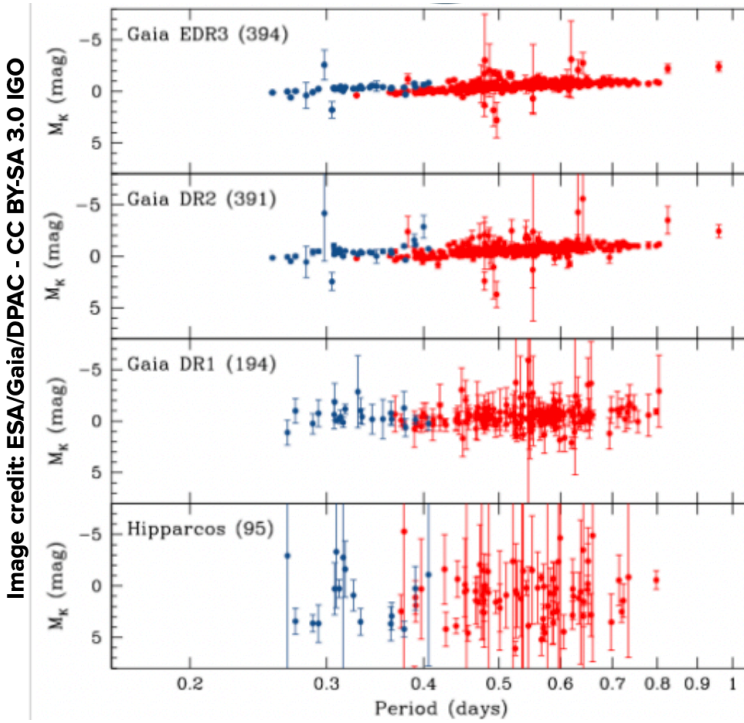

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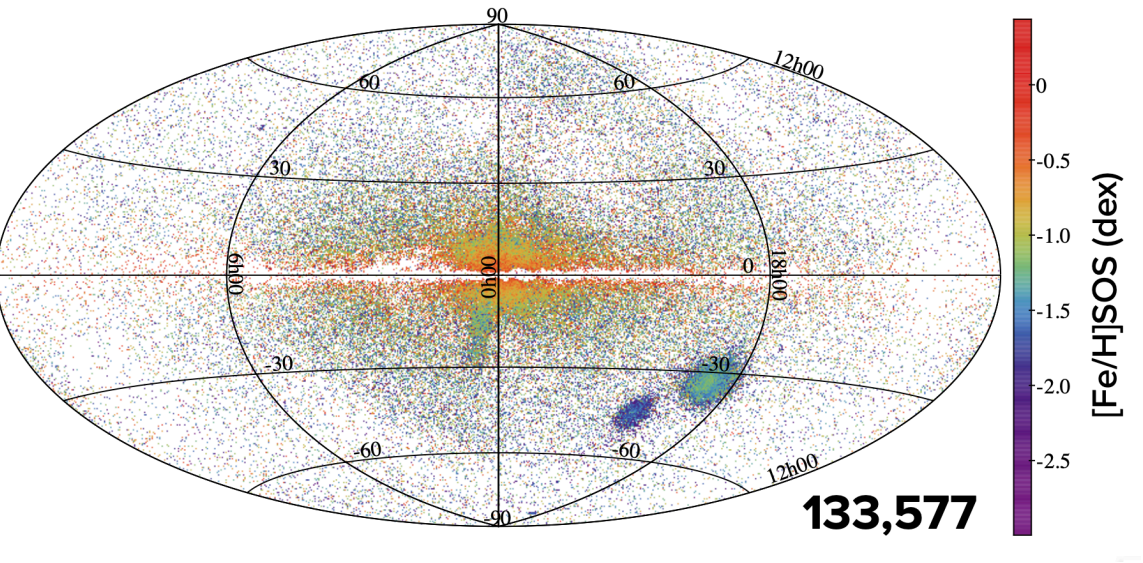

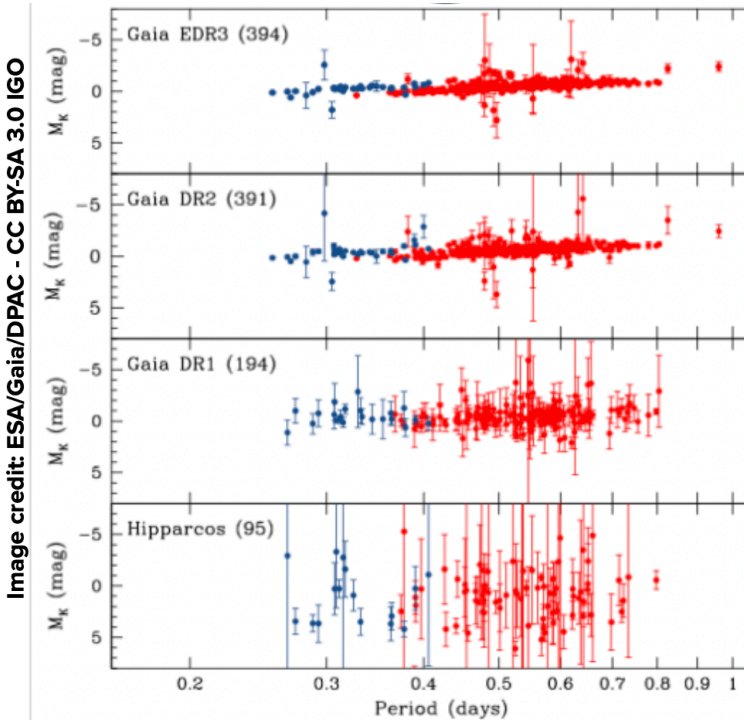

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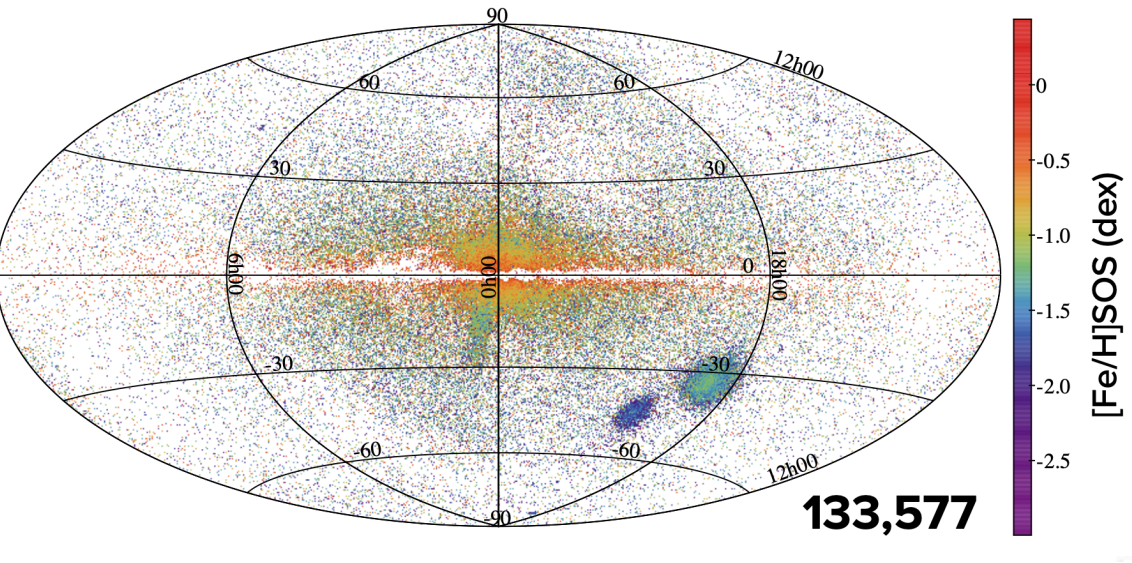

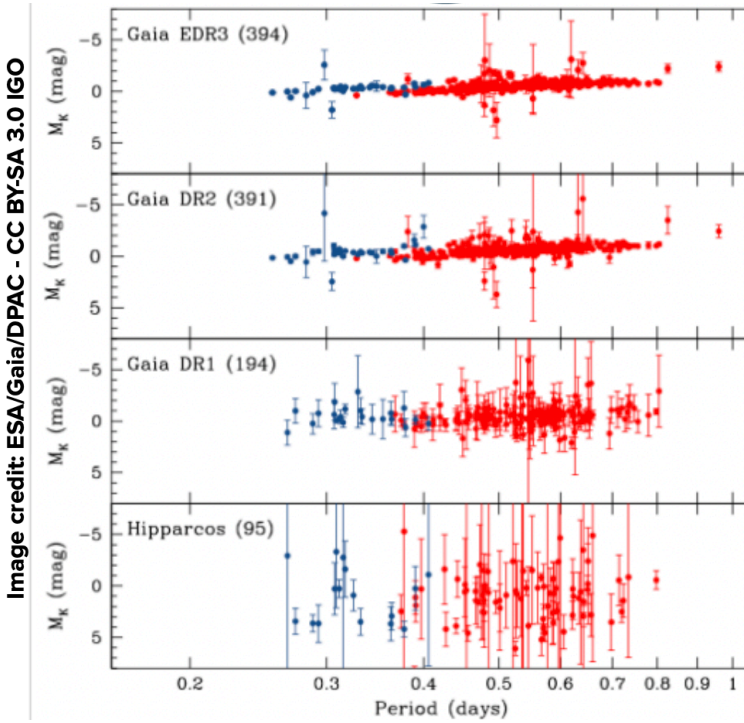

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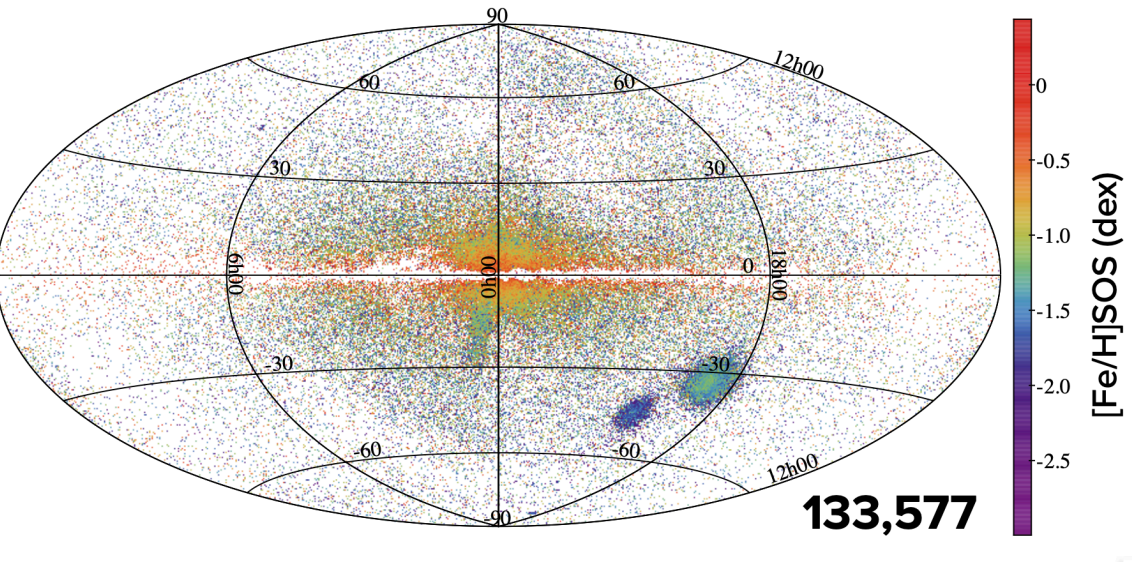

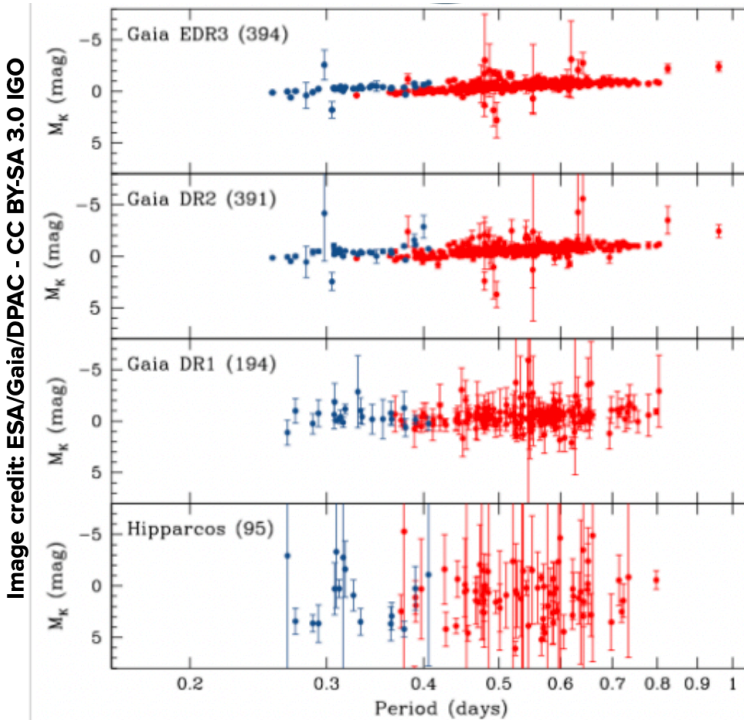

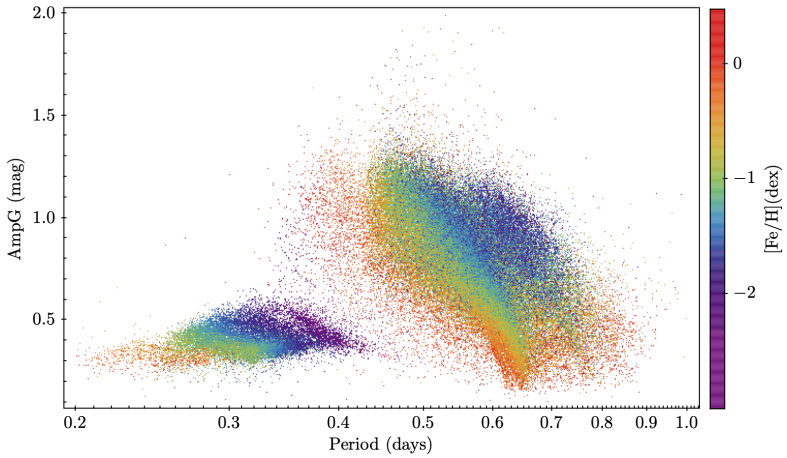

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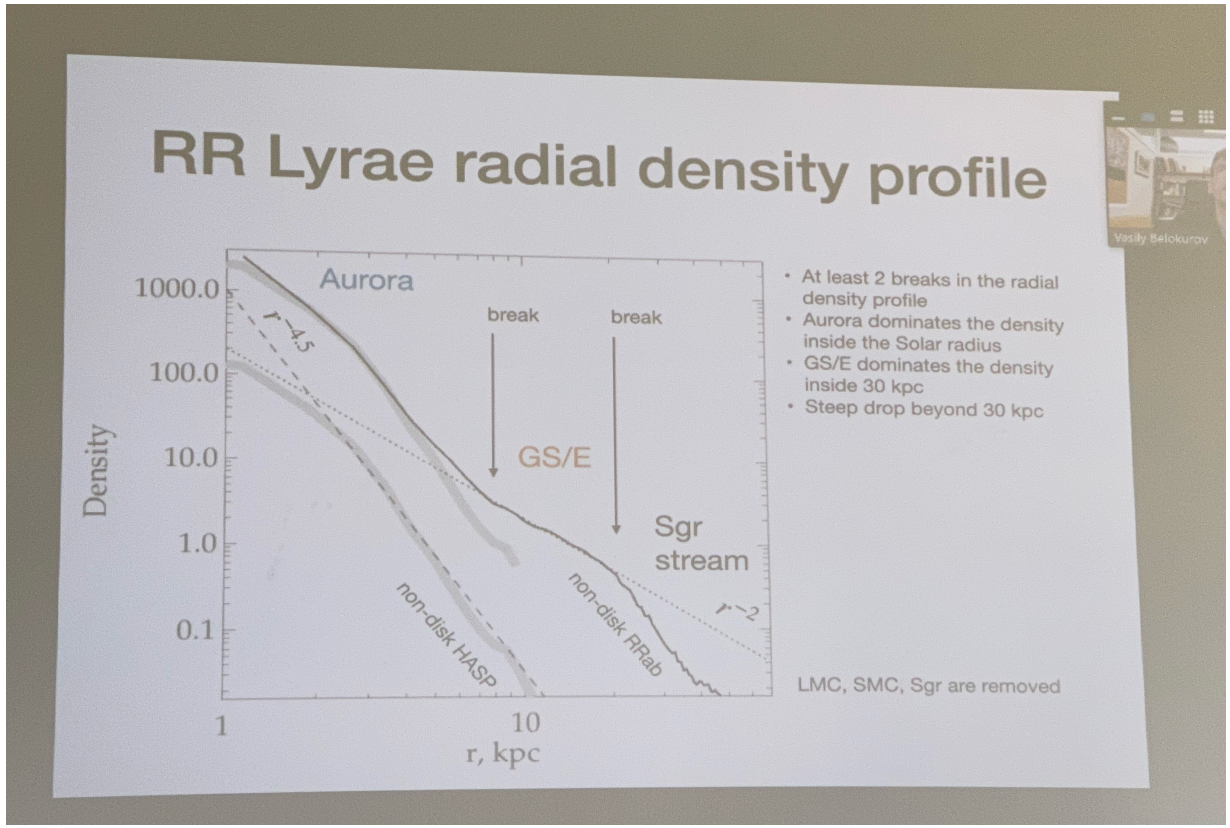

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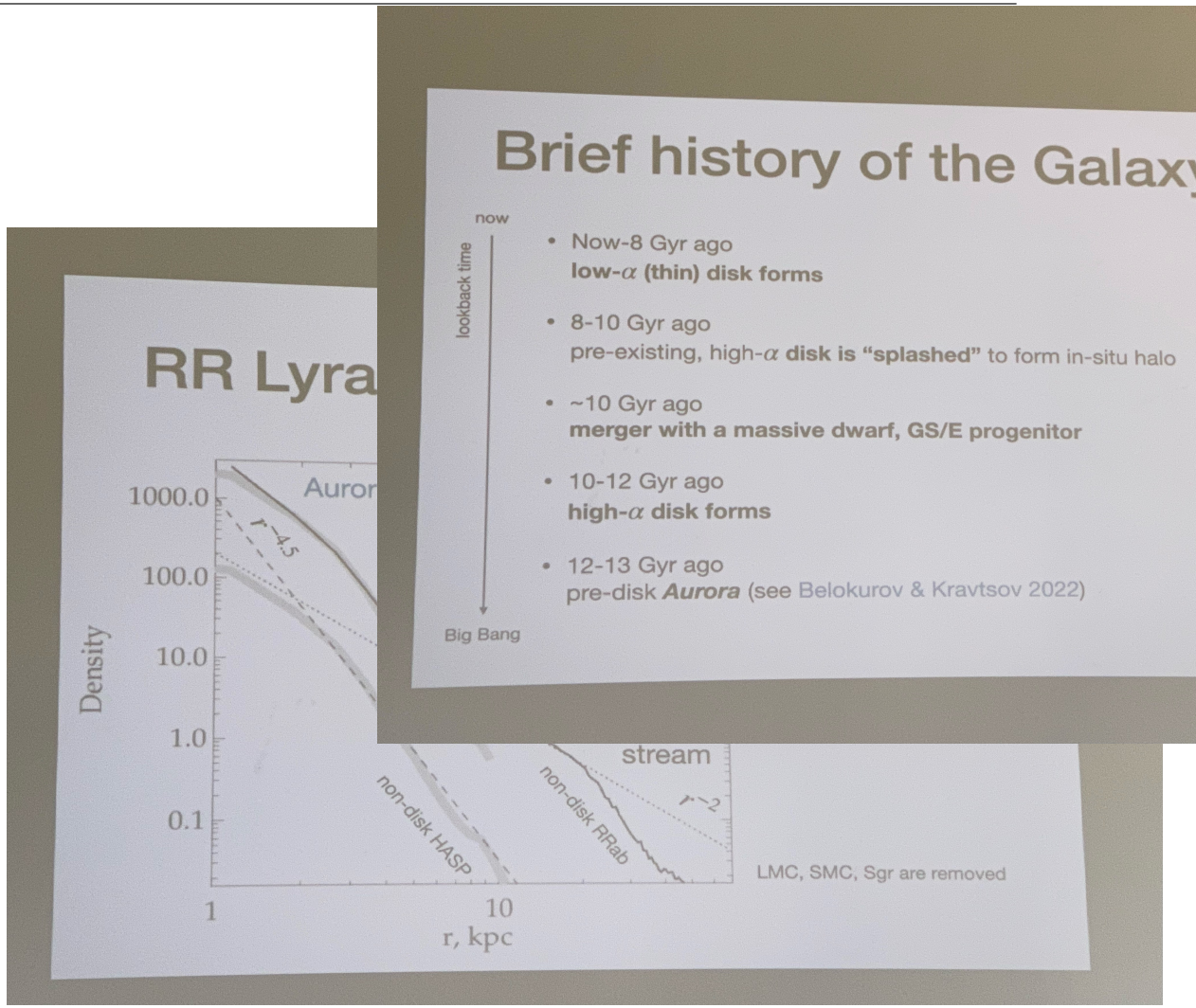

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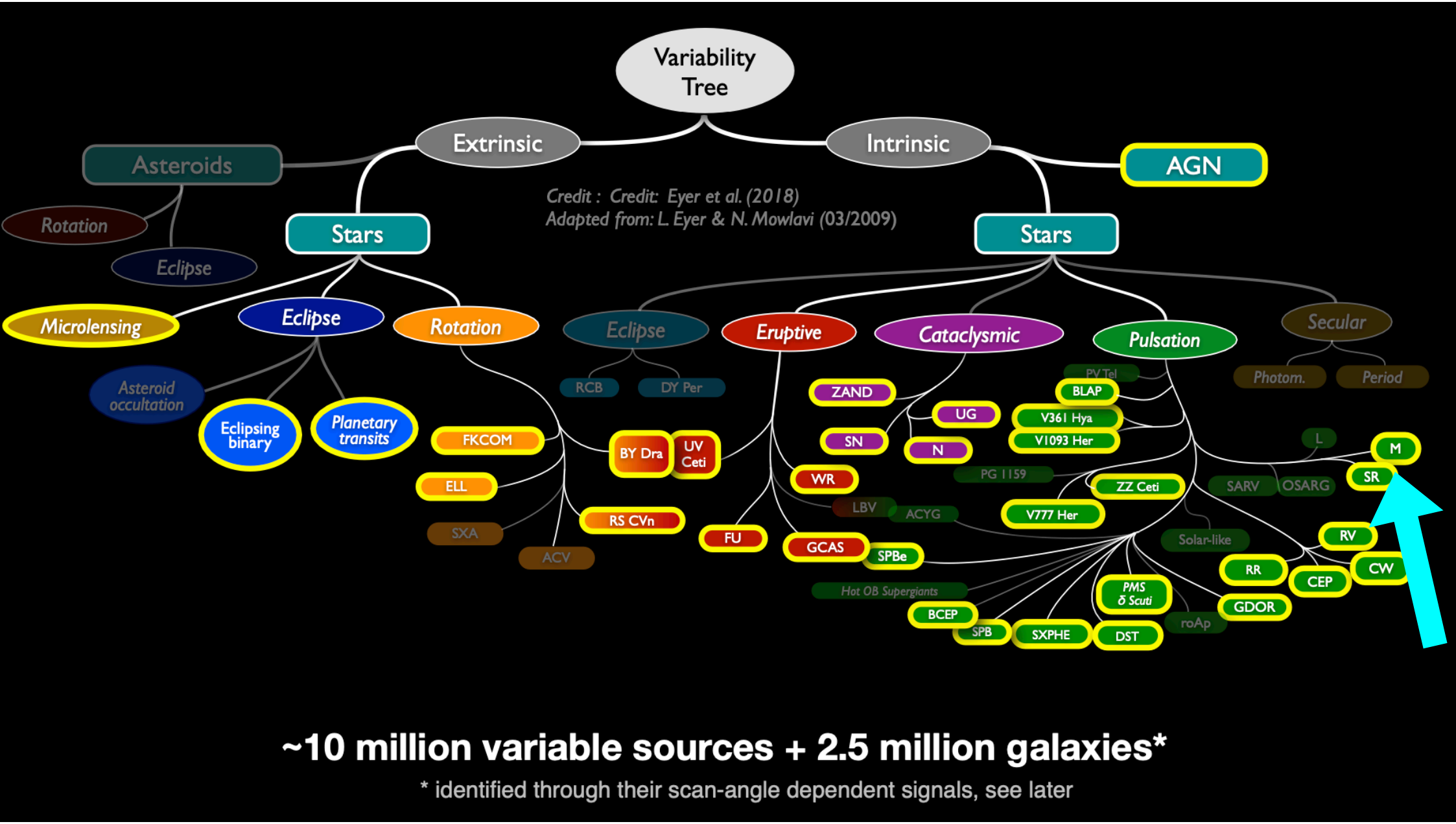
Metal rich RR Lyrae in the thin disk



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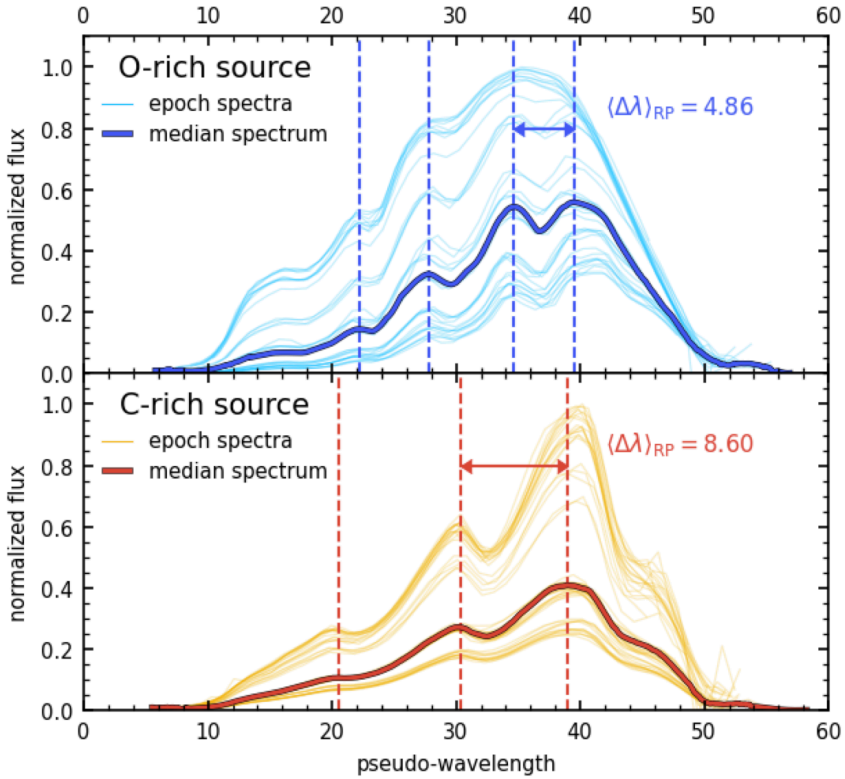

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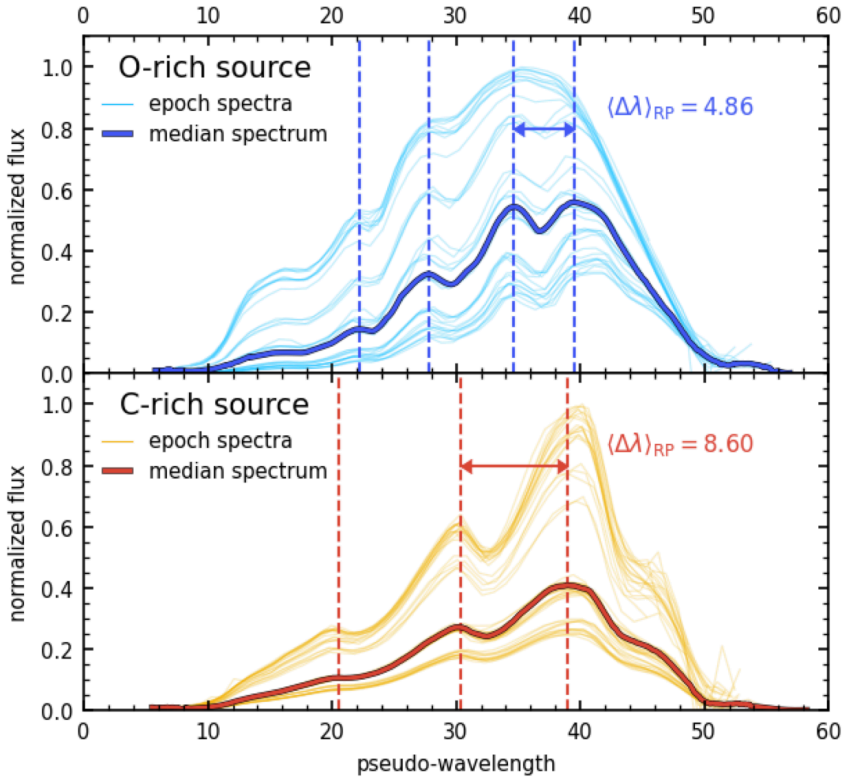

- 2MASS/Gaia photometry

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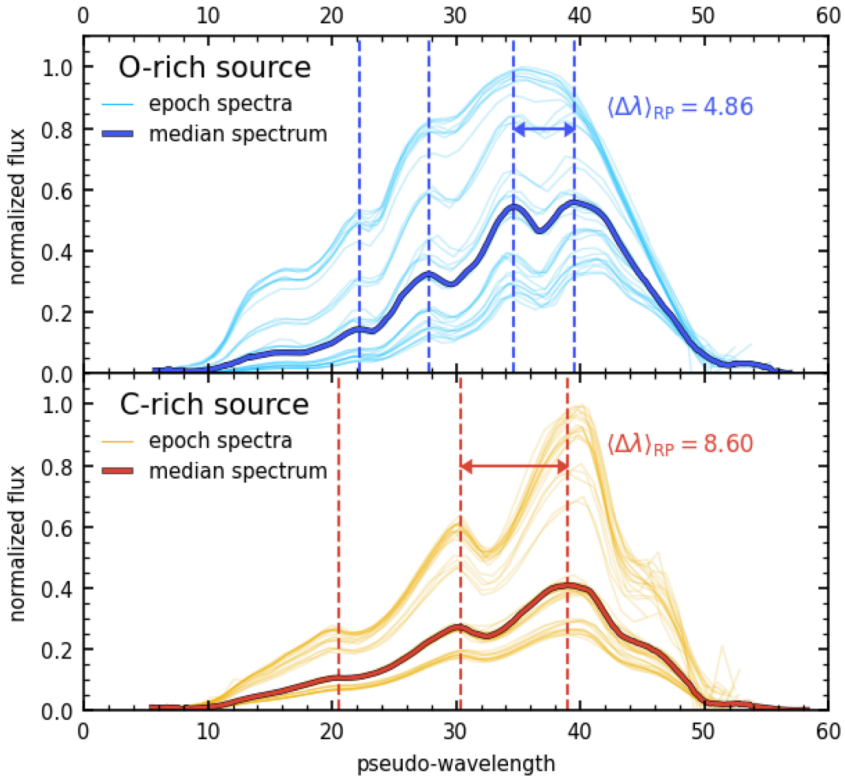
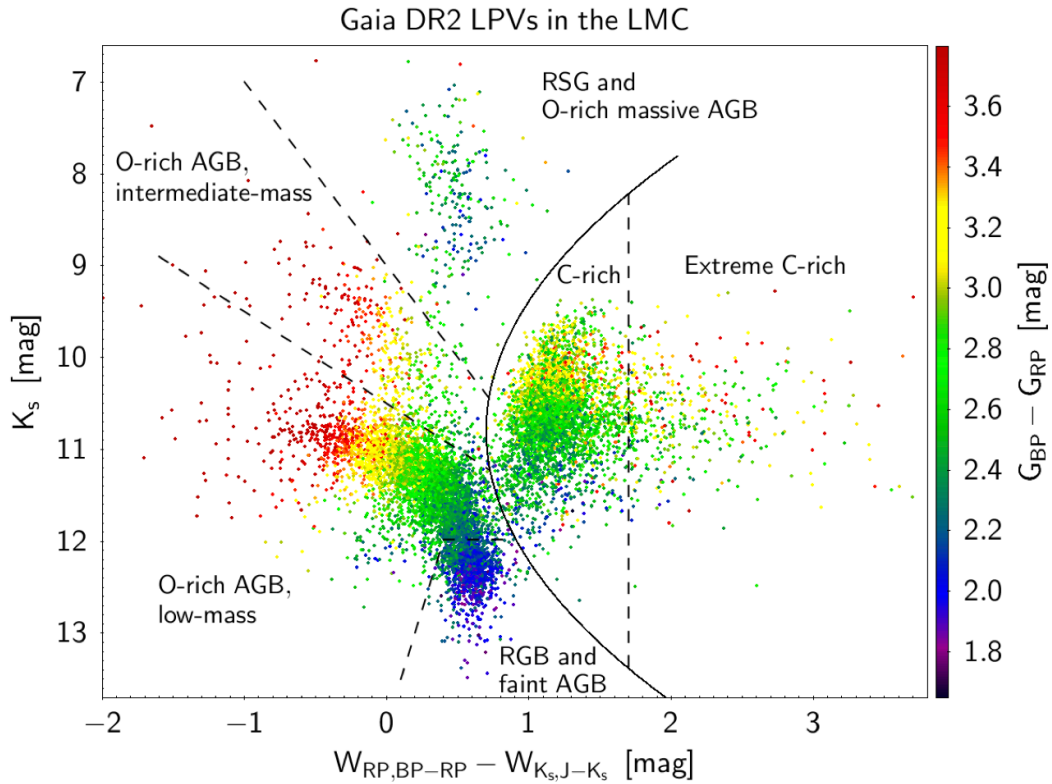
- Power of Gaia from RP



- 2MASS/Gaia photometry



ADDENDUM: Long Period Variables
Focused Product Release

Gaia FPR (Focused Product Release) 10 October 2023

The release will be consisting of:

- Updated astrometry for Solar System objects.
- Astrometry and photometry from engineering images taken in selected regions of high source density (only Omega Cen for this FPR).
- The first results of quasars' environment analysis for gravitational lenses search.
- Extended radial velocity epoch data for Long Period Variables.
- Diffuse Interstellar Bands from aggregated RVS spectra.
- Pre-main sequence accretion parameters (no longer part of the FPR, postponed to Gaia DR4)

Long Period Variables

Thomas Lebzelter, Fran Jiménez-Esteban, Konstantinova-Antova

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Thomas Lebzelter, Fran Jiménez-Esteban, Konstantinova-Antova

- Properties (place in HR diagram and amplitudes) of Asymptotic Giant Branch stars on composition

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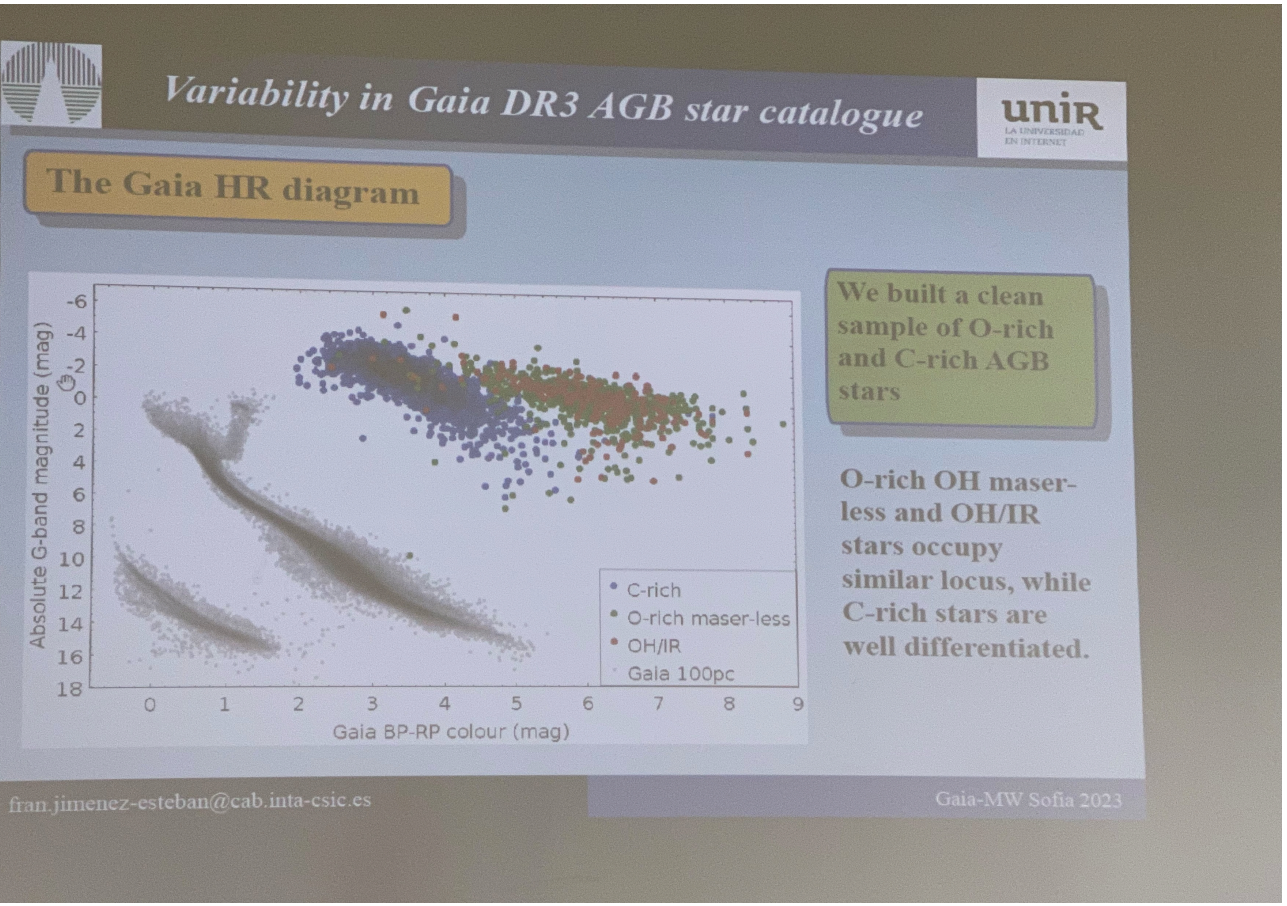

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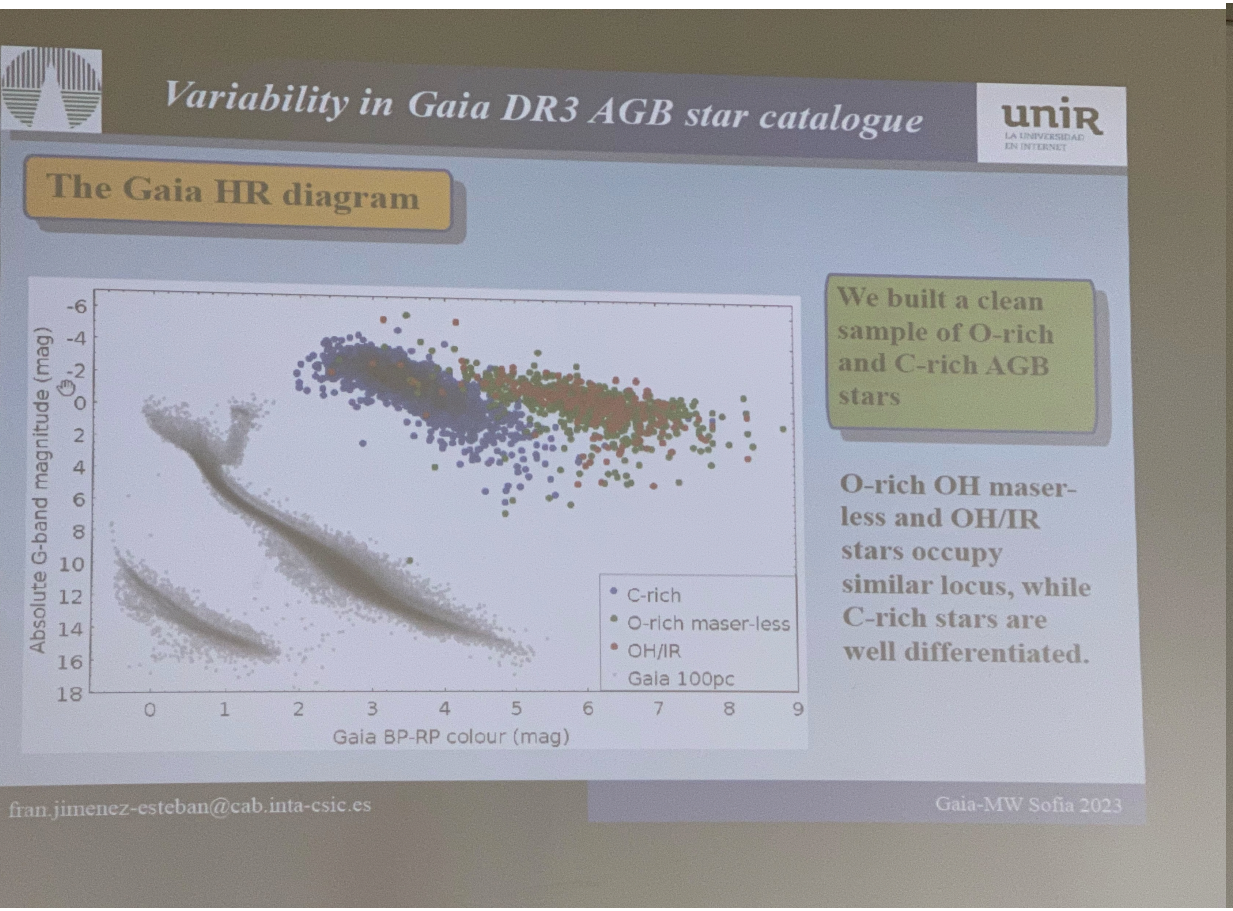

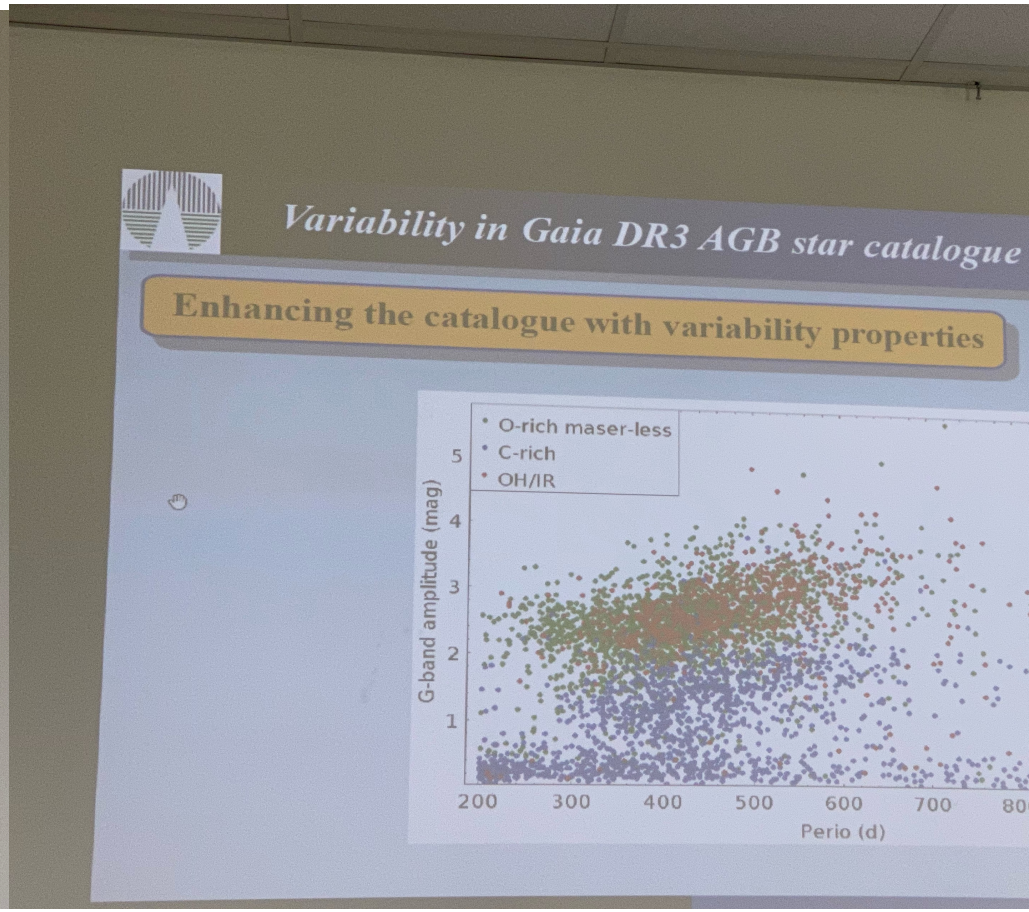

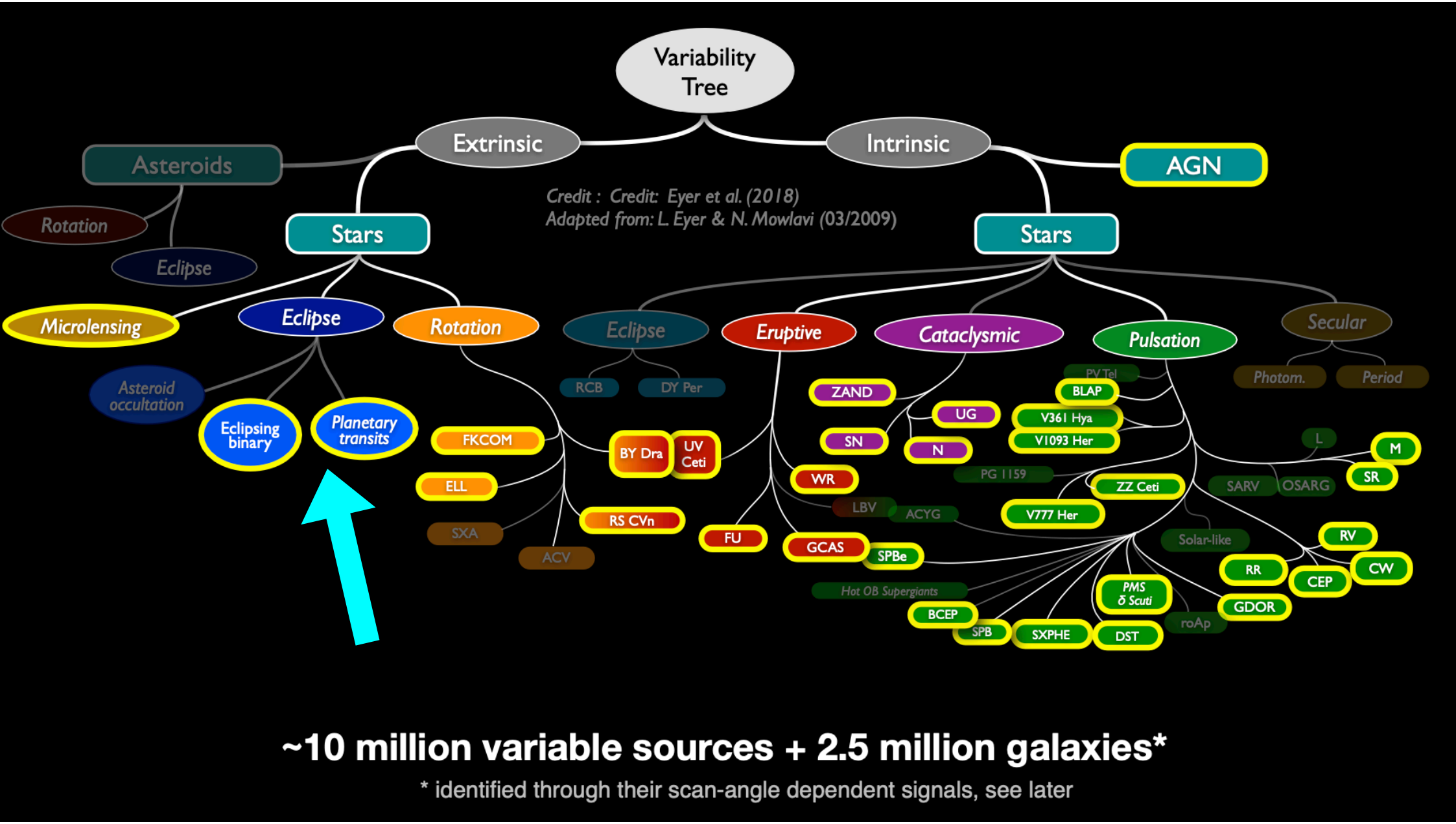

~10 million variable sources + 2.5 million galaxies*

* identified through their scan-angle dependent signals, see later

Binaries

John Southworth, Laurent Mahy, Alexandre Gallen, Nicolas Lodieu, Judit Donada Oliu, Priya Shah

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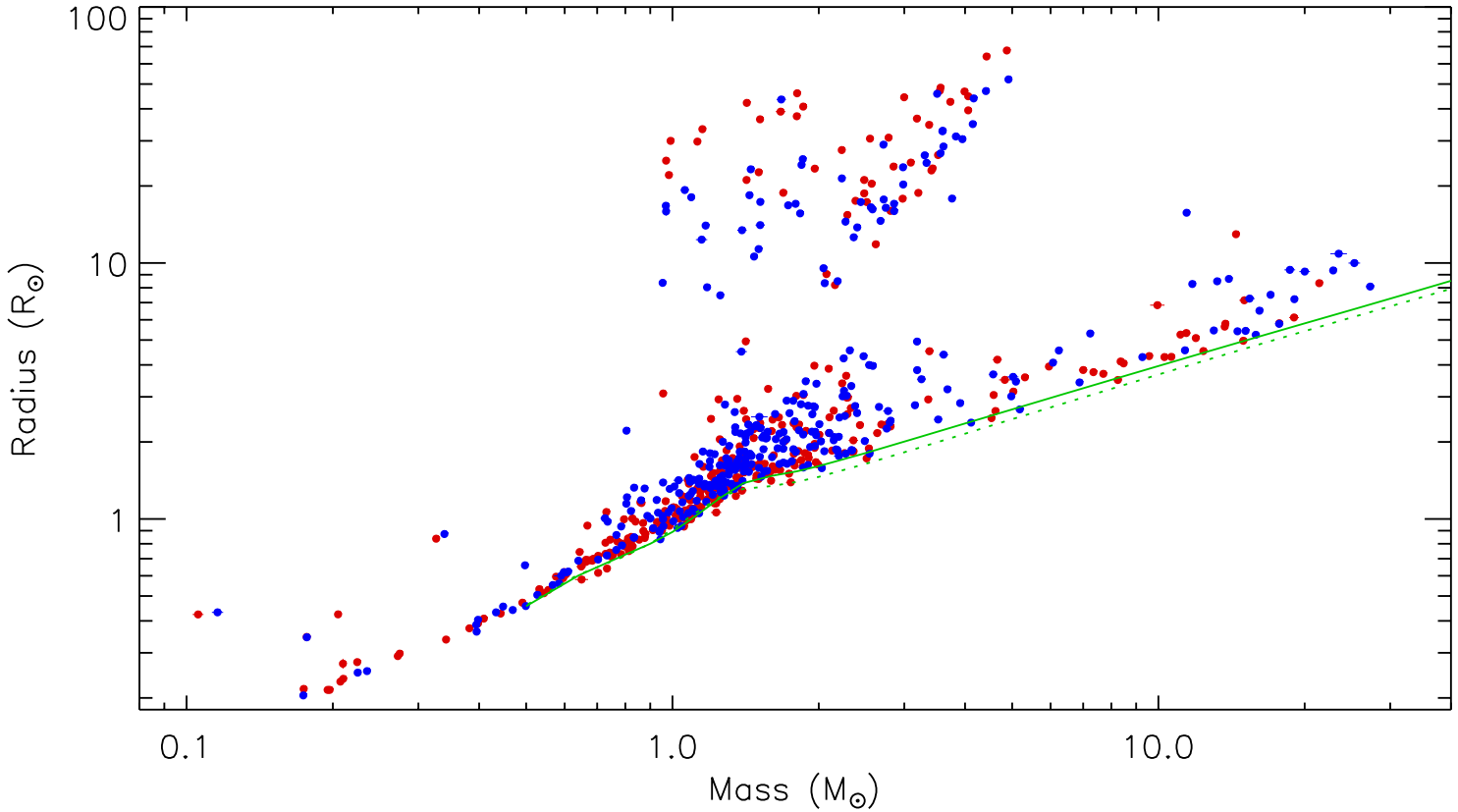

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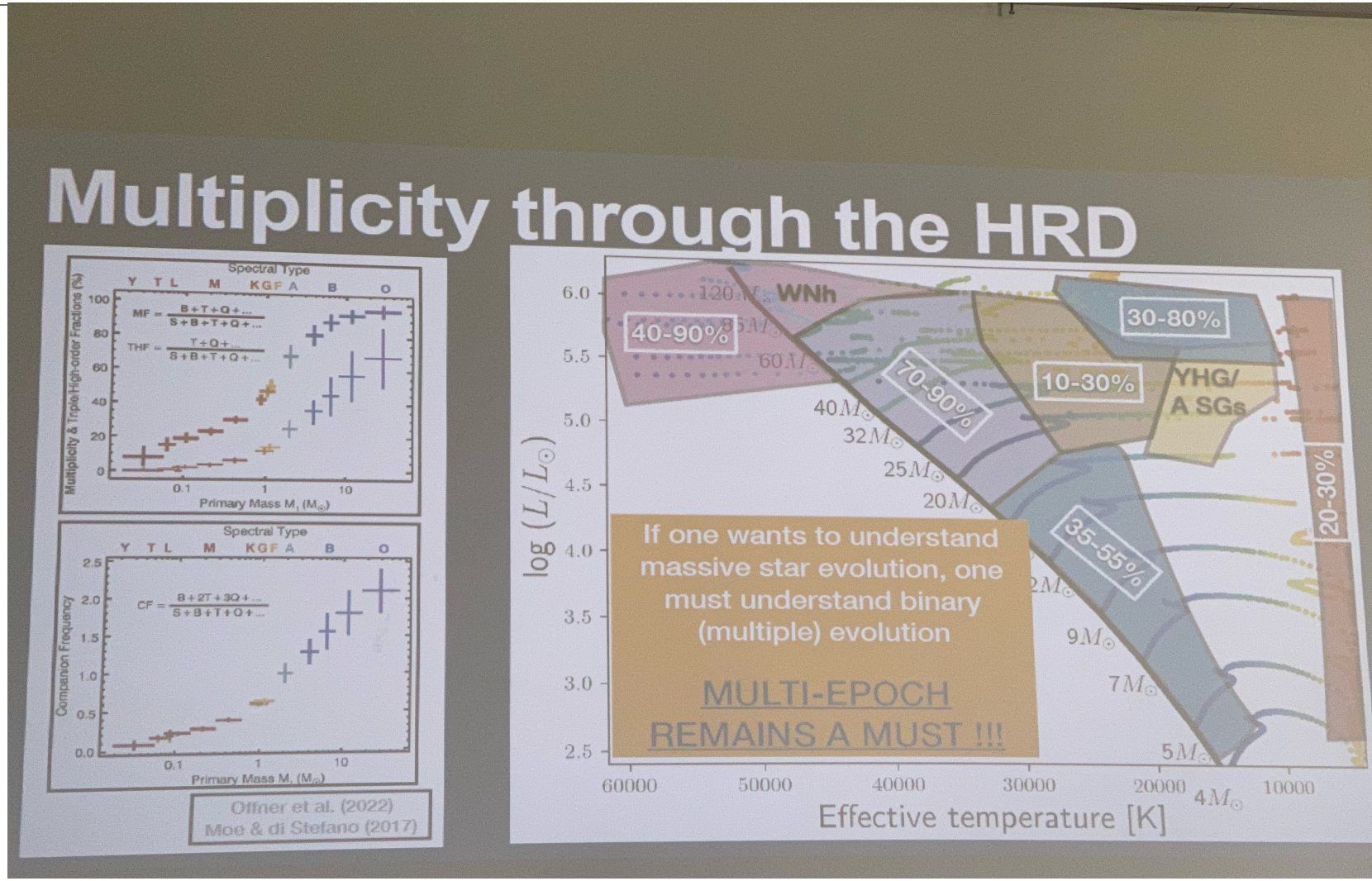

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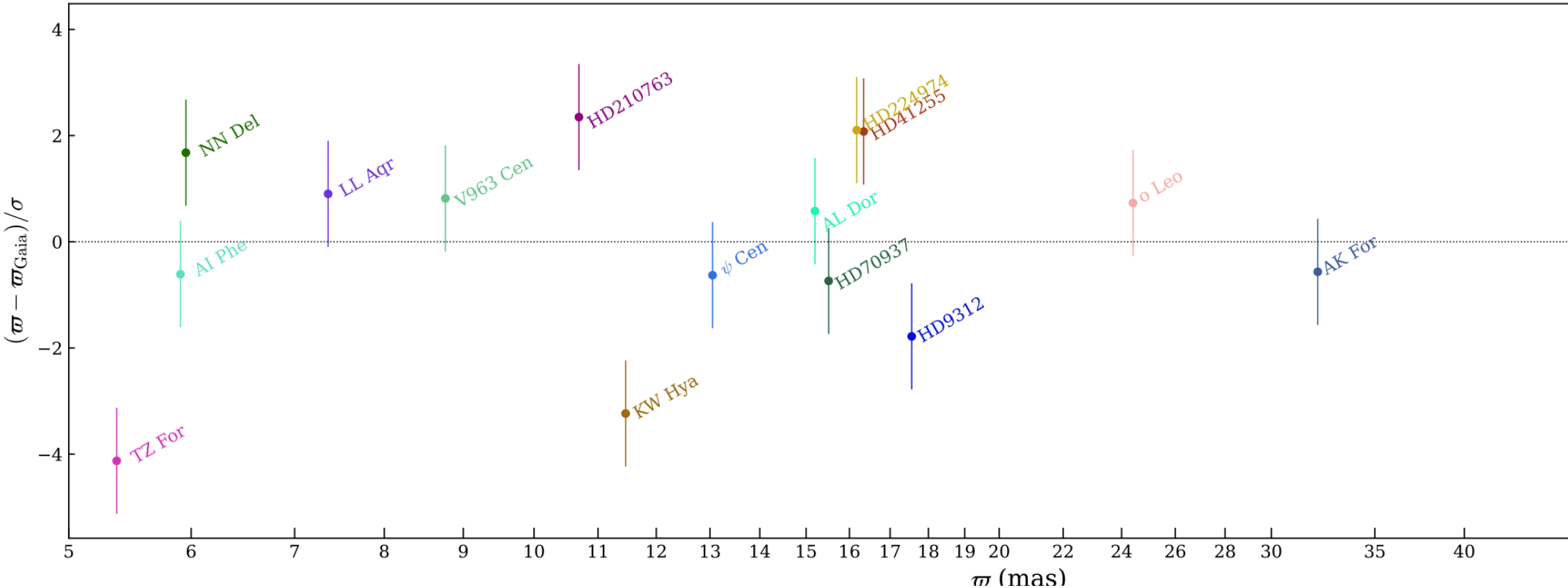

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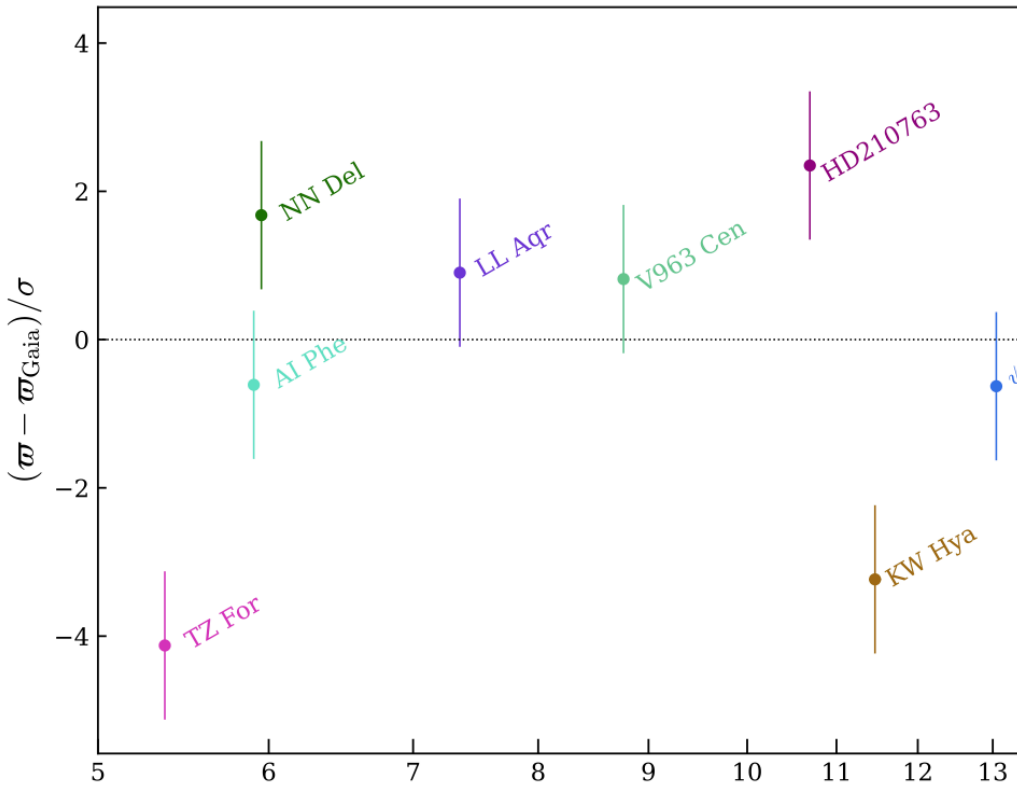

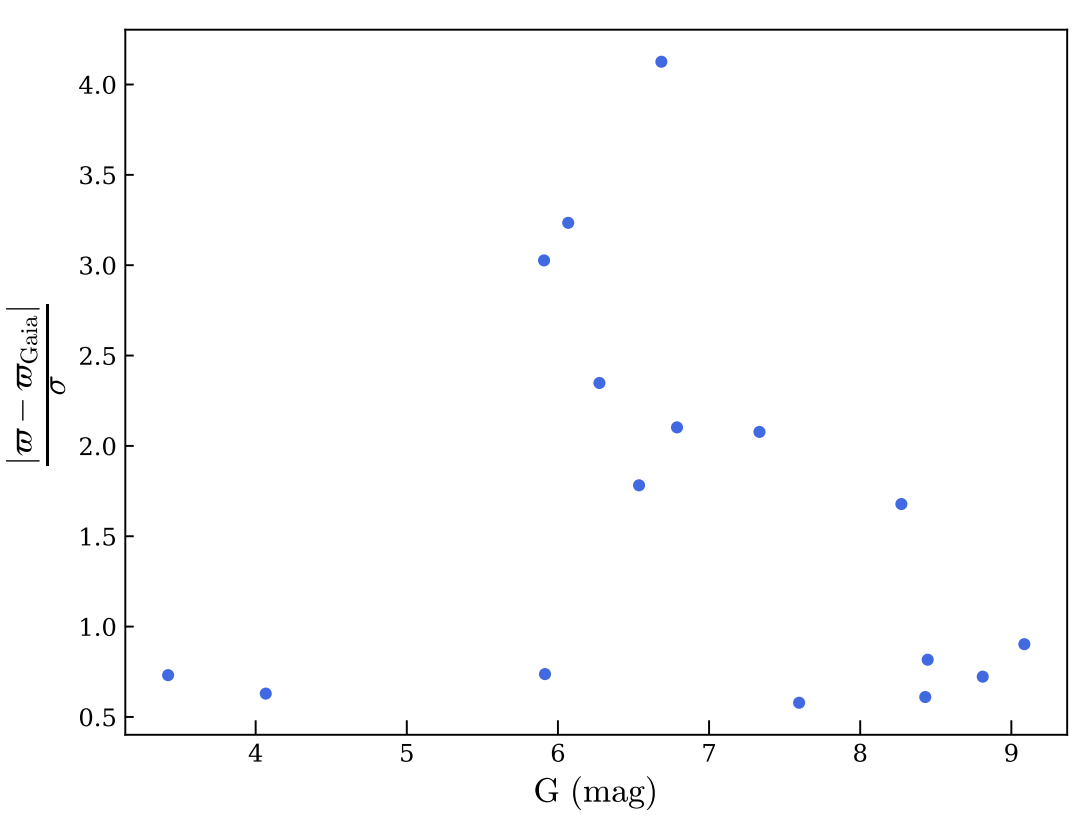

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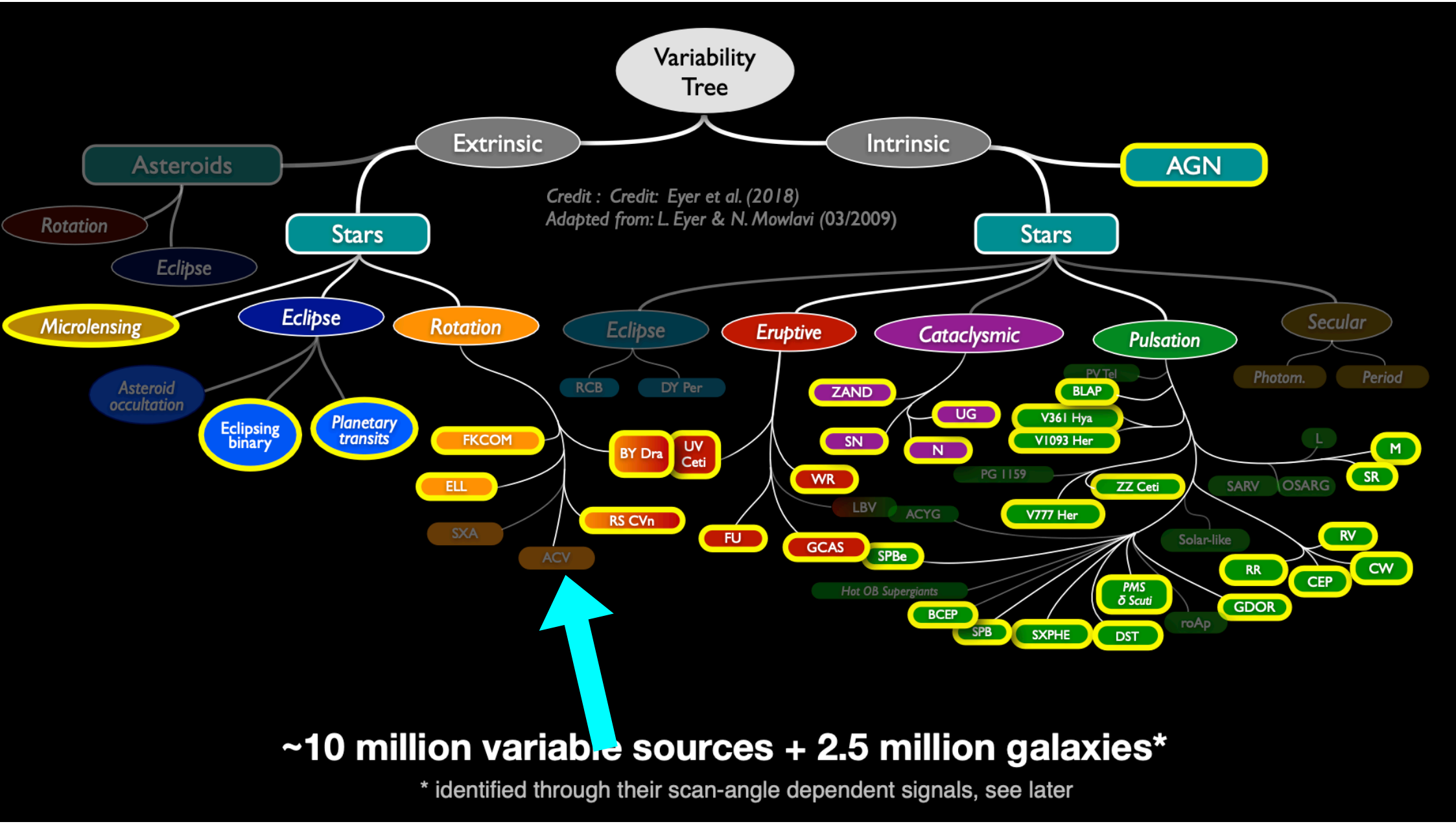
Clusters

Binarity in clusters

Low-mass and sub-stellar eclipsing binaries in stellar clusters



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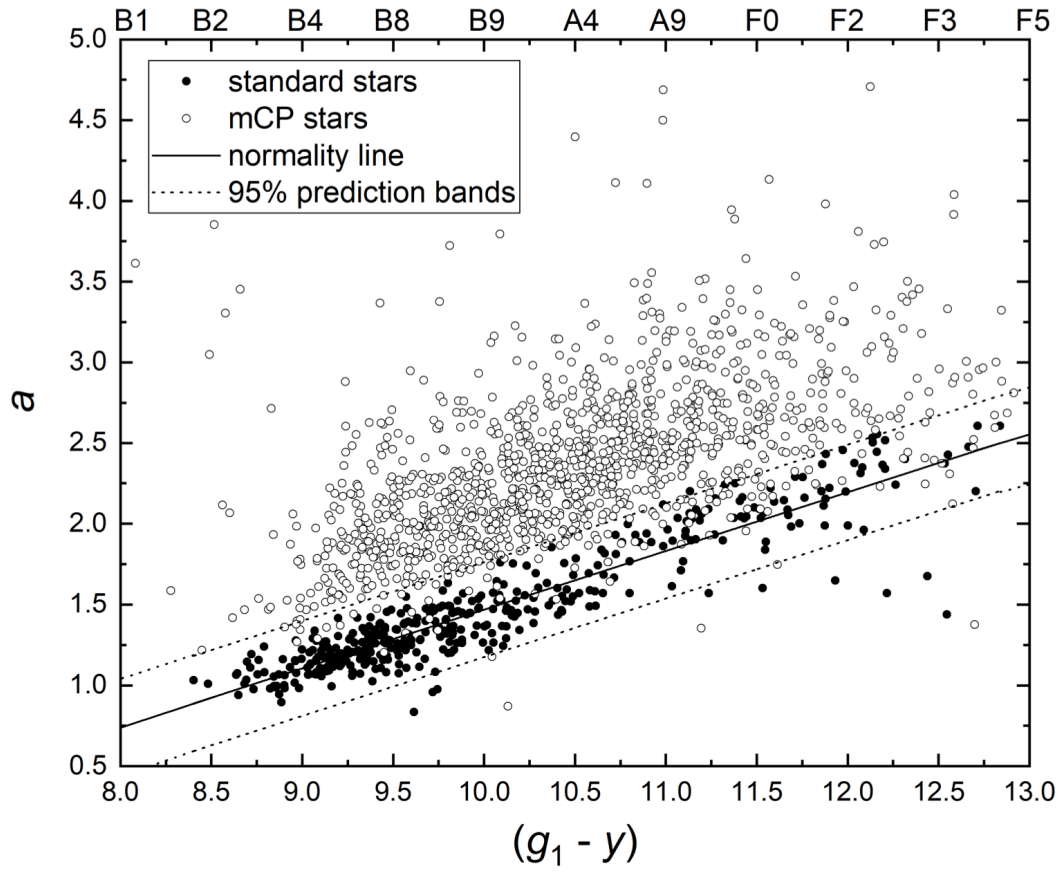
Chemically peculiar stars

Ernst Paunzen, Natalia Posilek, Ewa Niemczura

Indentification of CP stars

through photometric bands



Chemically peculiar stars

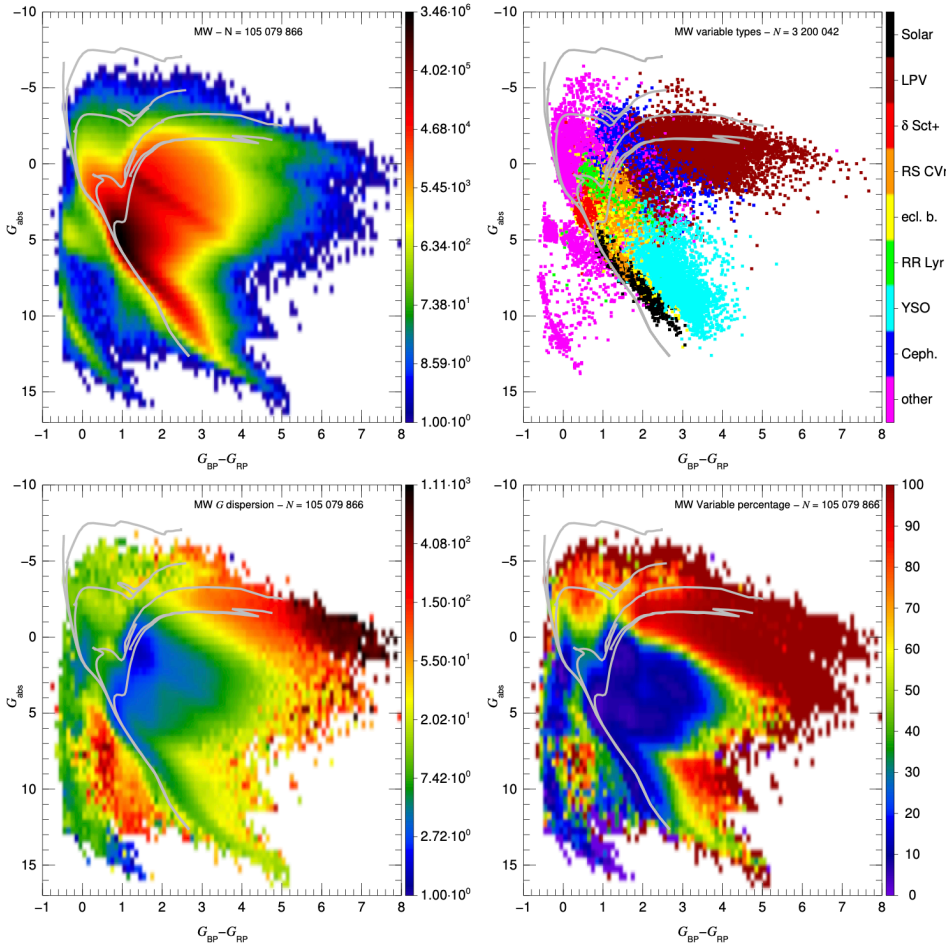
Ernst Paunzen, Natalia Posilek, Ewa Niemczura

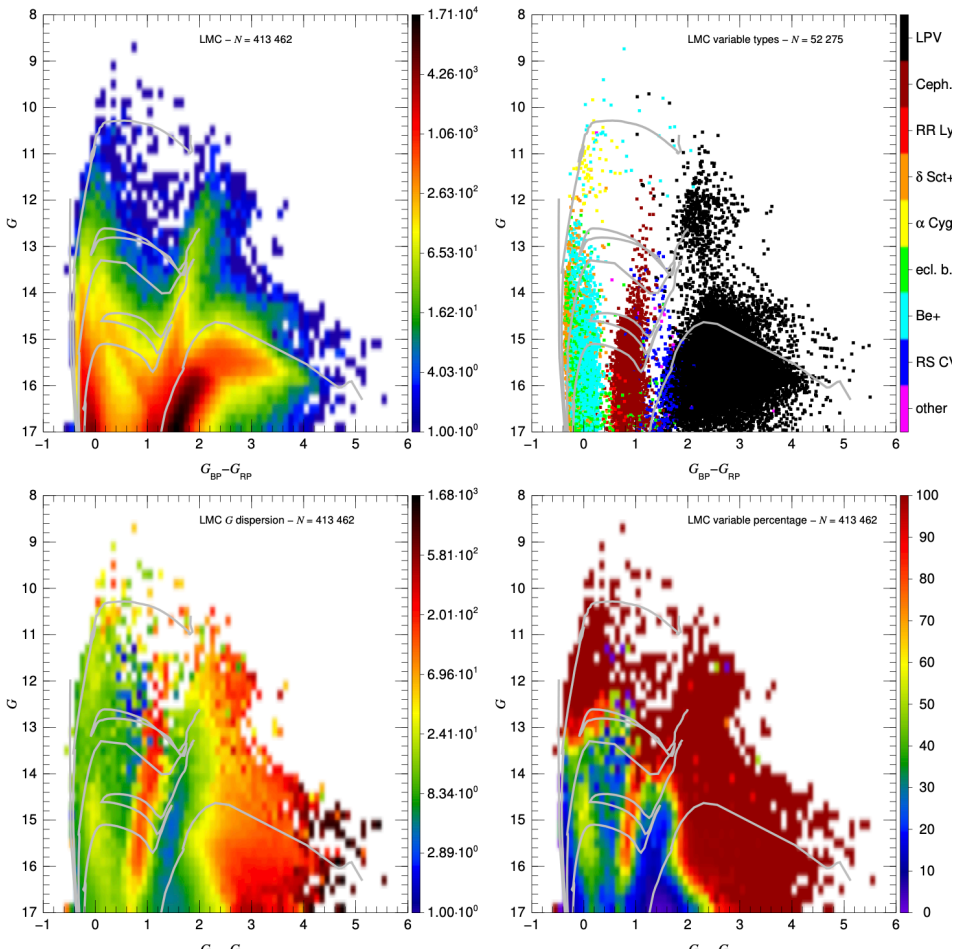
Am stars

300 Am stars

Surprise half of the sample not the Am stars

General approach





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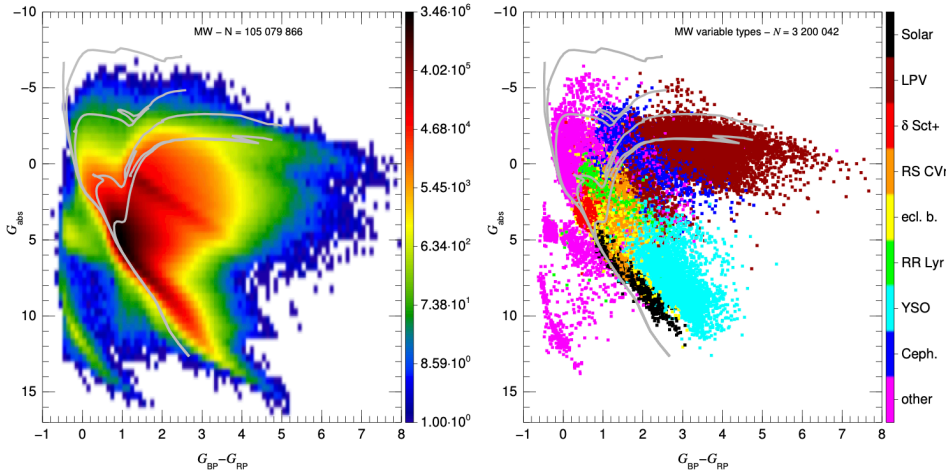
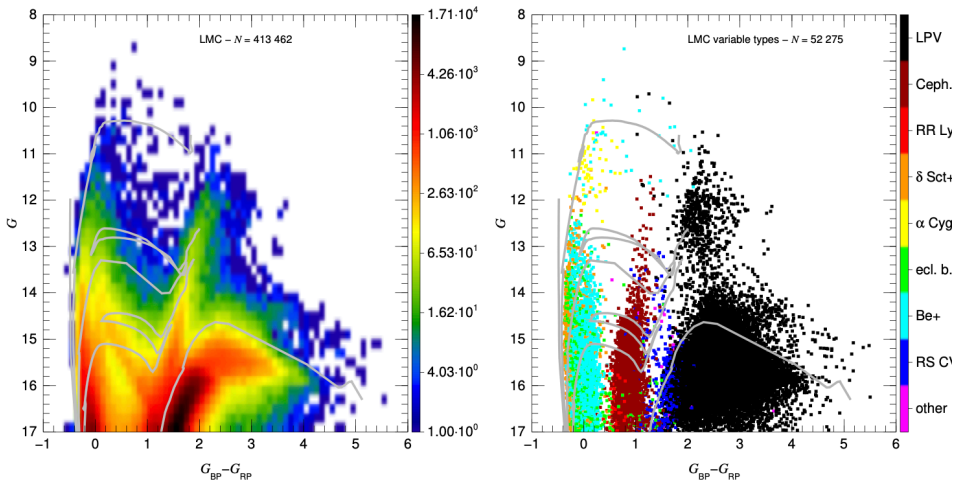
Maiz Appelaniz, Gonzalo Holgado, Ranaivomanana Tahina Princy, Szofia Nagy





General approach

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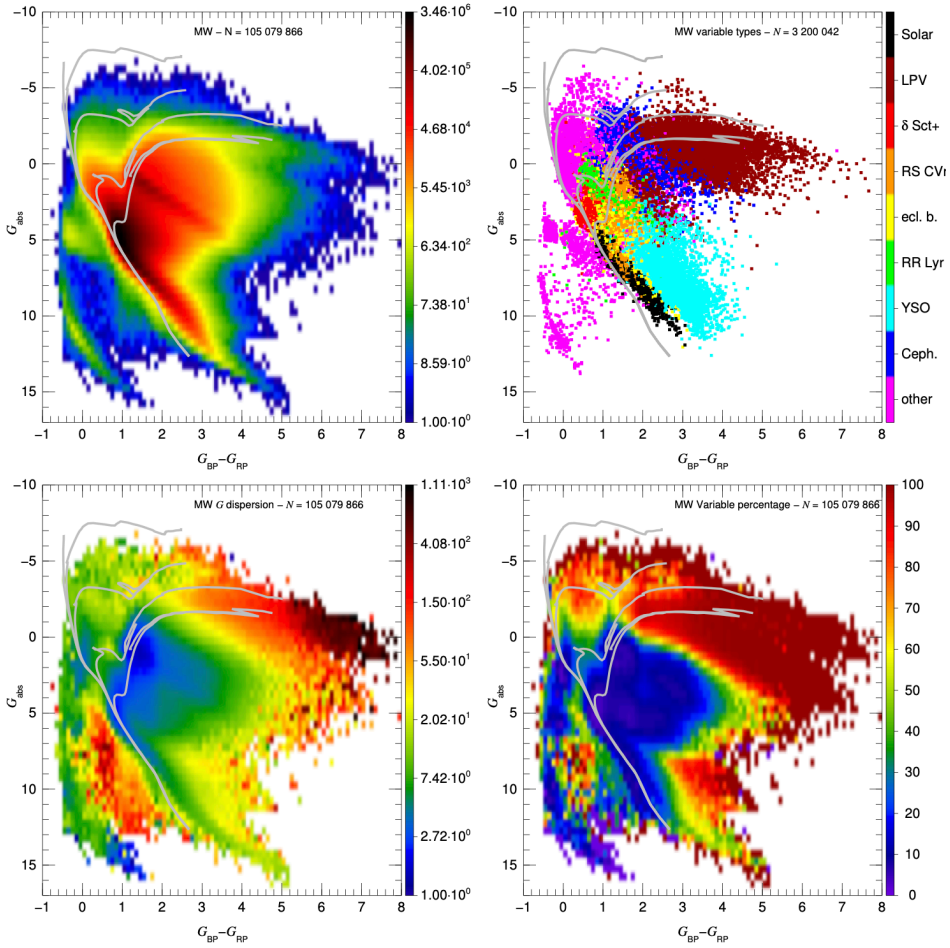
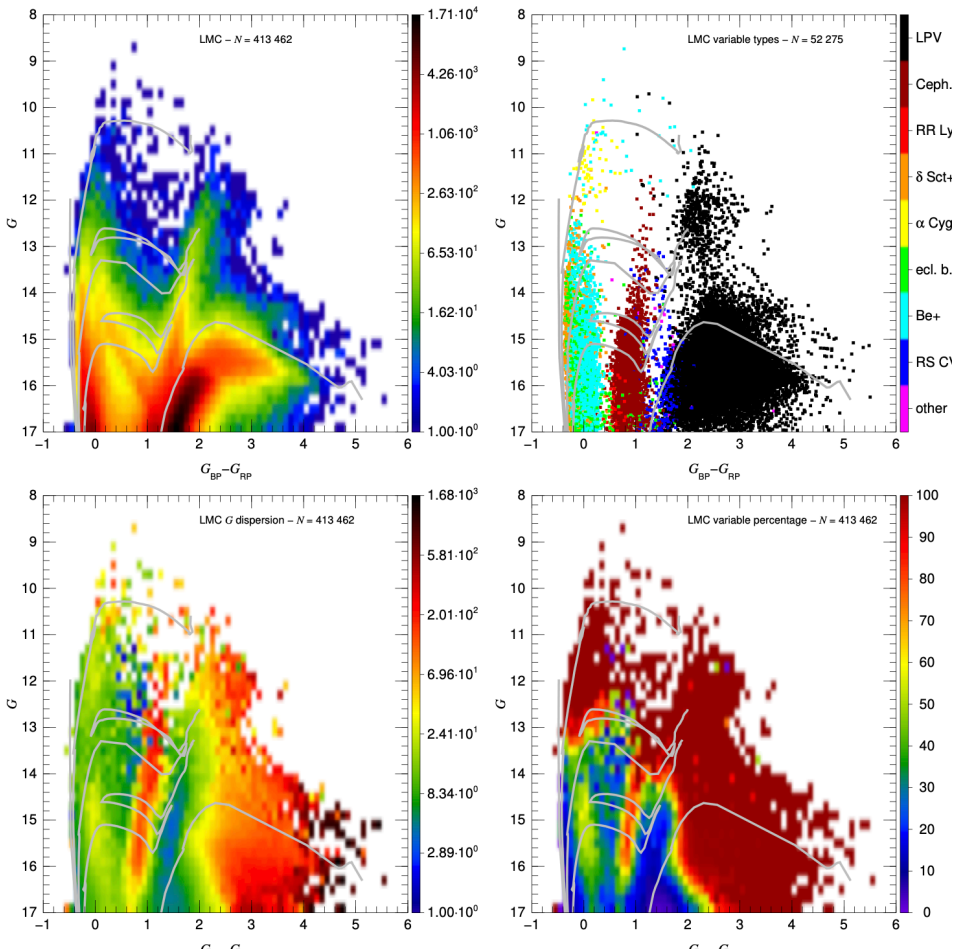
- Using excess variance built from the uncertainty on the mean from the Gaia catalogue





General approach

Early and late stages of evolution

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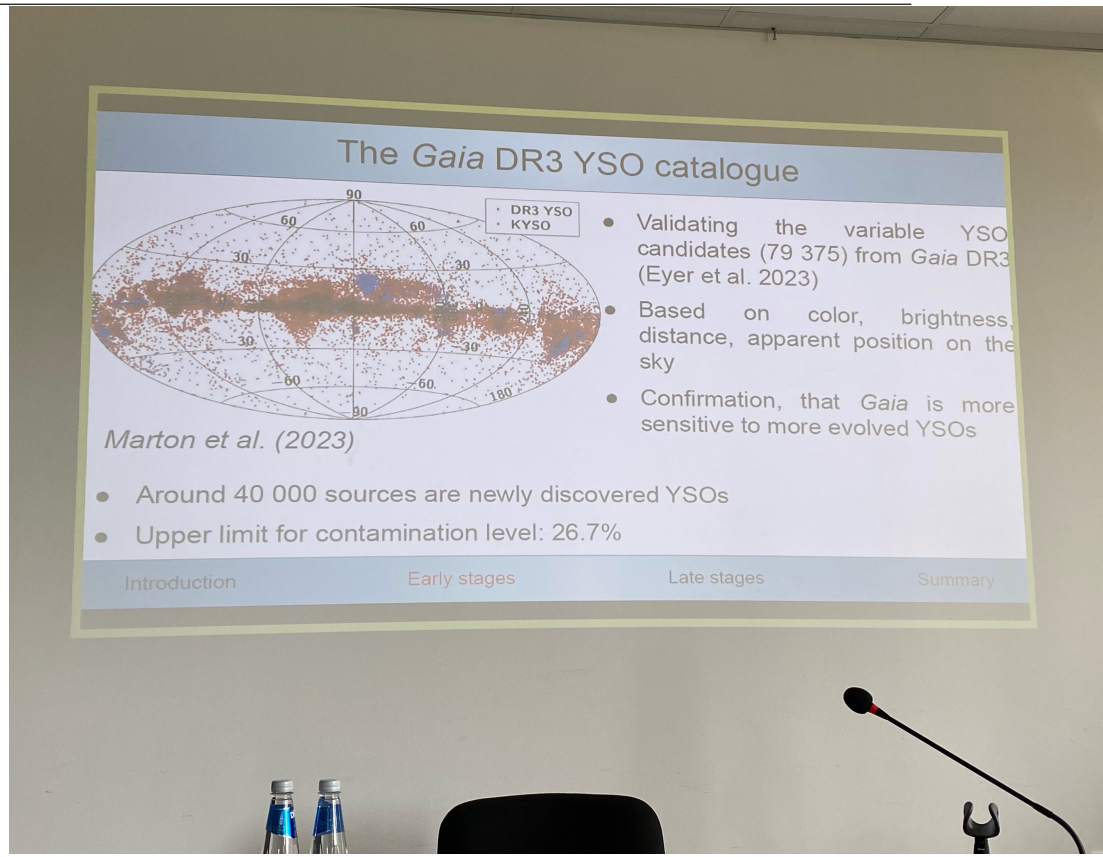

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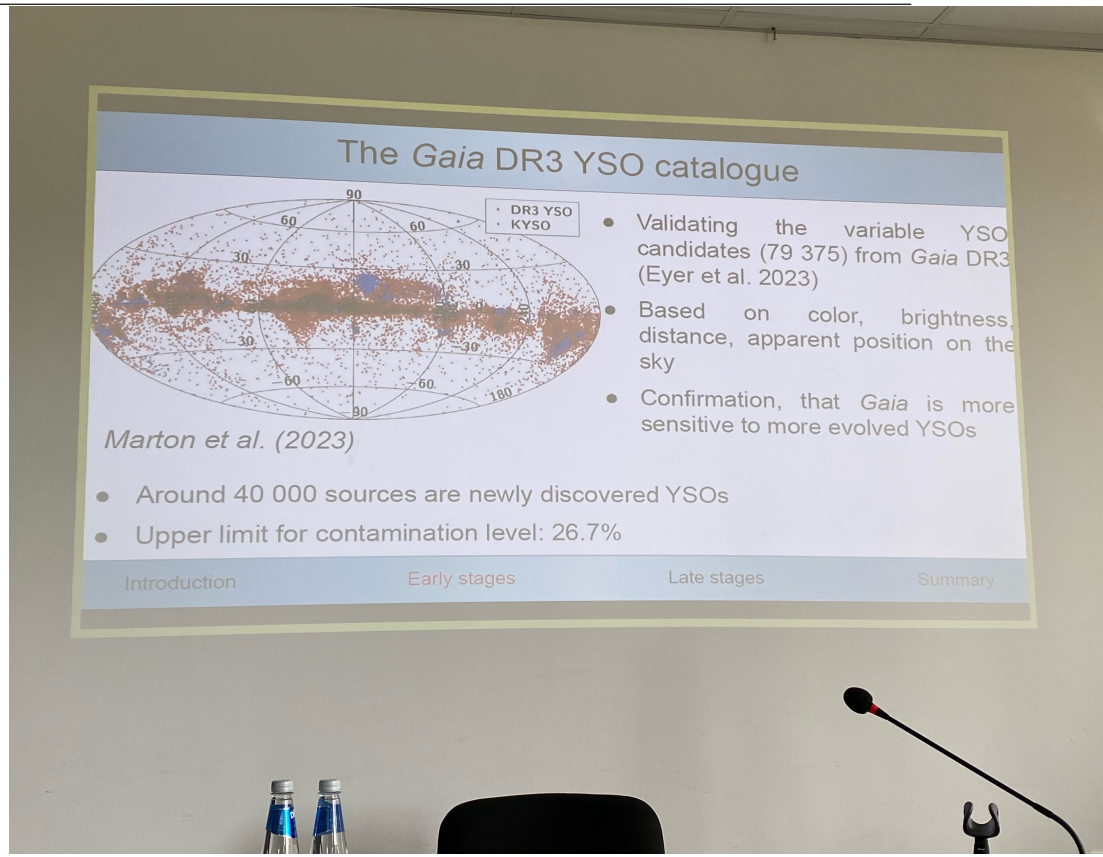
Science Alerts



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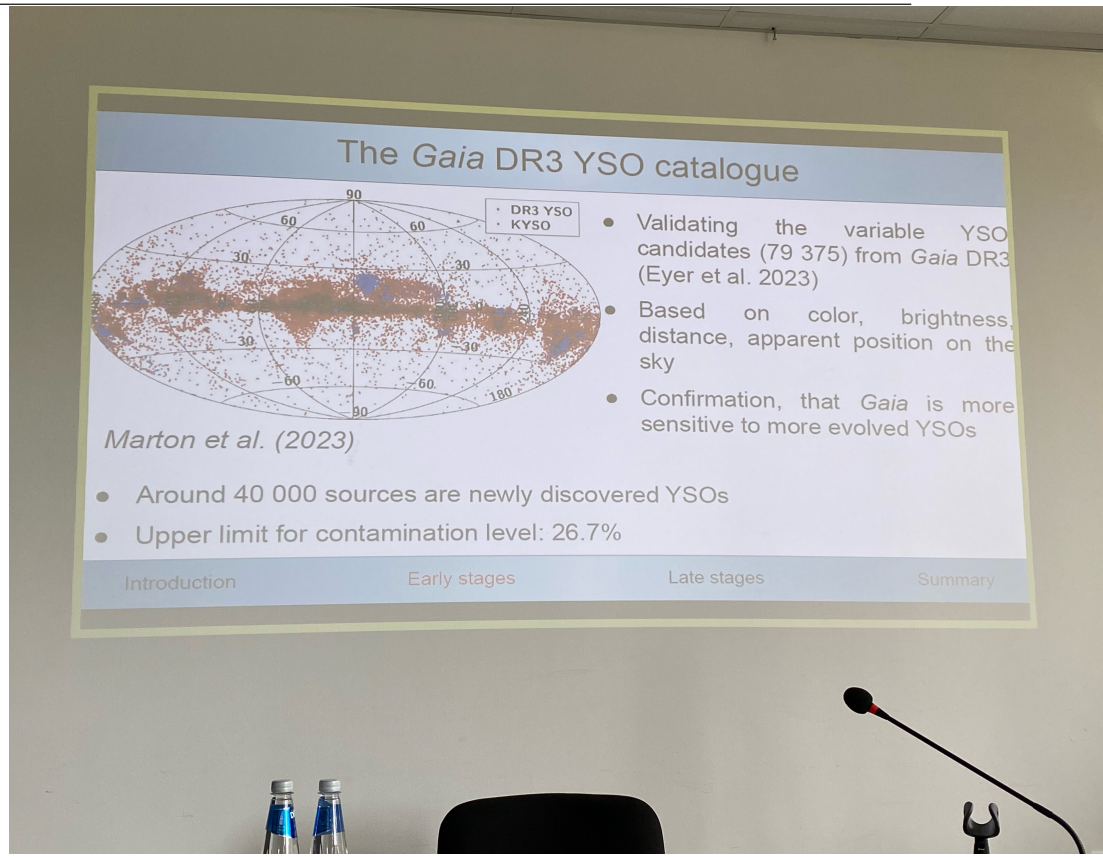

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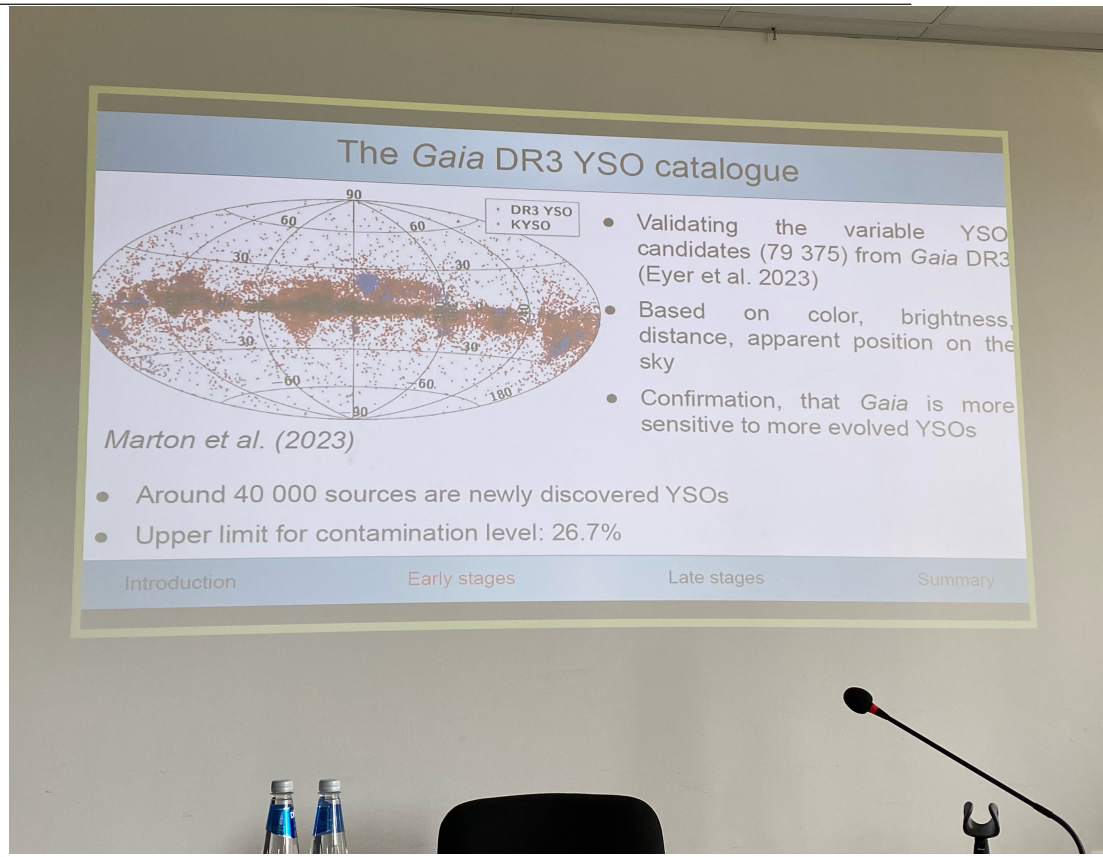

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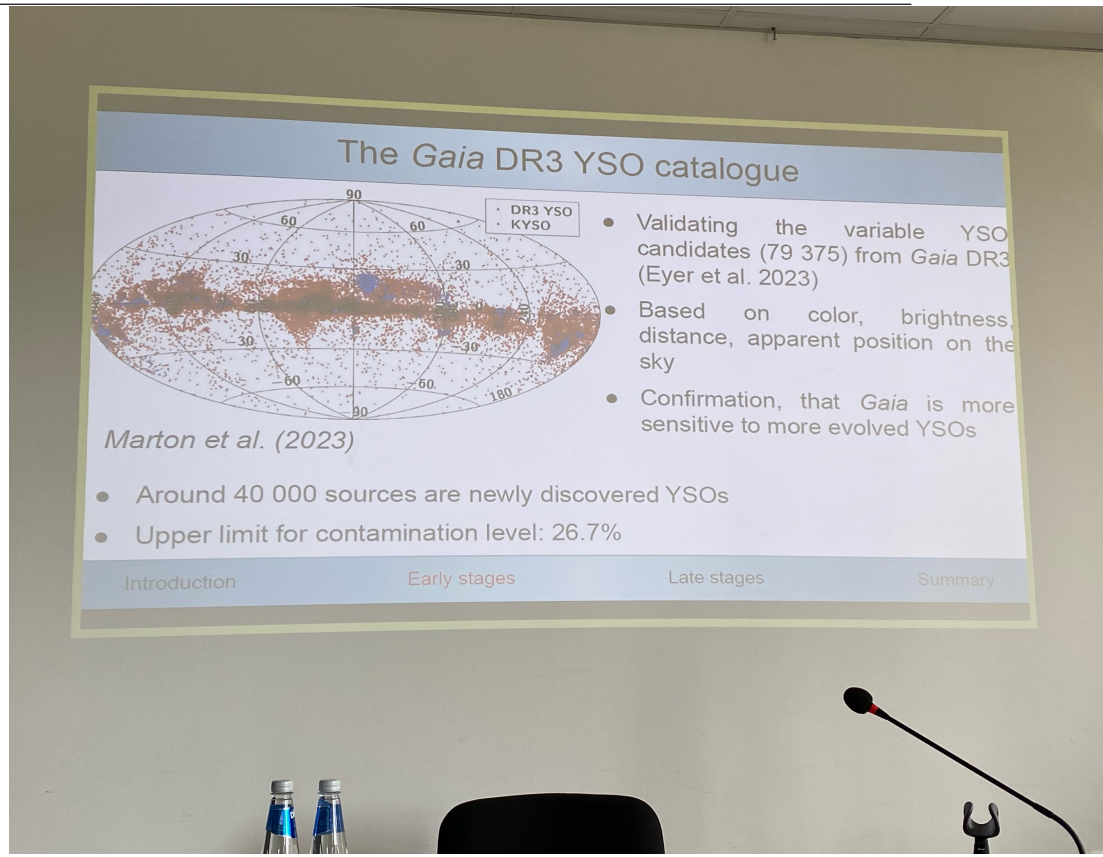

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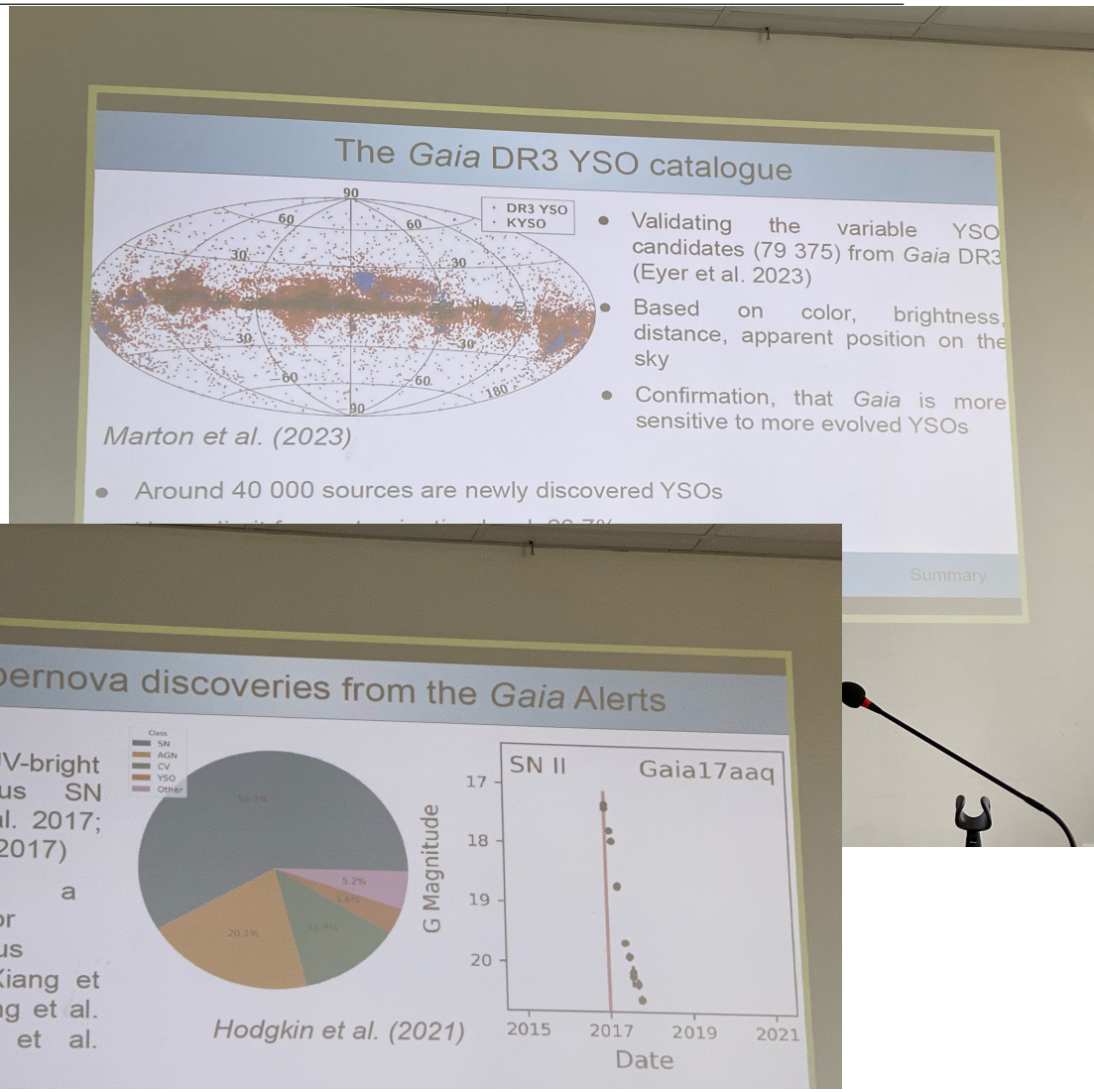

Data - infrastructure

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Evgeni Semkov, Tomislav Juric

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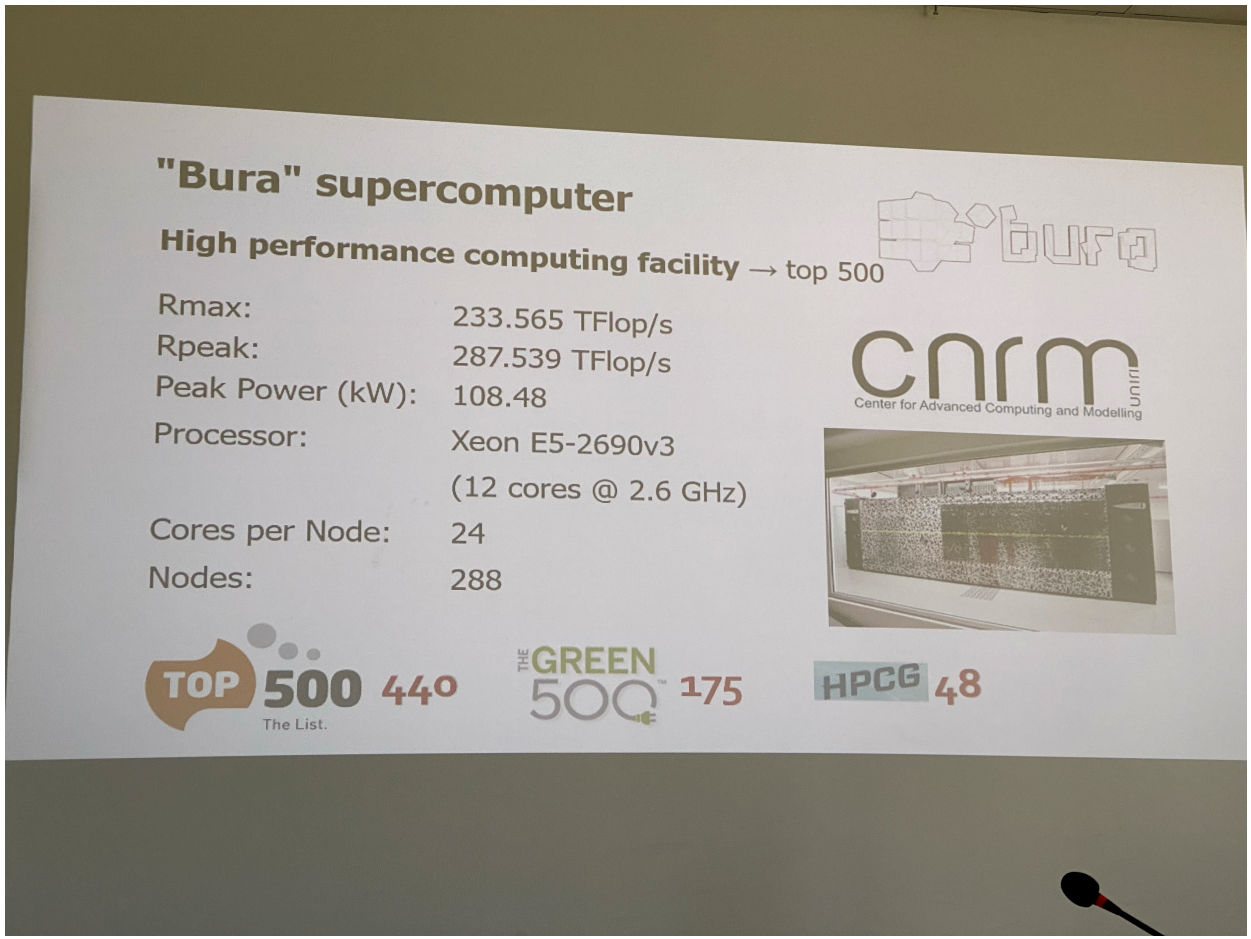
Rozhen Semkov

Data (observatory - infrastructure)



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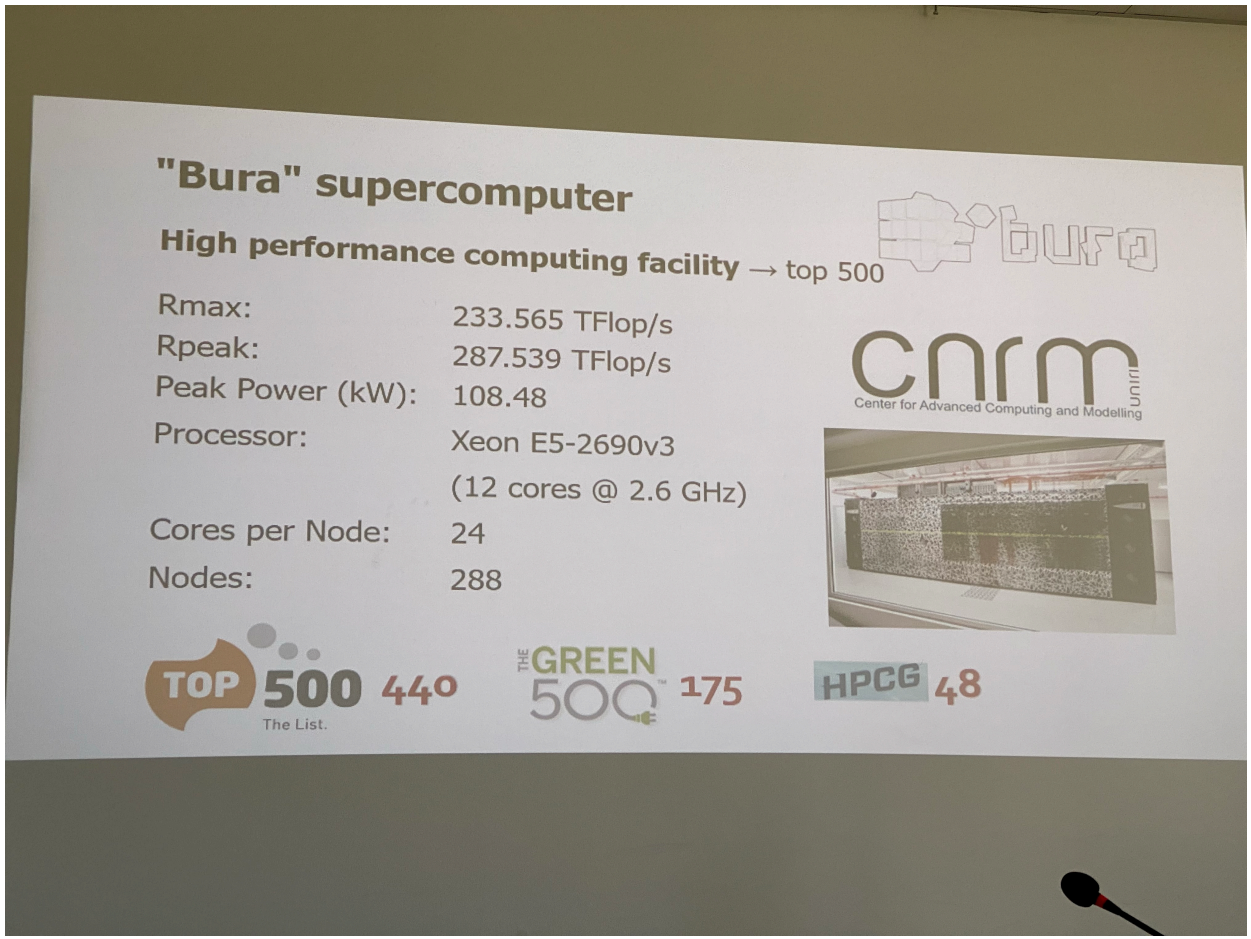

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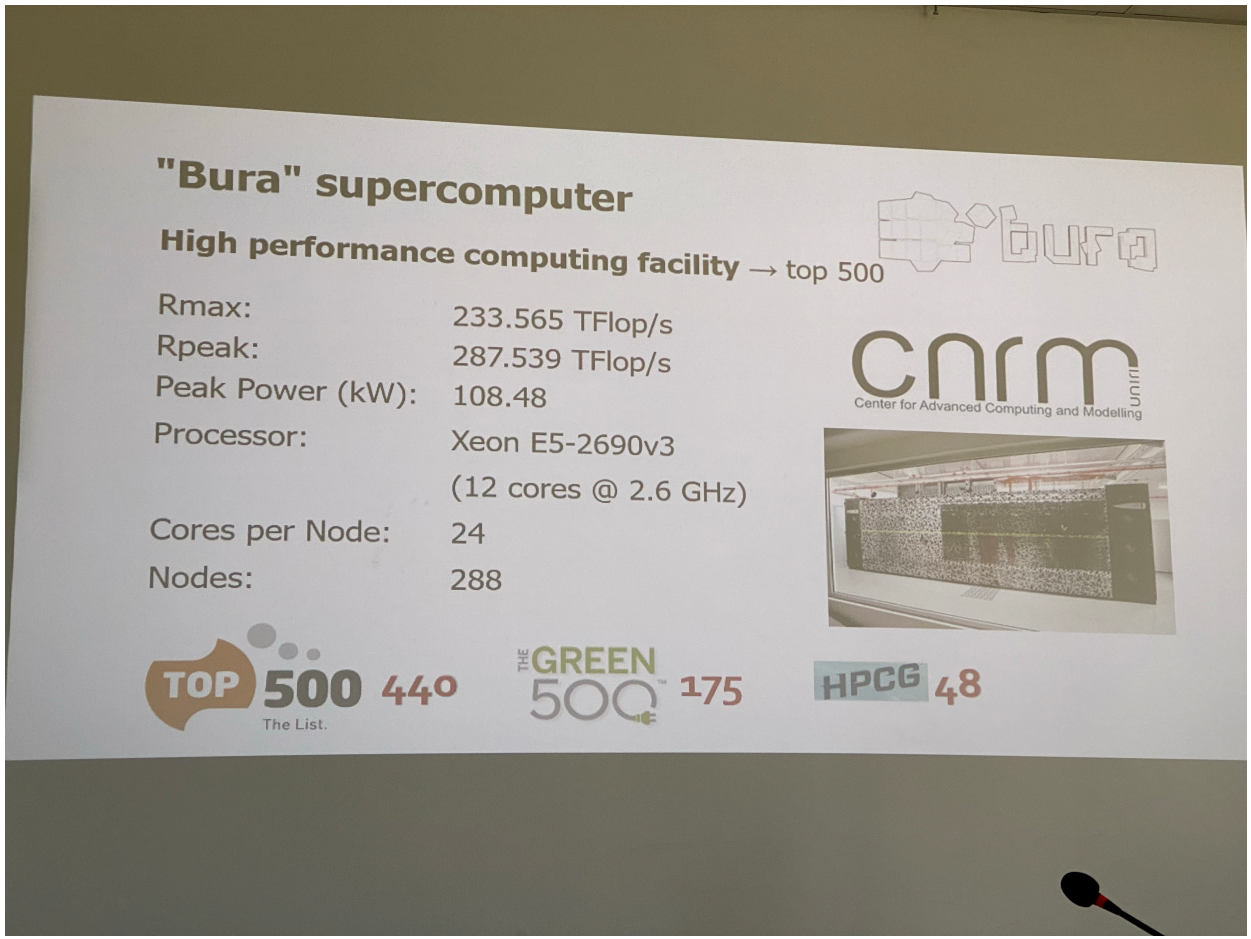
Supercomputer Bura



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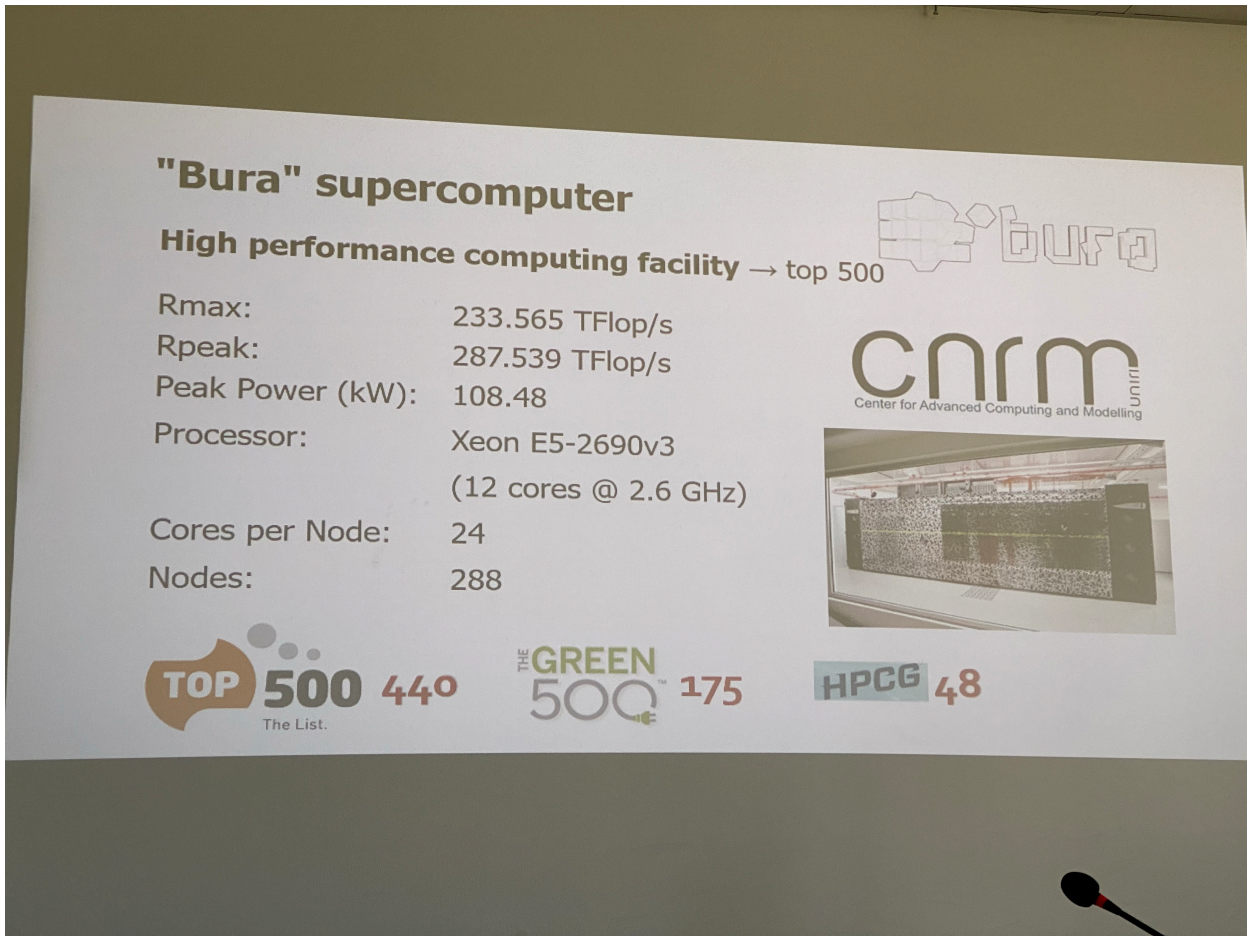
LSST



Data

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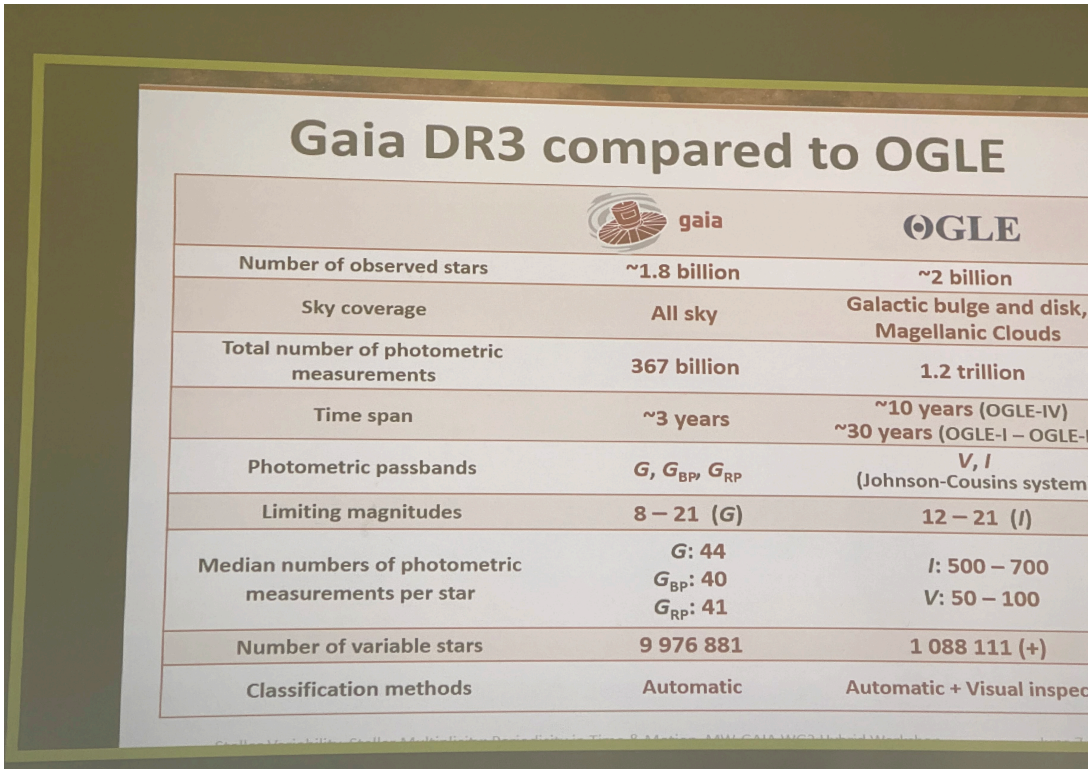
Evgeni Semkov, Tomislav Juric

Other surveys

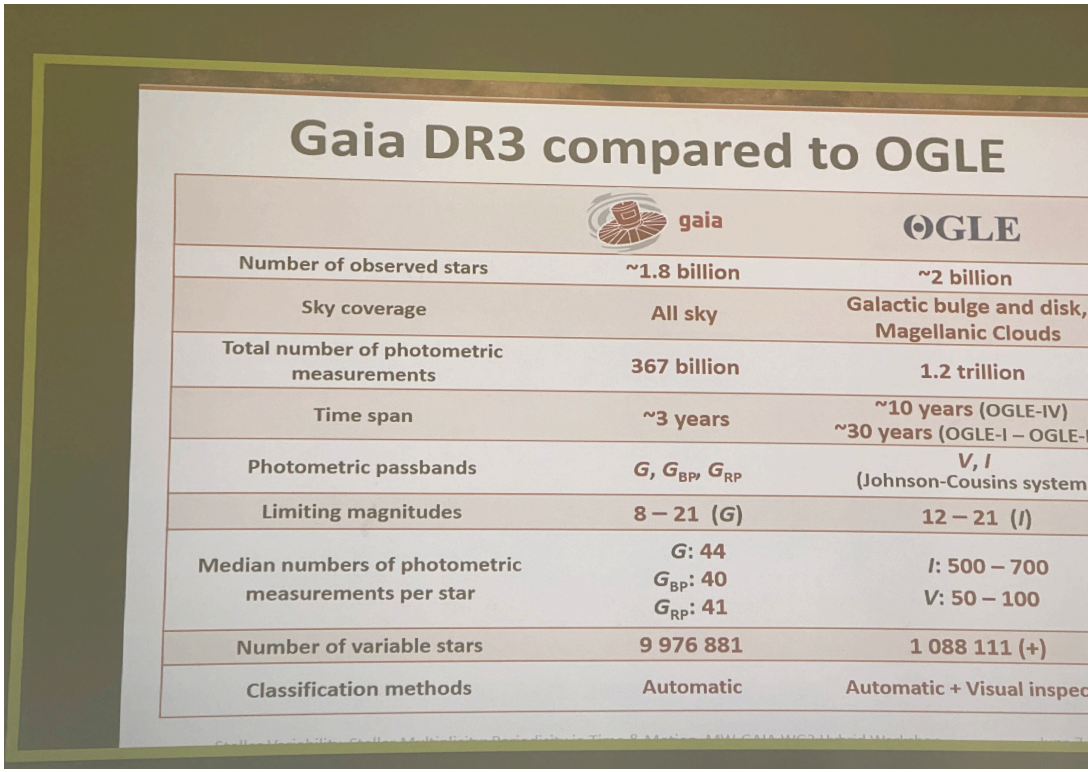


Gaia DR3 compared to OGLE

	gaia	OGLE
Number of observed stars	~1.8 billion	~2 billion
Sky coverage	All sky	Galactic bulge and disk, Magellanic Clouds
Total number of photometric measurements	367 billion	1.2 trillion
Time span	~3 years	~10 years (OGLE-IV) ~30 years (OGLE-I – OGLE-
Photometric passbands	G, G_{BP}, G_{RP}	V, I (Johnson-Cousins system
Limiting magnitudes	8 – 21 (G)	12 – 21 (I)
Median numbers of photometric measurements per star	G: 44 G_{BP}: 40 G_{RP}: 41	I: 500 – 700 V: 50 – 100
Number of variable stars	9 976 881	1 088 111 (+)
Classification methods	Automatic	Automatic + Visual inspec

Other surveys

Igor Soszyński, Zeljko Ivezic, Lovro Palaversa, Ashish Mahabal



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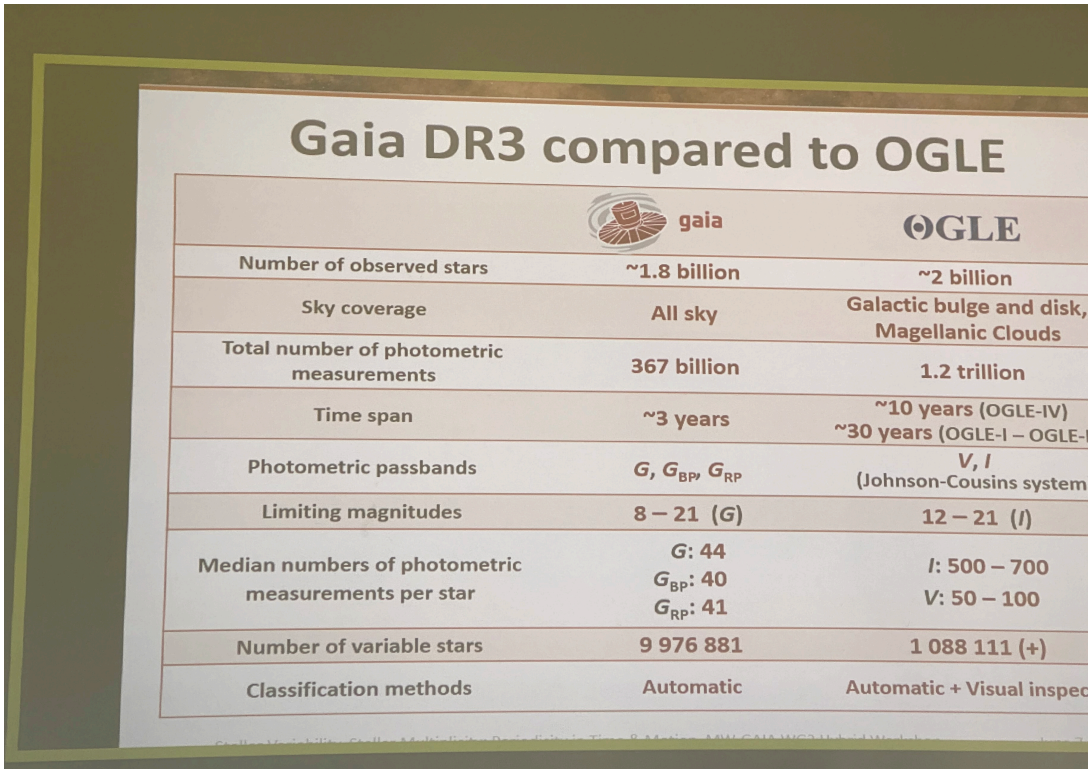

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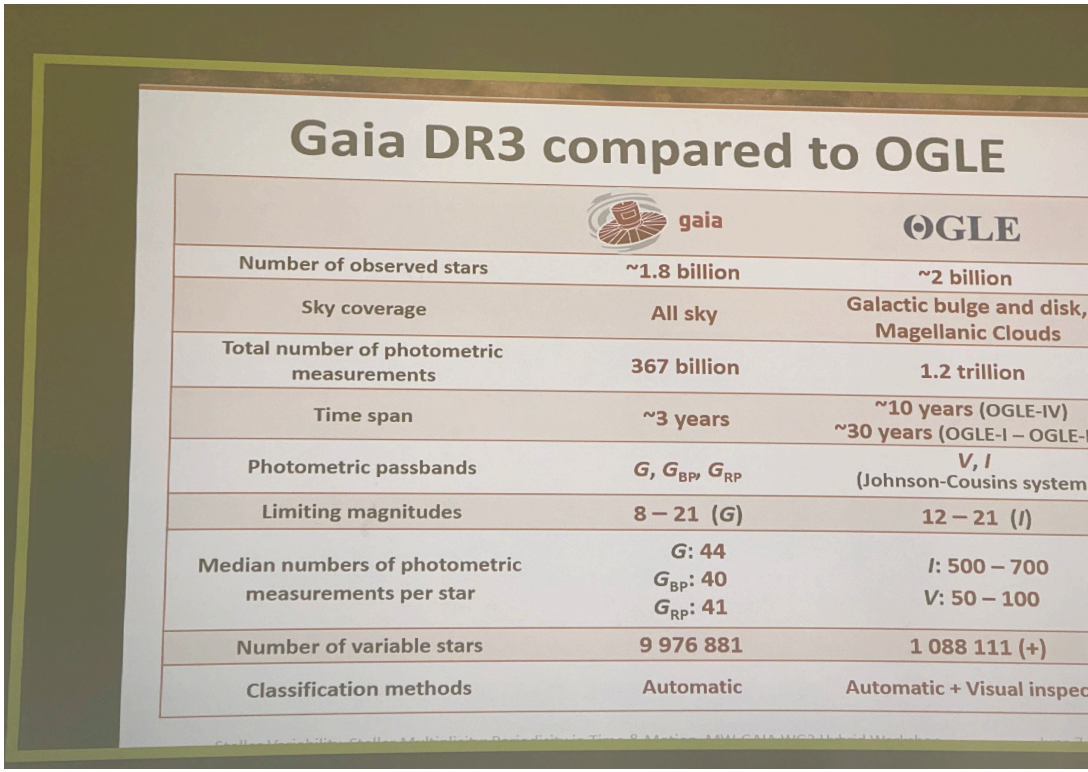

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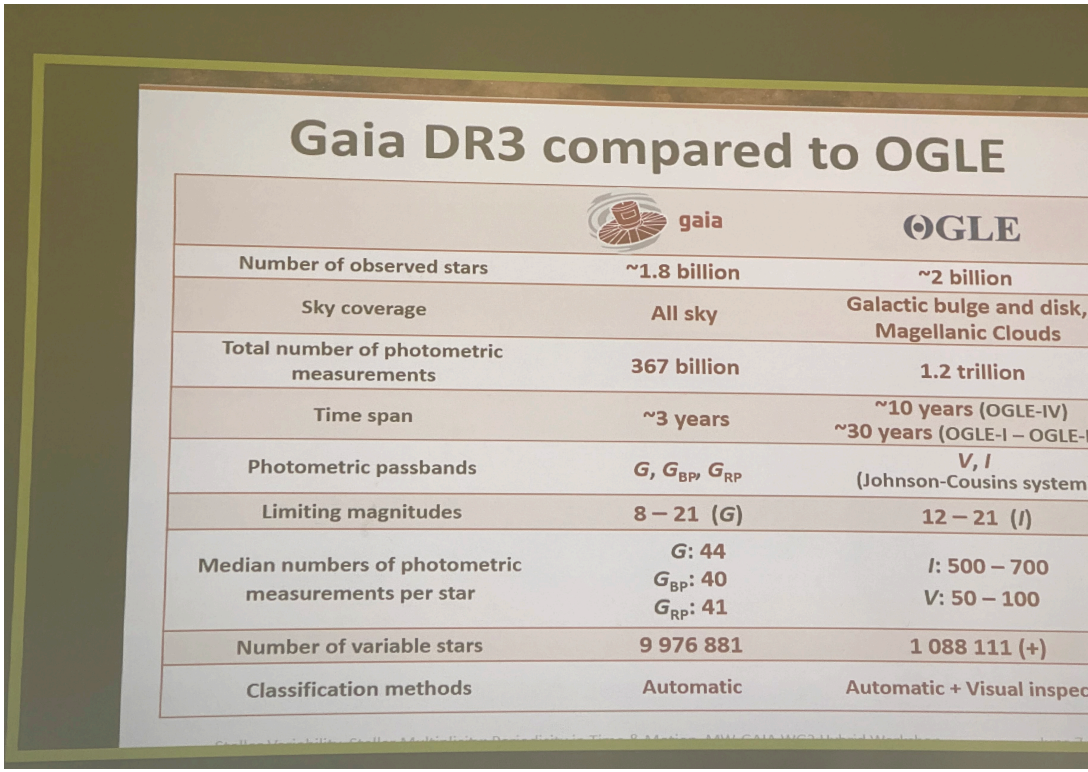

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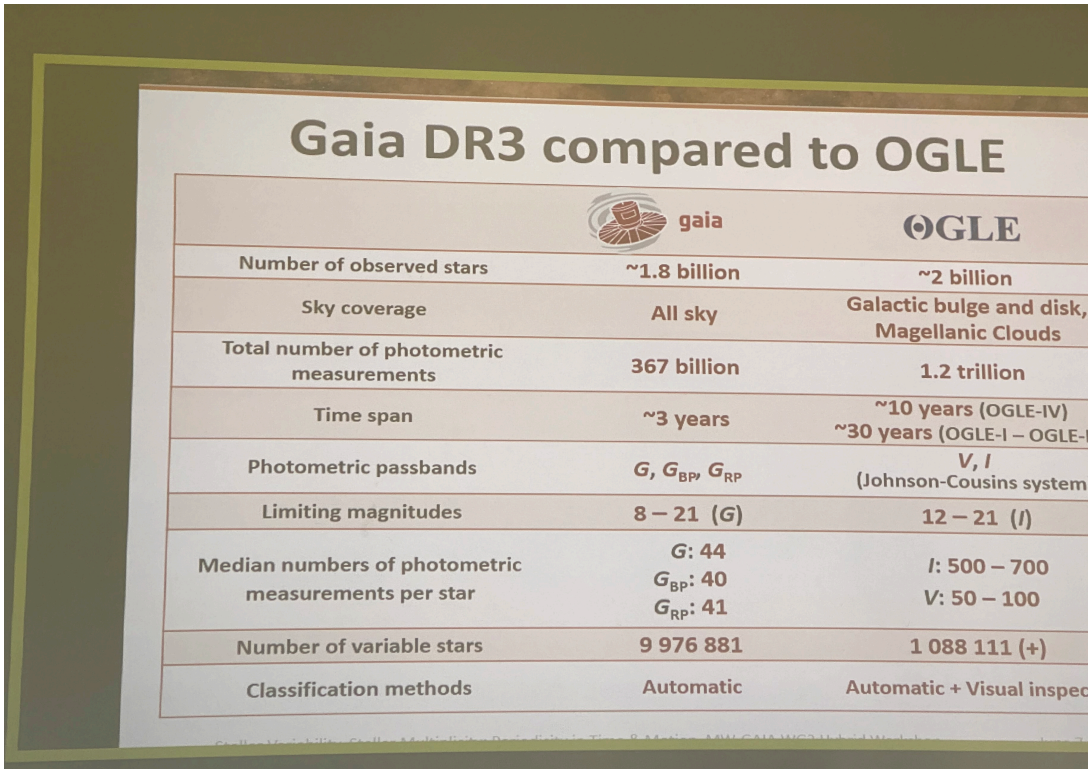

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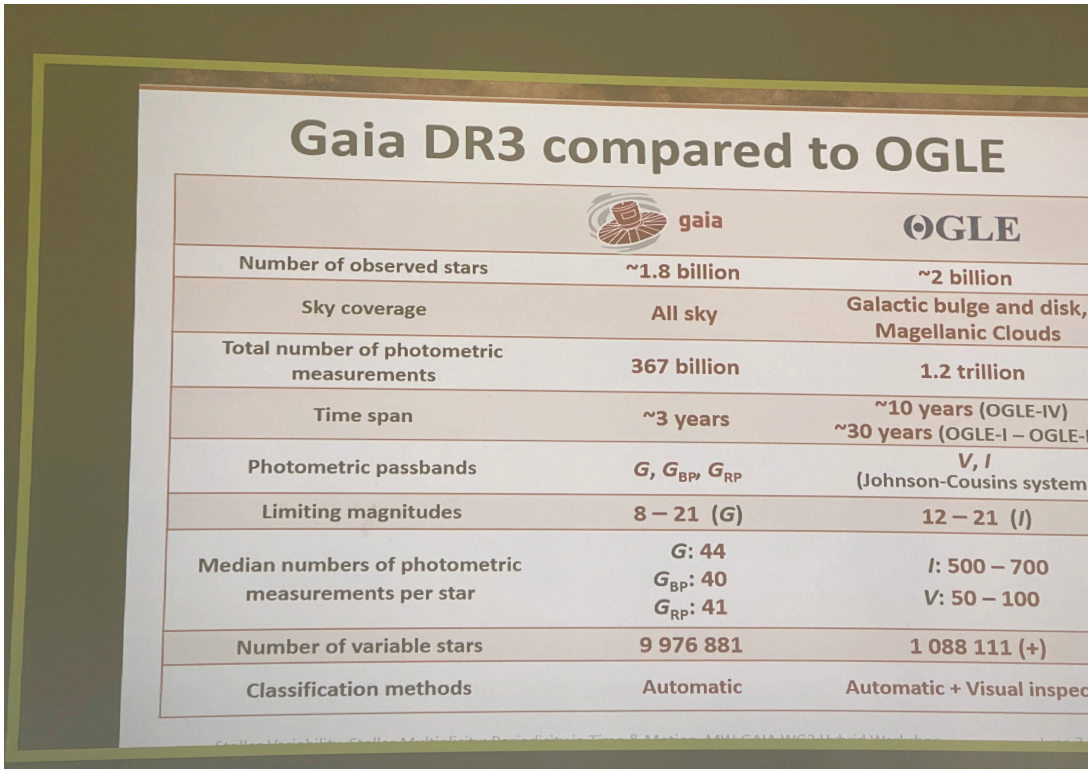
Your presentation will be very useful for Gaia



Gaia DR3 compared to OGLE

	gaia	OGLE
Number of observed stars	~1.8 billion	~2 billion
Sky coverage	All sky	Galactic bulge and disk, Magellanic Clouds
Total number of photometric measurements	367 billion	1.2 trillion
Time span	~3 years	~10 years (OGLE-IV) ~30 years (OGLE-I – OGLE-
Photometric passbands	G, G_{BP}, G_{RP}	V, I (Johnson-Cousins system
Limiting magnitudes	8 – 21 (G)	12 – 21 (I)
Median numbers of photometric measurements per star	G: 44 G_{BP}: 40 G_{RP}: 41	I: 500 – 700 V: 50 – 100
Number of variable stars	9 976 881	1 088 111 (+)
Classification methods	Automatic	Automatic + Visual inspec

Other surveys

Other surveys

- Igor Soszyński, Zeljko Ivezic, Lovro Palaversa, Ashish Mahabal

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LSST

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20 billion stars

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- 20 billion stars
- 20 billion galaxies

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LSST

- 20 billion stars
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  - u, g, r, i, z, y

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LSST

20 billion stars

20 billion galaxies

u, g, r, i, z, y

10 years, 1000 times

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LSST

- 20 billion stars
- 20 billion galaxies
  - u, g, r, i, z, y
  - 10 years, 1000 times
  - 100 petabytes

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LSST

20 billion stars

20 billion galaxies

u, g, r, i, z, y

10 years, 1000 times

100 petabytes

Data release 6 months: 2026

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Generating LSST synthetic photometry from XP Spectra

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Good example of synergies between Gaia and LSST

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gaiaxpy:

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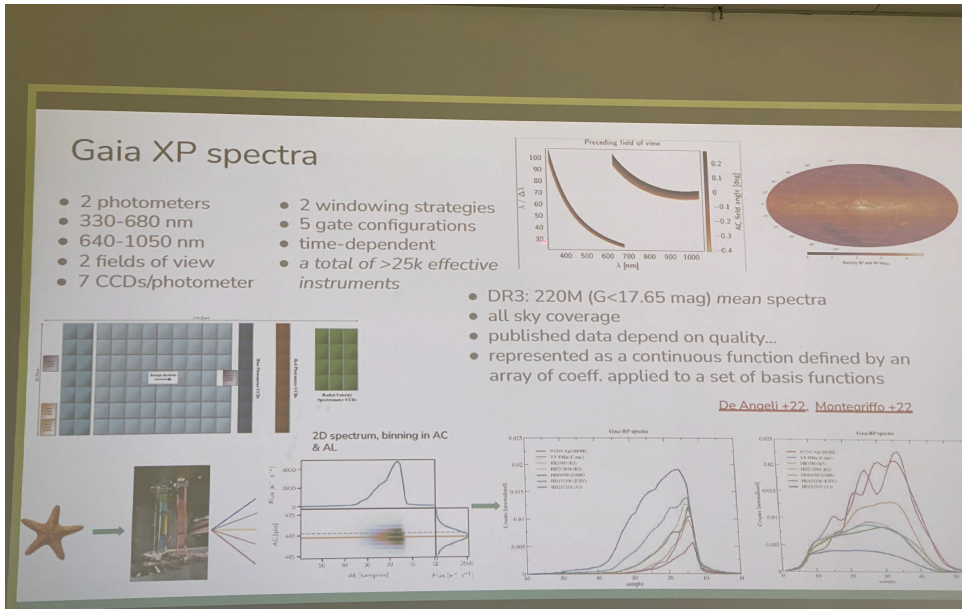

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Many surveys

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- CSS/CRTS long from 2005

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Using the data of
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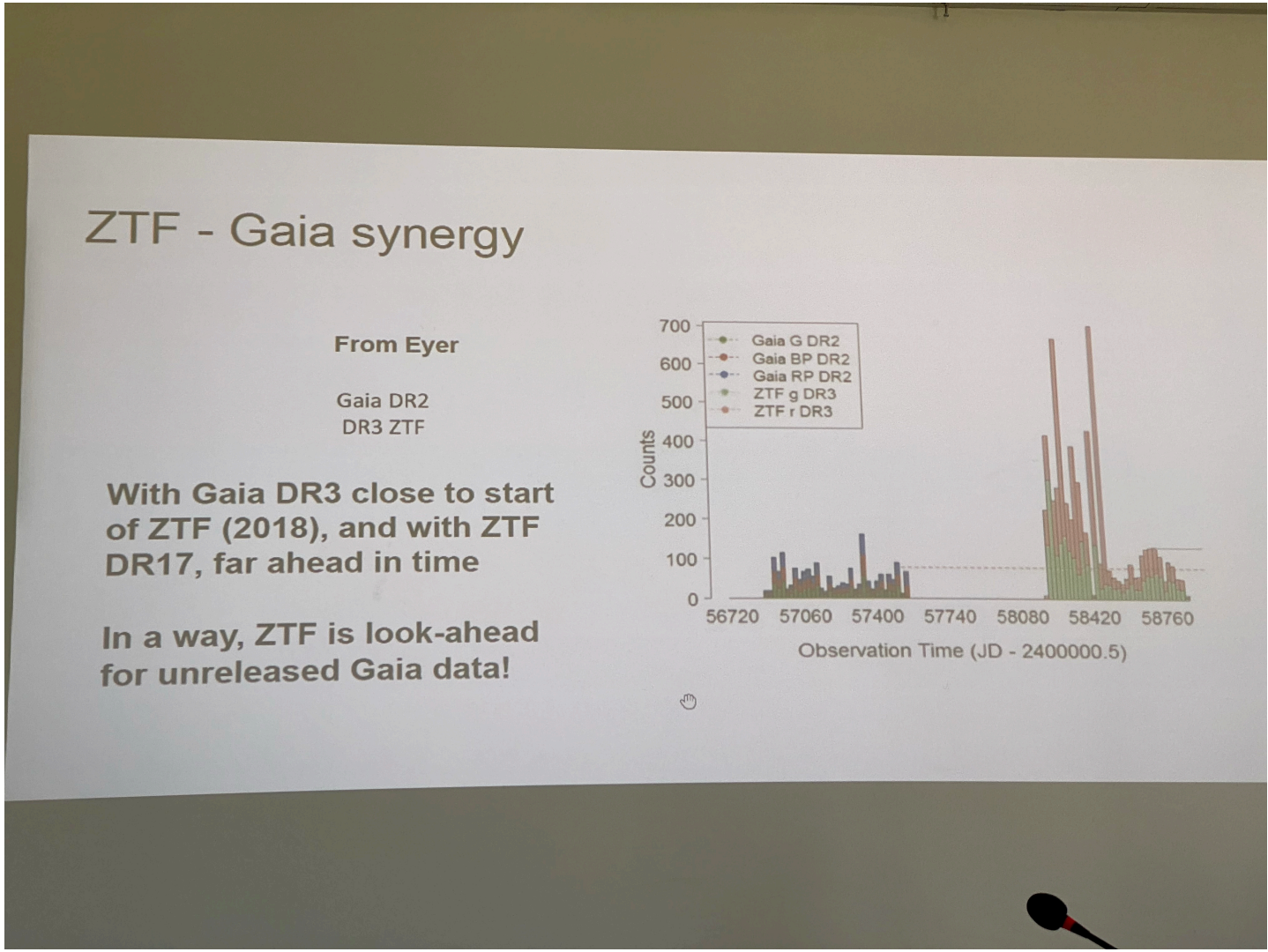

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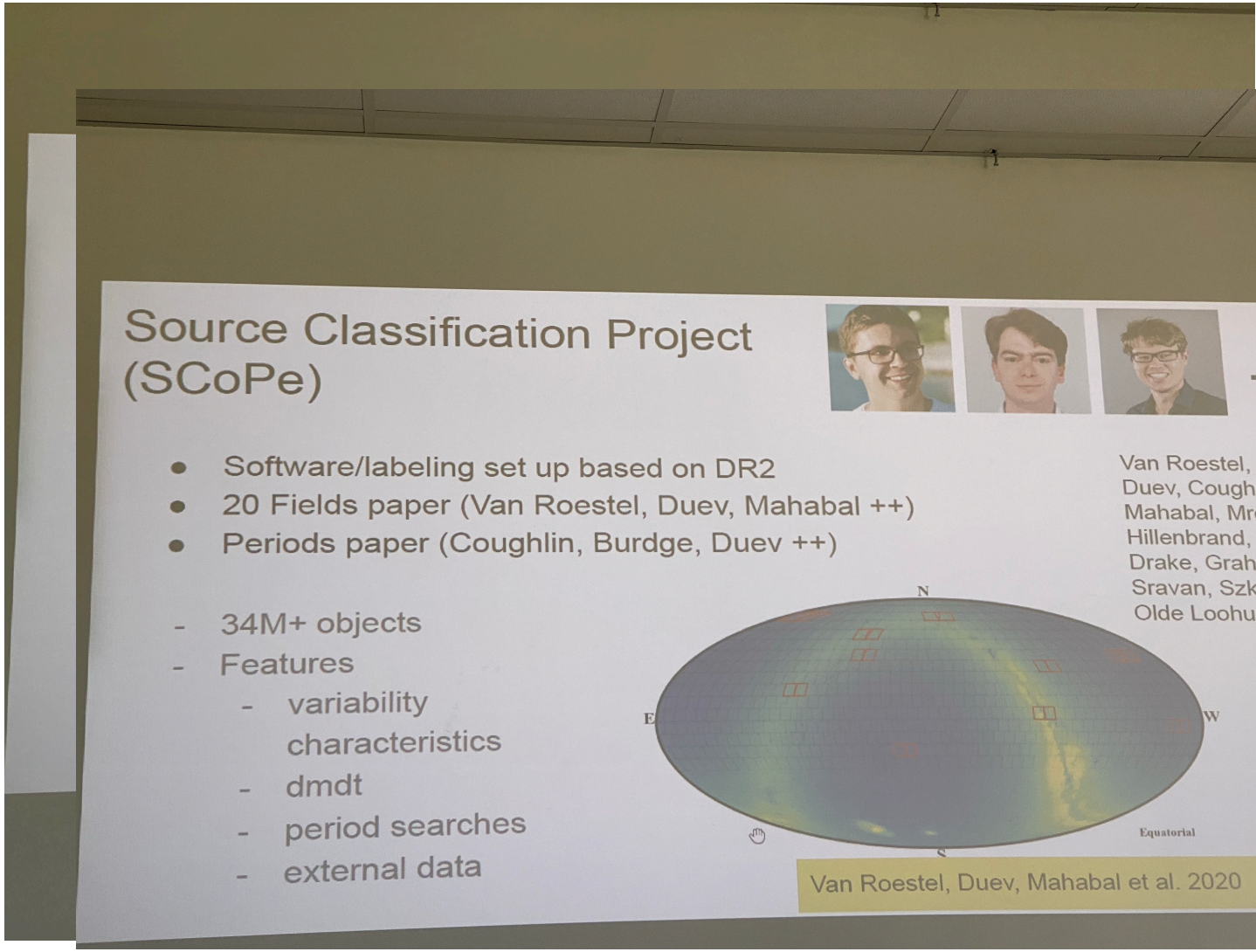

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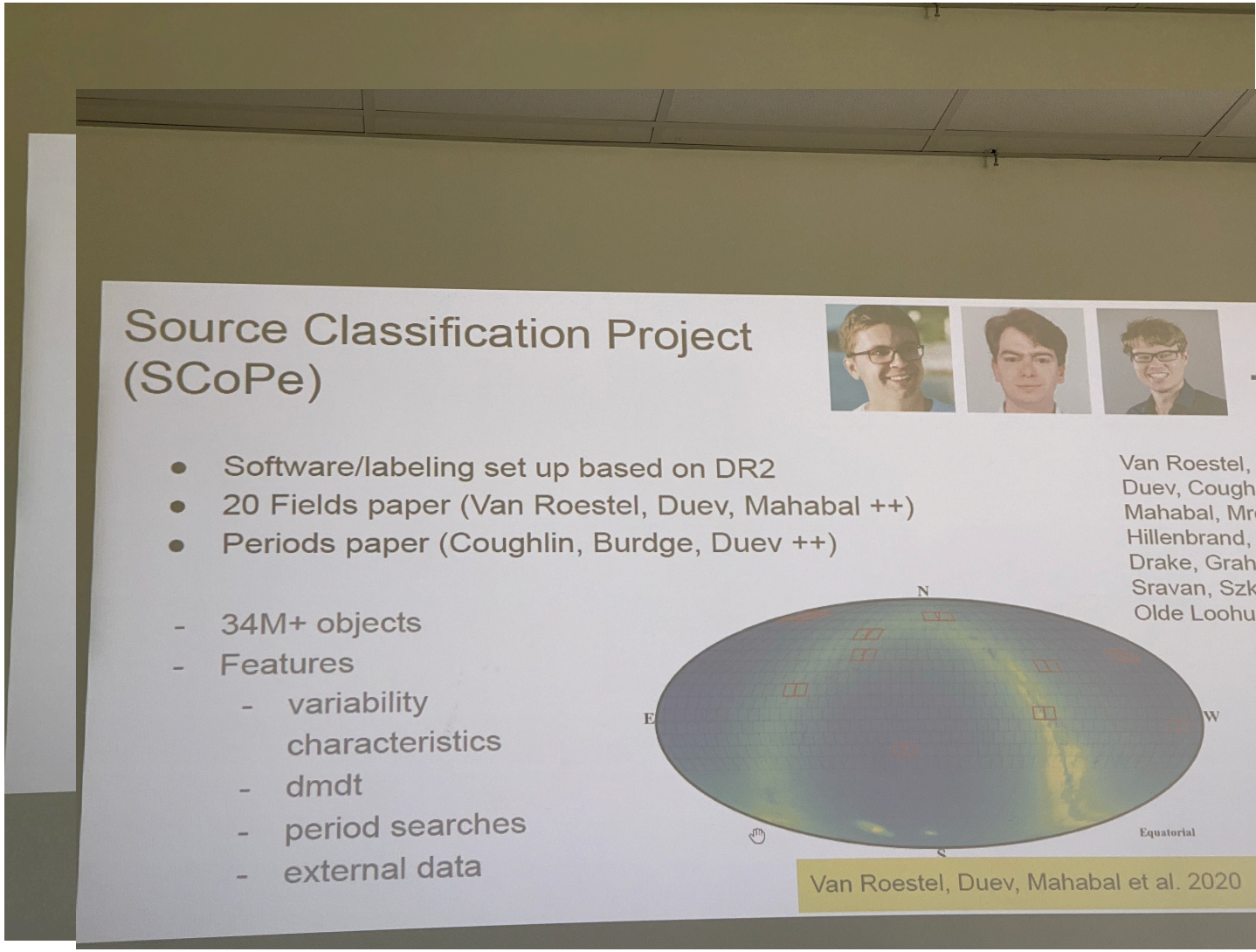
No anomaly left behind



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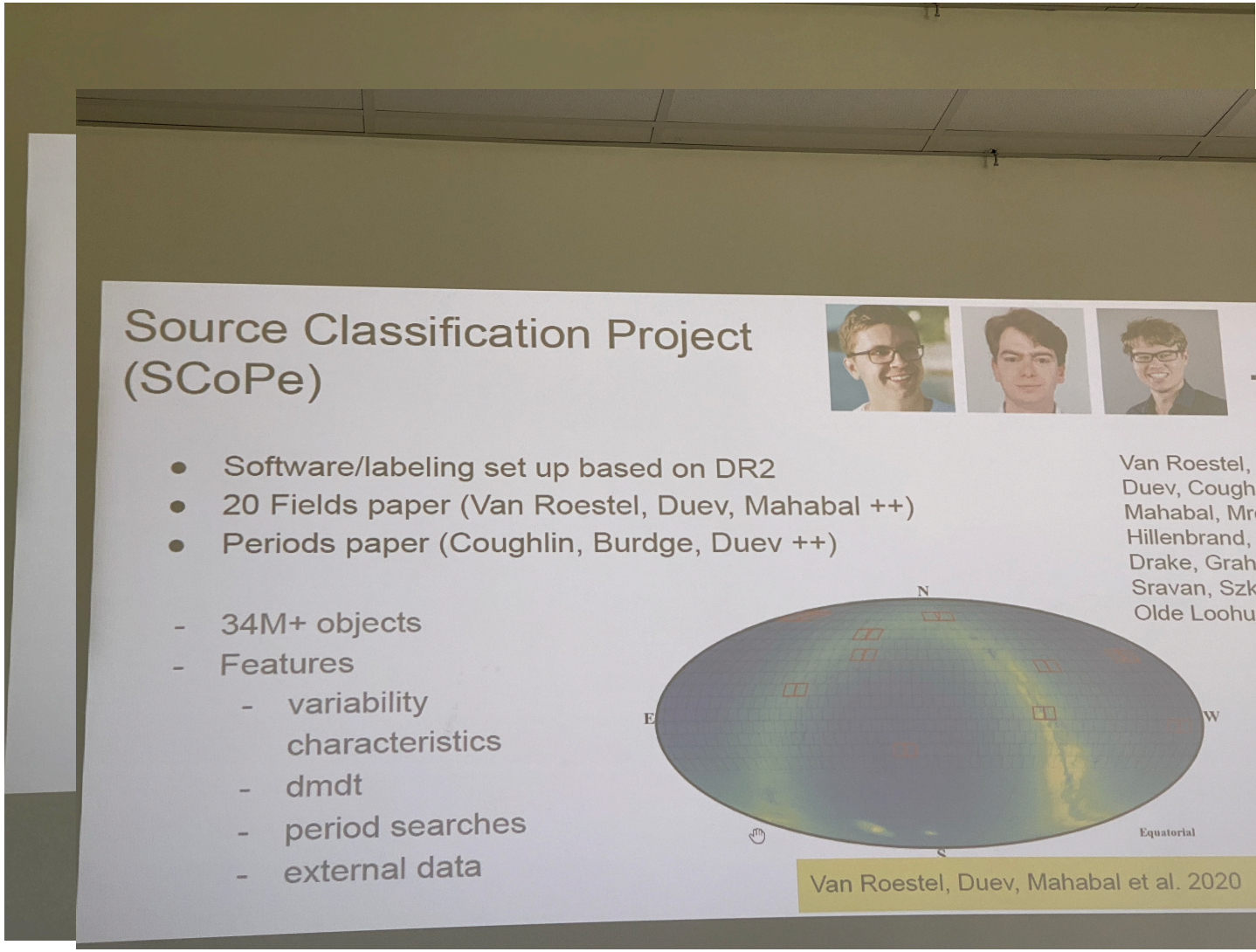
ZARTH - Pokemon GO coming soon



- **Thanks**

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  - **TO ALL THE SPEAKERS**