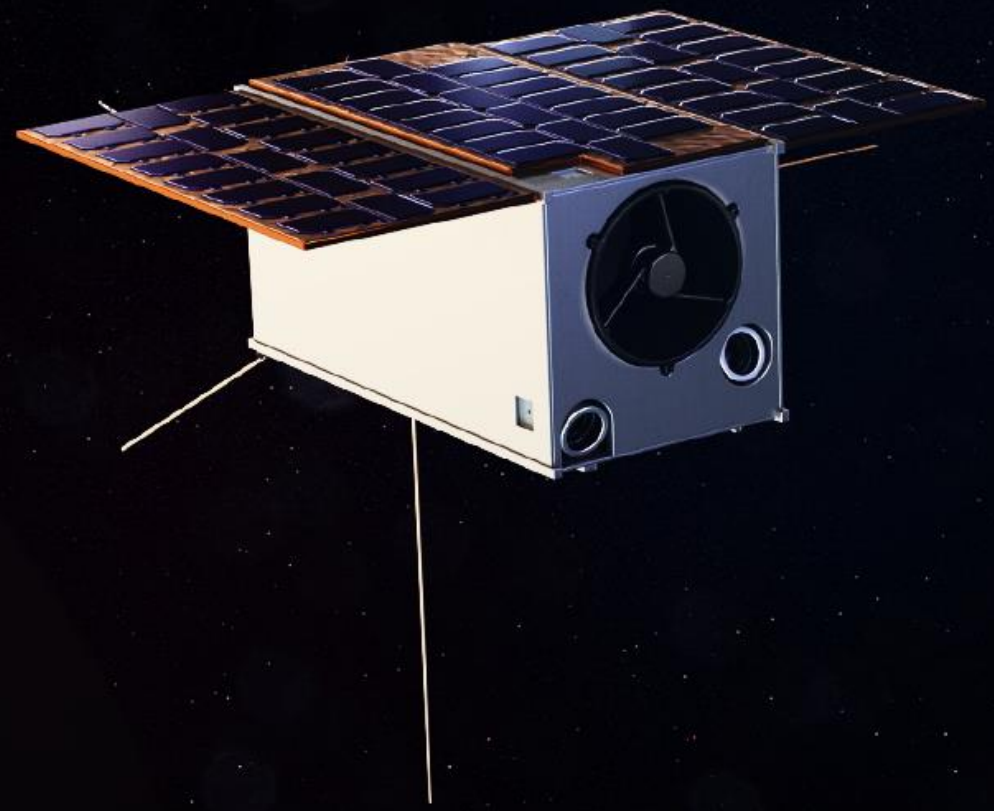
MAUVE

A science satellite from BLUE SKIES SPACE



MAUVE

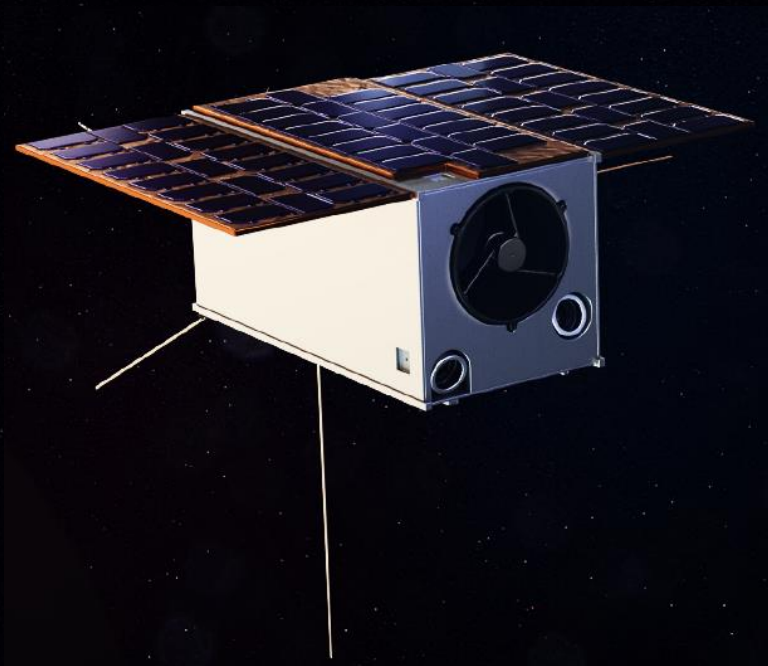
UV-Vis spectroscopy to monitor stars

3-year survey programme

Time domain astronomy

Fully funded

Under construction



C3S

ISISPACE

BLUE SKIES SPACE

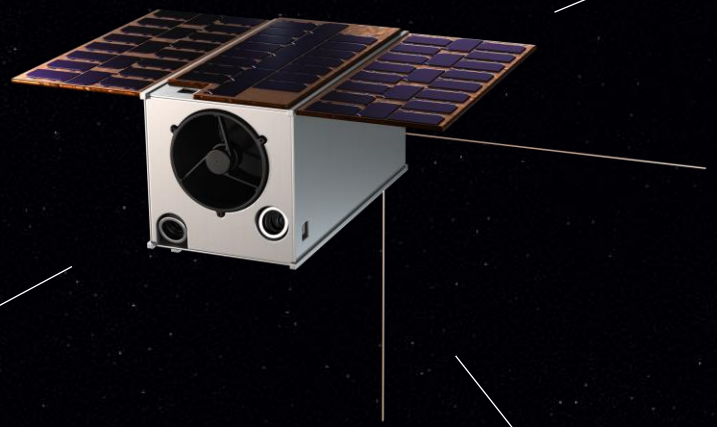
Funded by the European Union

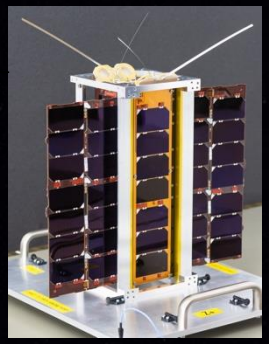
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101082738.

The satellite

Avionics

Star tracker





C3S 16U Platform

Low-Earth orbit

UV & Visible spectrometer

200 – 700nm

Resolving power 20 - 65

13cm telescope

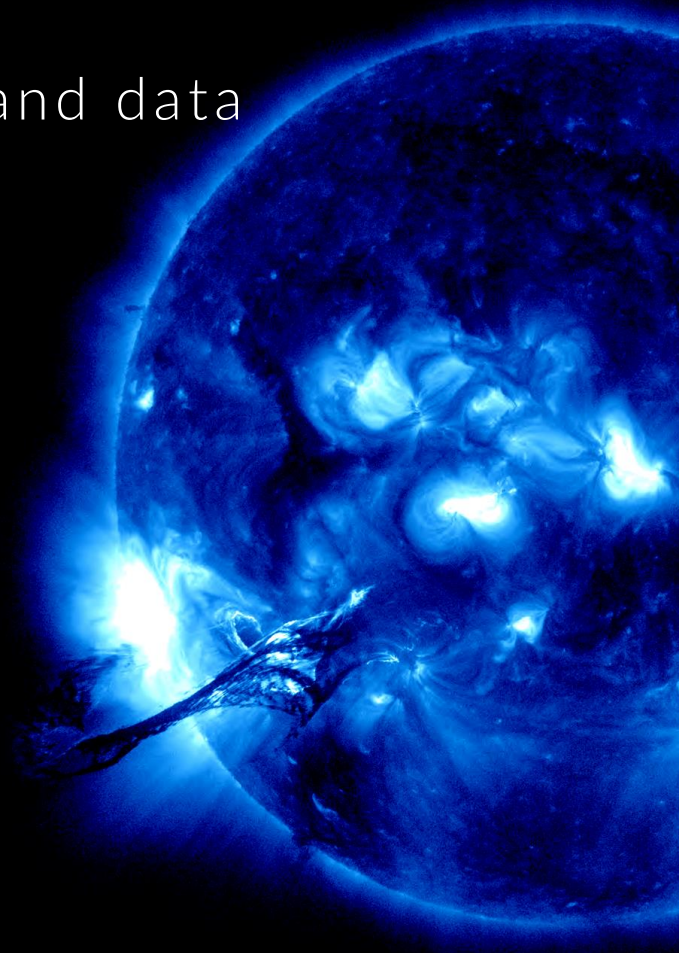

BLUE SKIES SPACE LTD
MAUVE
Twinkle

Empowering science

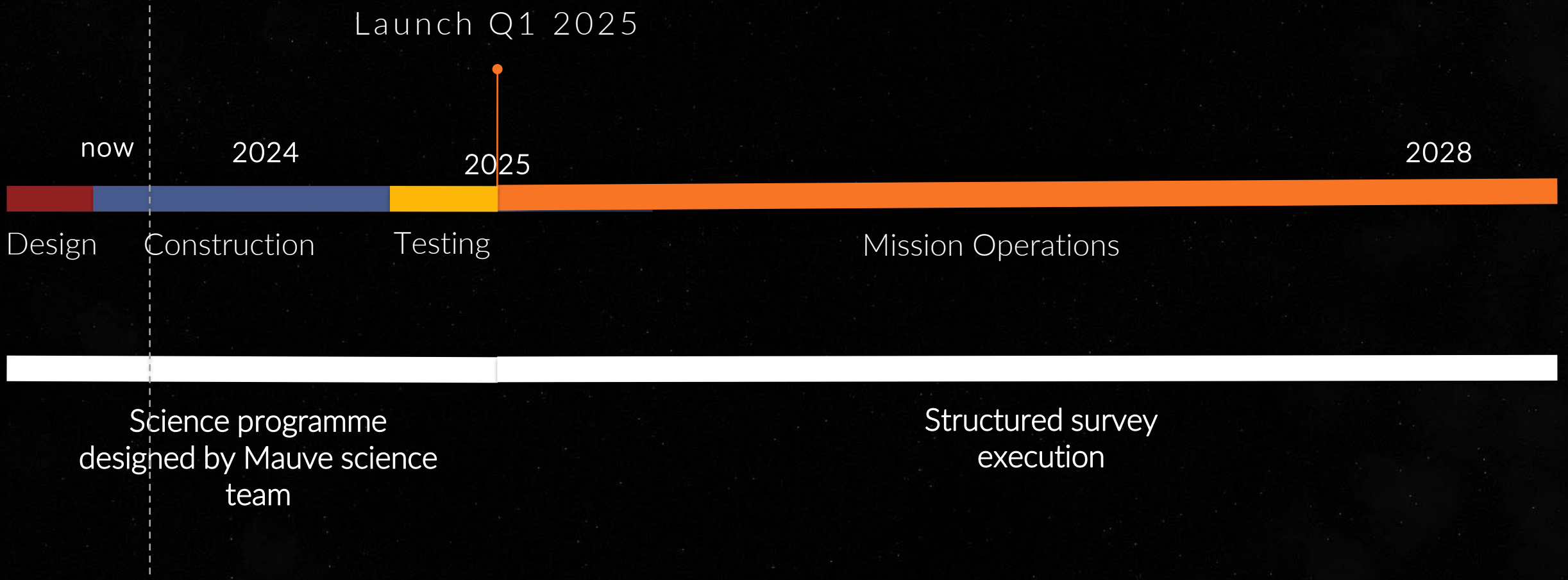
Providing the science community with in-demand data

Serving the under-served research fields

A collaborative global platform for new ideas



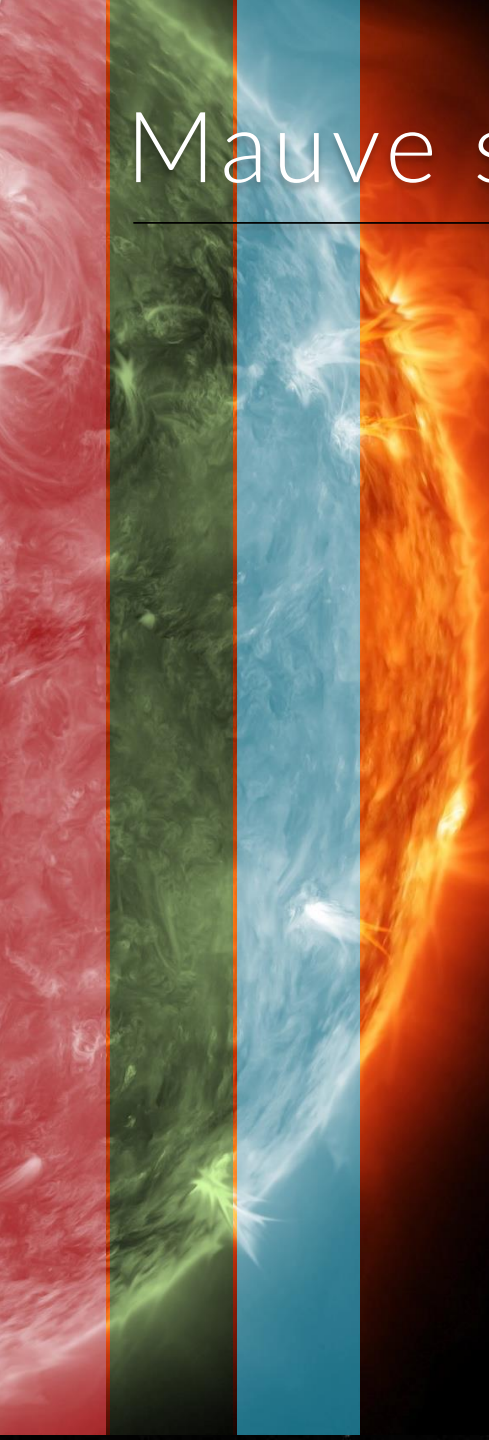
Mauve development

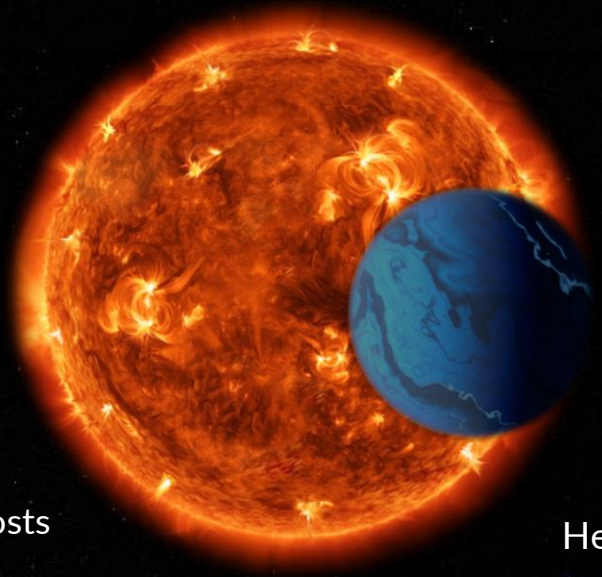


Mauve science cases

MAUVE

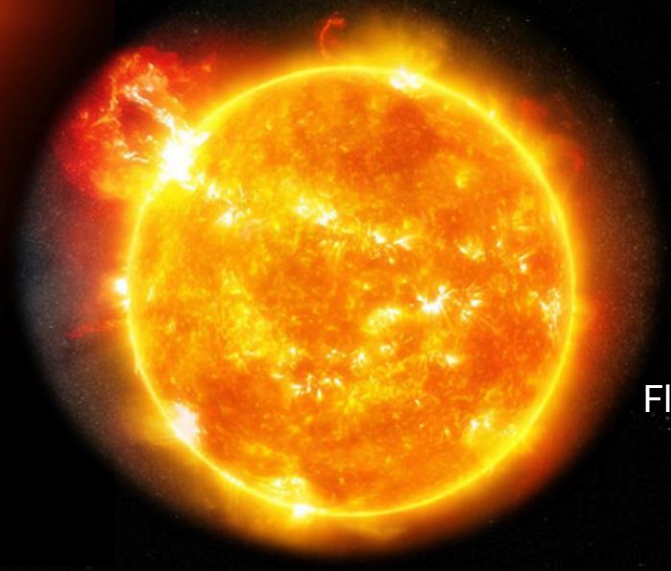
Spectral Characterisation &
Classification of Stars





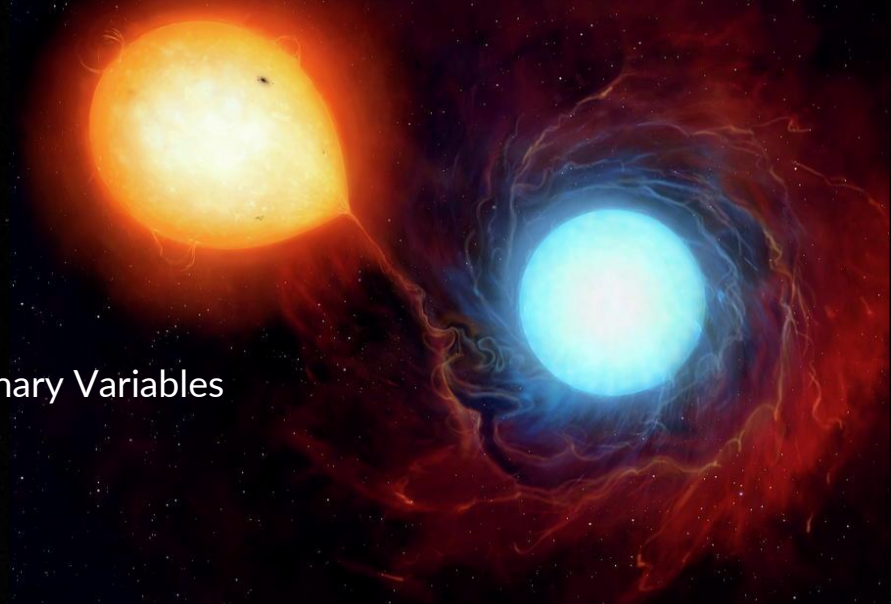
Exoplanet Hosts

Herbig Ae/Be Stars



Flaring Activity

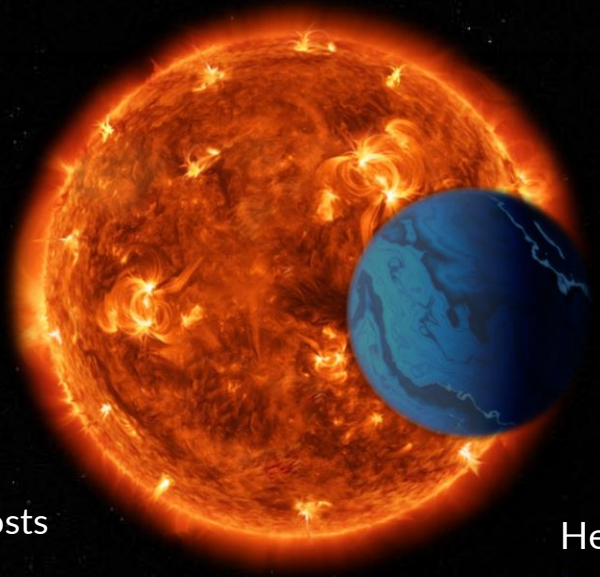
Contact Binary Variables



Mauve science cases

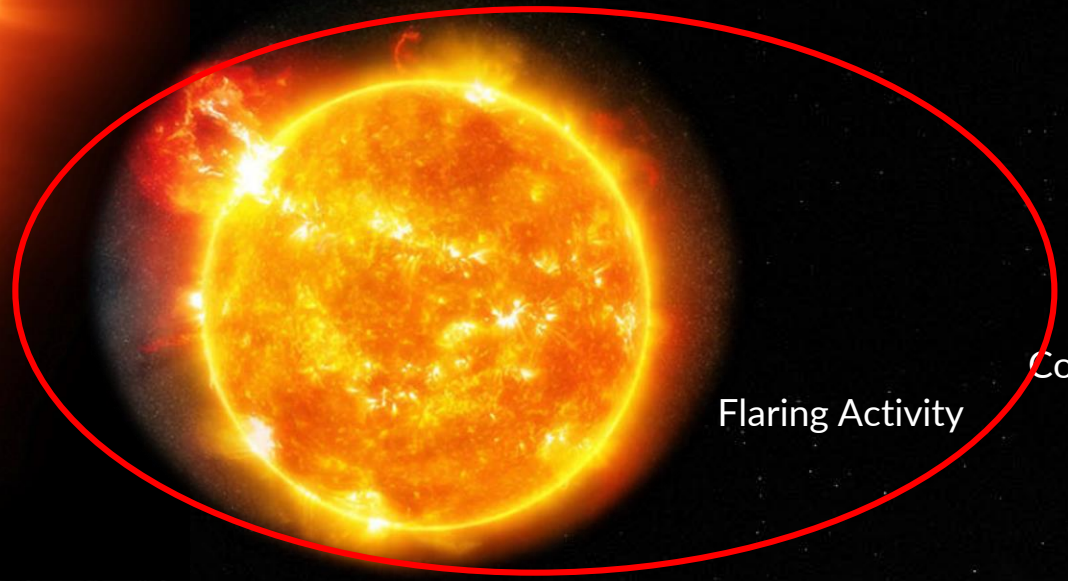
MAUVE

Spectral Characterisation &
Classification of Stars

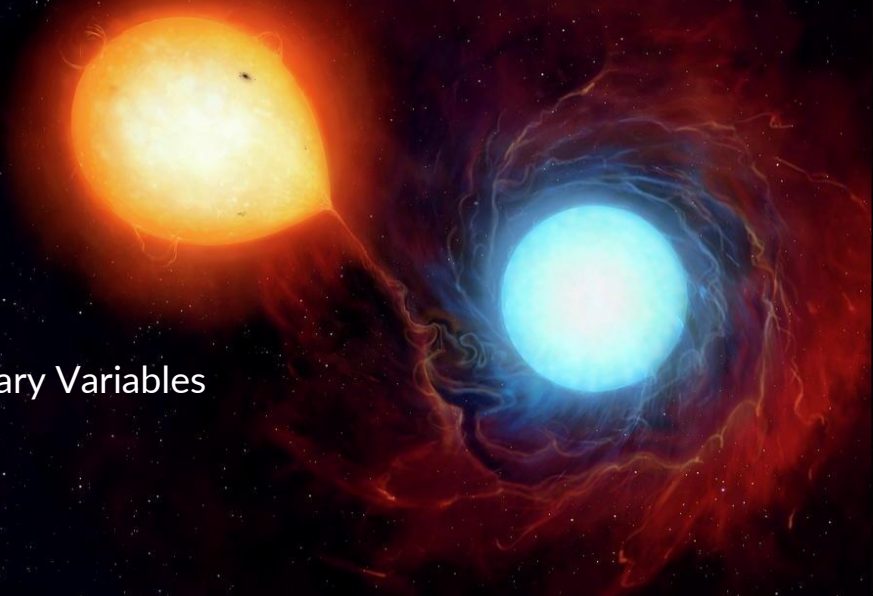


Exoplanet Hosts

Herbig Ae/Be Stars



Flaring Activity

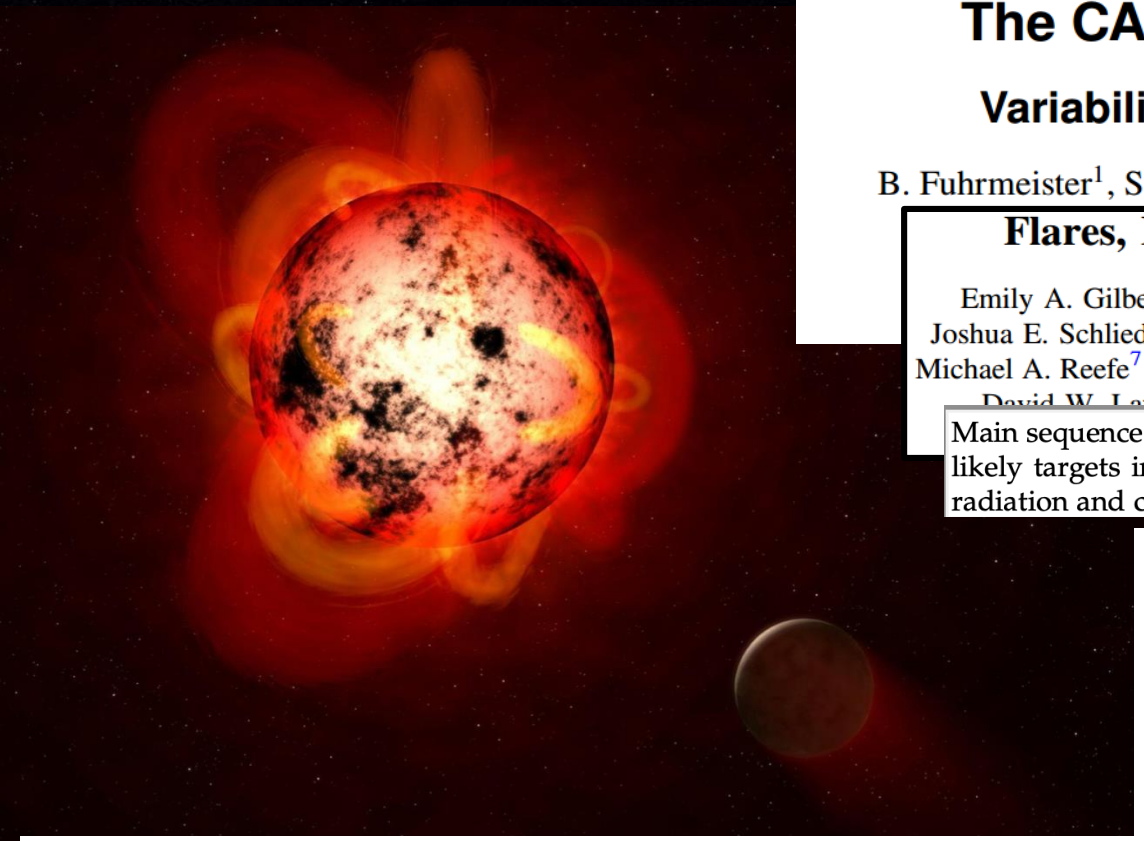


Contact Binary Variables

Mauve science case I: flaring cool dwarfs

MAUVE

Characterise K/M-dwarfs and their flaring activity



The CARMENES search for exoplanets around M dwarfs

Variability on long timescales as seen in chromospheric indicators

B. Fuhrmeister[1], S. Czesla[2,1], V. Perdelwitz[3,1], E. Nagel[1], J. H. M. M. Schmitt[1], S. V. Jeffers[4], J. A. Caballero[5],

Flares, Rotation, and Planets of the AU Mic System from TESS Observations

Emily A. Gilbert[1,2,3,4,5], Thomas Barclay[2,4], Elisa V. Quintana[4], Lucianne M. Walkowicz[3], Laura D. Vega[4,6], Joshua E. Schlieder[4], Teresa Monsue[4], Bryson L. Cale[7], Kevin I. Collins[7], Eric Gaidos[8], Mohammed El Mufti[7], Michael A. Reefe[7], Peter Plavchan[7], Angelle Tanner[9], Robert A. Wittenmyer[10], Justin M. Wittrock[7], Jon M. Jenkins[11], David W. Latham[12], George R. Ricker[13], Mark E. Rose[11], S. Seager[13,14,15], Roland K. Vanderspek[13], and

Main sequence M stars pose an interesting problem for astrobiology: their abundance in our galaxy makes them likely targets in the hunt for habitable planets, but their strong chromospheric activity produces high-energy radiation and charged particles that may be detrimental to life. We studied the impact of the 1985 April 12 flare

The Effect of a Strong Stellar Flare on the Atmospheric Chemistry of an Earth-like Planet Orbiting an M Dwarf

Antígona Segura,[1,*] Lucianne M. Walkowicz,[2,*] Victoria Meadows,[3,*] James Kasting,[4,*] and Suzanne Hawley[3]

INFLUENCE OF STELLAR FLARES ON THE CHEMICAL COMPOSITION OF EXOPLANETS AND SPECTRA

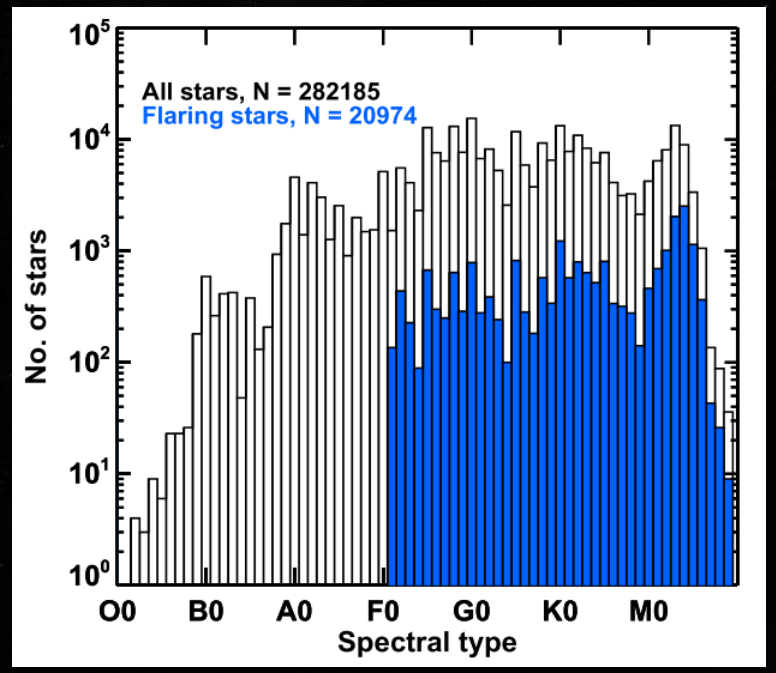
Olivia Venot[1], Marco Rocchetto[2], Shaun Carl[3], Aysha Roshni Hashim[3], and Leen Decin[1]
[1] Instituut voor Sterrenkunde, Katholieke Universiteit Leuven, Celestijnenlaan 200D, B-3001 Leuven, Belgium; olivia.venot@kuleuven.be
[2] University College London, Department of Physics and Astronomy, Gower Street, London WC1E 6BT, UK
[3] Department of Quantum Chemistry and Physical Chemistry, Katholieke Universiteit Leuven, Celestijnenlaan 200F, B-3001 Leuven, Belgium
Received 2015 November 17; revised 2016 June 14; accepted 2016 July 26; published 2016 October 14

Localizing flares to understand stellar magnetic fields and space weather in exo-systems

Ekaterina Ilin[1,2] | Katja Poppenhäger[1,2] | Julián D. Alvarado-Gómez[1]

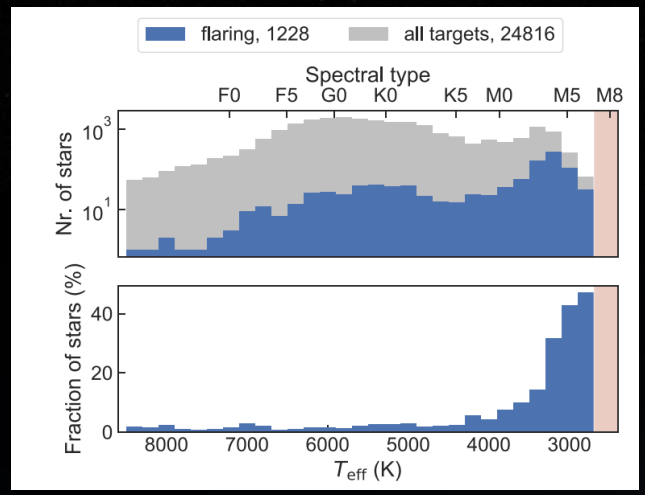
Mauve key science case II: flaring stars

Characterise stars and their flaring activity



Pietras et al. 2022

(First 39 sectors of TESS observations – 2 min cadence)



Günther et al. 2020

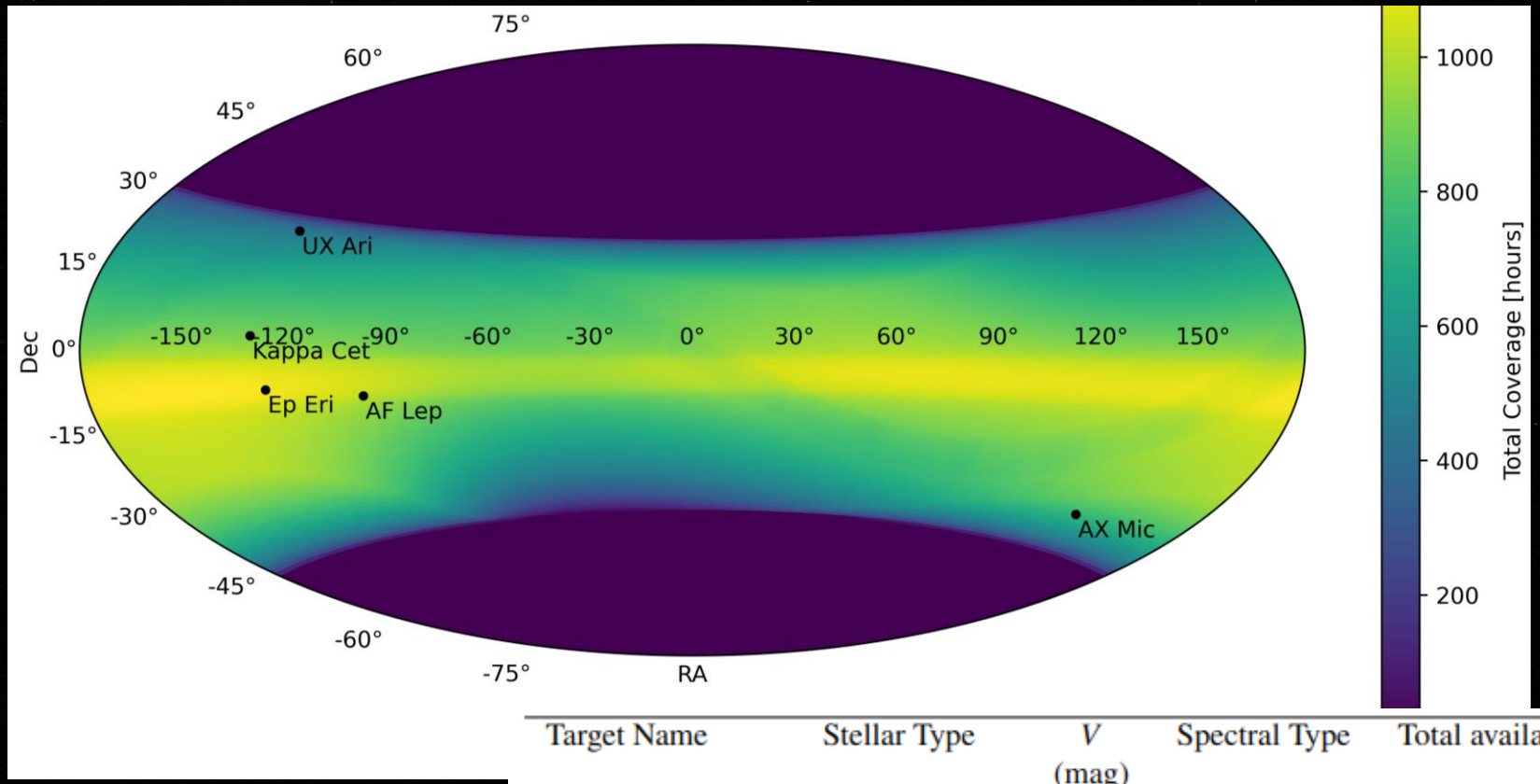
(First two months of the TESS mission – 2 min cadence)

Credit: Wikipedia Commons

Continuous monitoring of flaring stars

MAUVE

* Some stars in Mauve FoR have ~ 150 hours continuous coverage



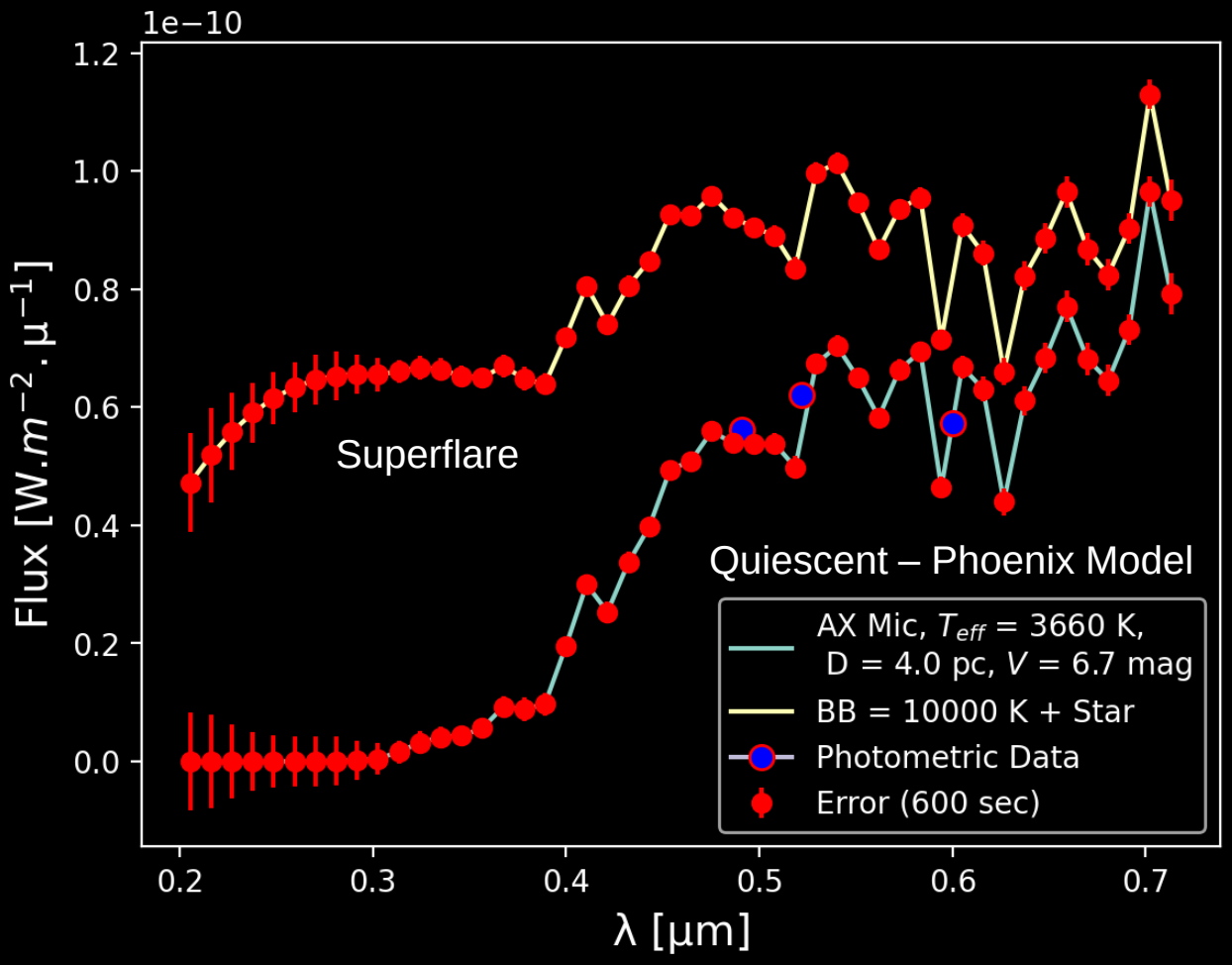
Target Name	Stellar Type	V (mag)	Spectral Type	Total available yearly coverage (hours)	Maximum continuous coverage (hours)
AF Lep	RS CVn Variable	6.3	F8V	1025	154
Kappa Cet	BY Dra Variable	4.8	G5V	903	1.1
UX Ari	RS CVn Variable	6.4	G5 V + K0 IV	960	1.2
Epsilon Eridani	BY Dra Variable	3.7	K2V	1026	148
AX Mic	Eruptive Variable	6.7	M1V	745	0.88

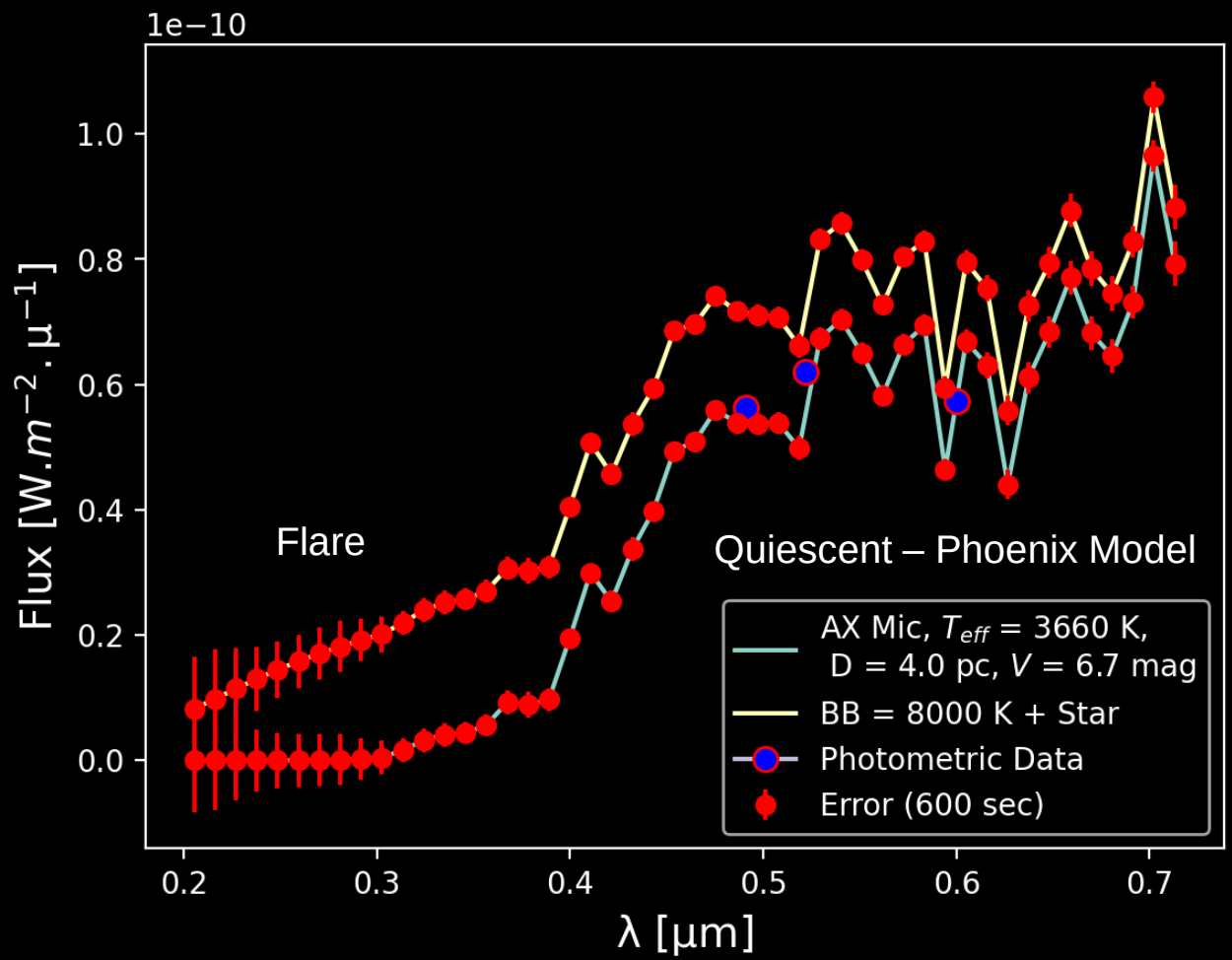
Example of Flaring Cool Dwarf

MAUVE

AX Mic Flares – MI V , V = 6.7 mag

Preliminary Results





Examples of RS CVn Variable (Contact Binaries)

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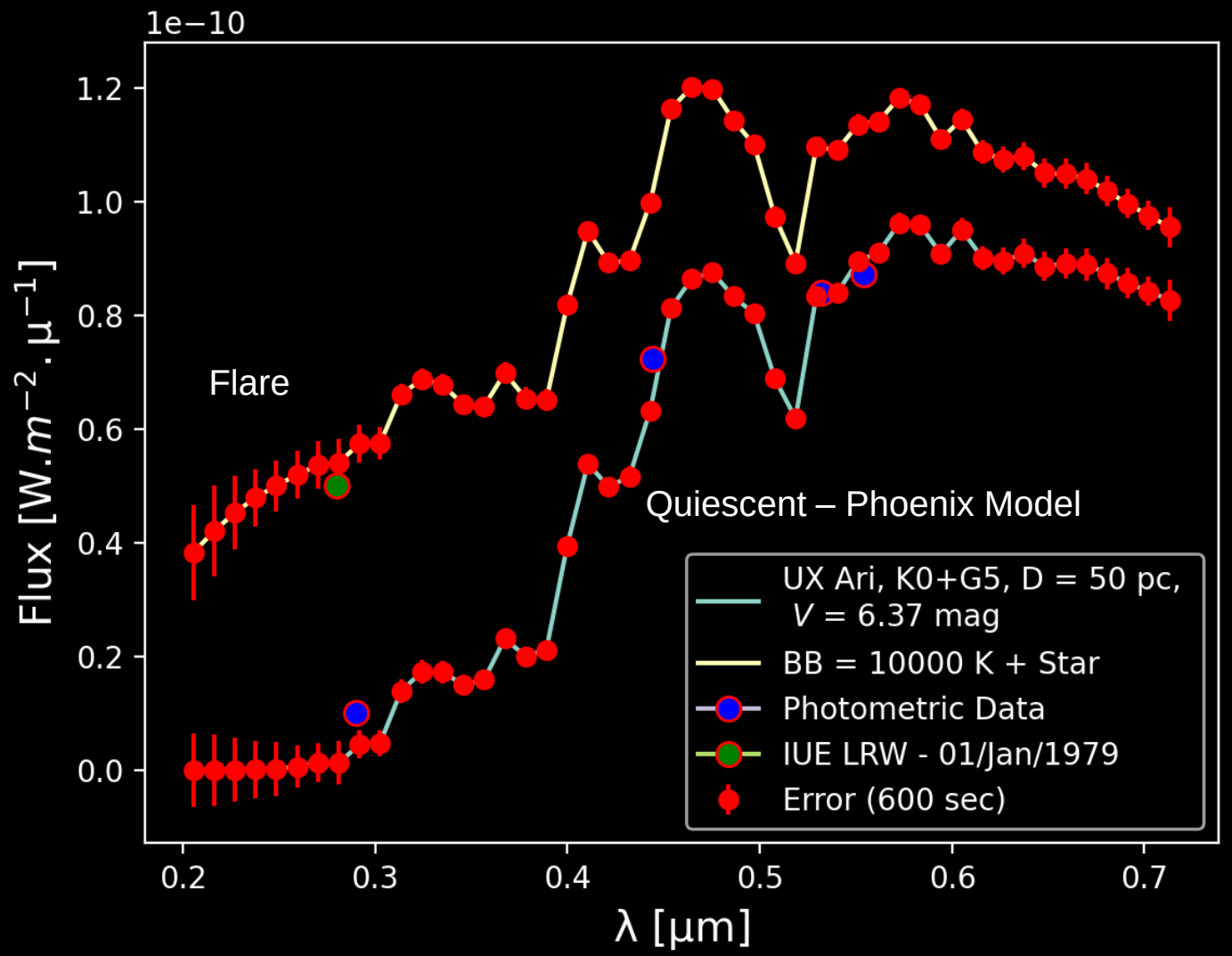
UX Ari Large Flare 01/Jan/1979 – G5 V+K0 IV , *V* = 6.37 mag



Preliminary Results

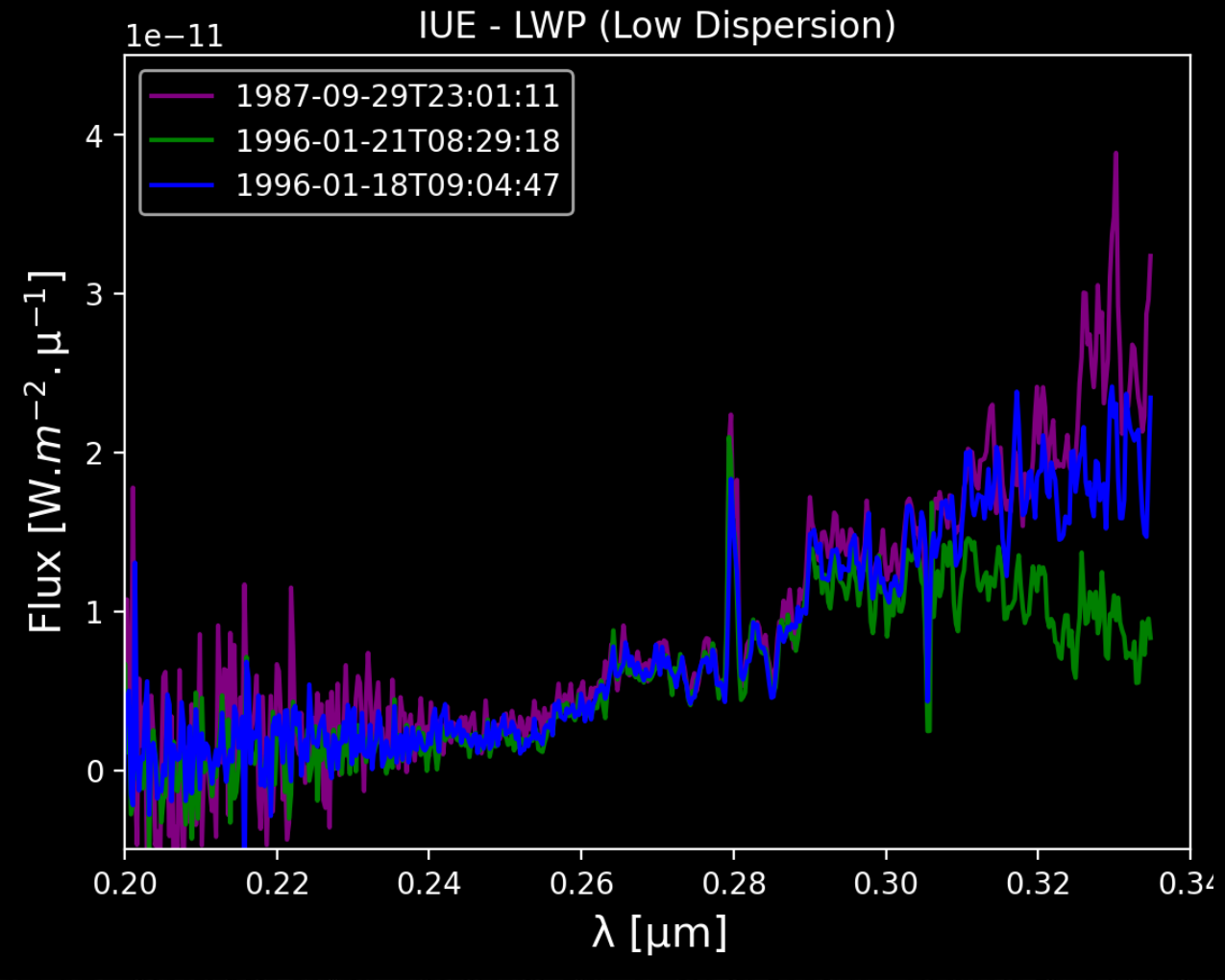
Mauve can monitor flares at different frequencies, with cadence of 30 s

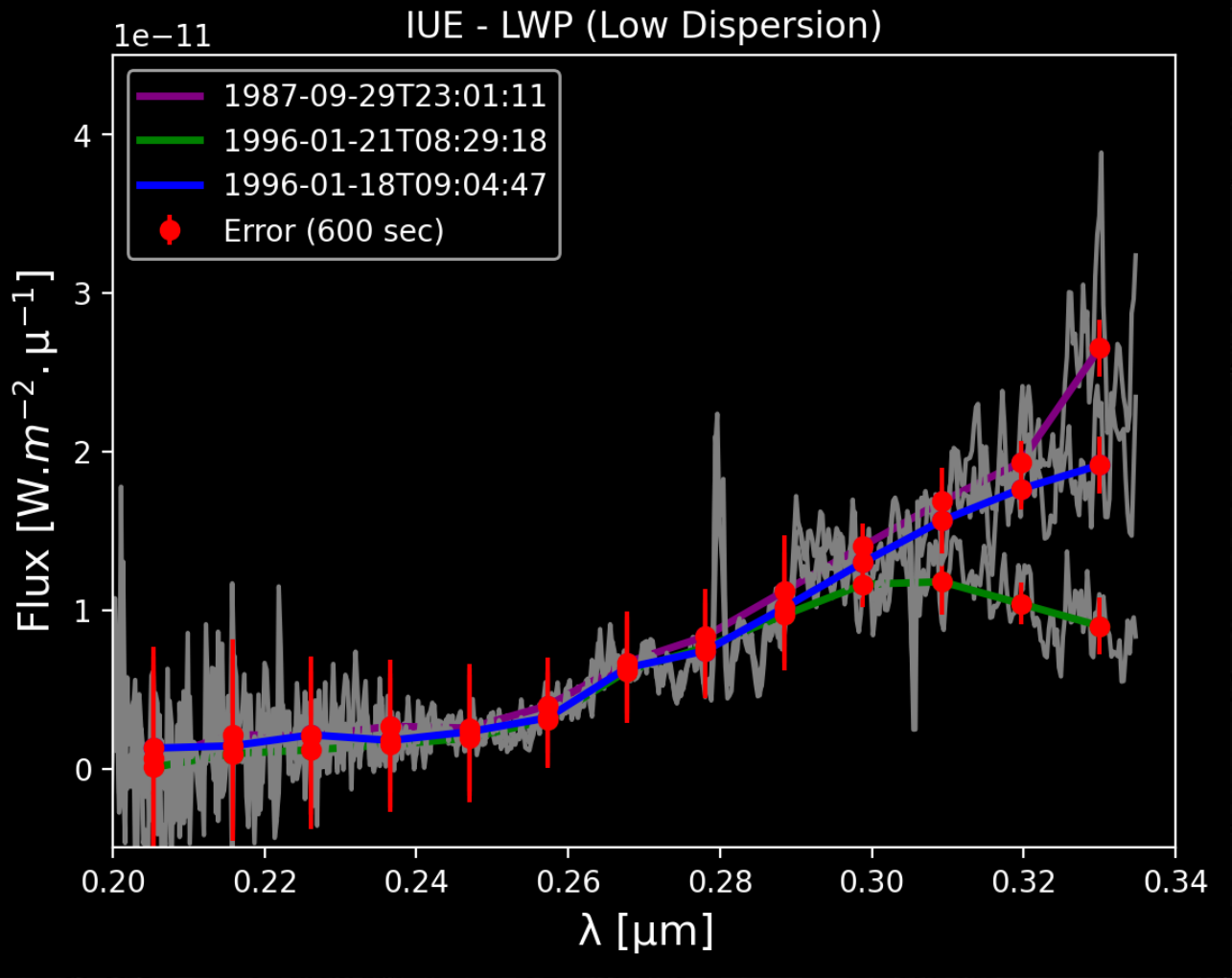
* The alert was received a day before from the Algonquin Radio Observatory.

Examples of RS CVn Variable (Contact Binaries)

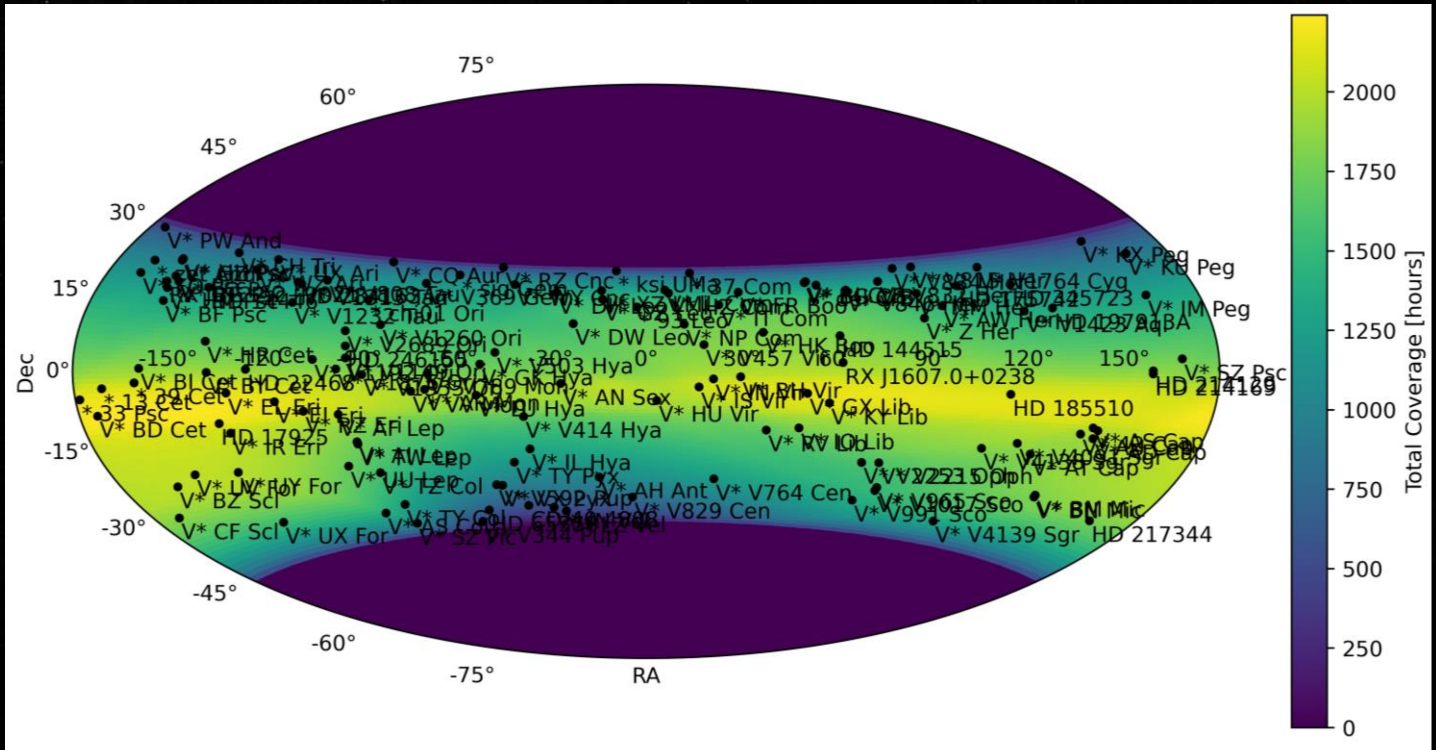
UX Ari Variability in Different Epochs – G5 V+K0 IV , V = 6.37 mag

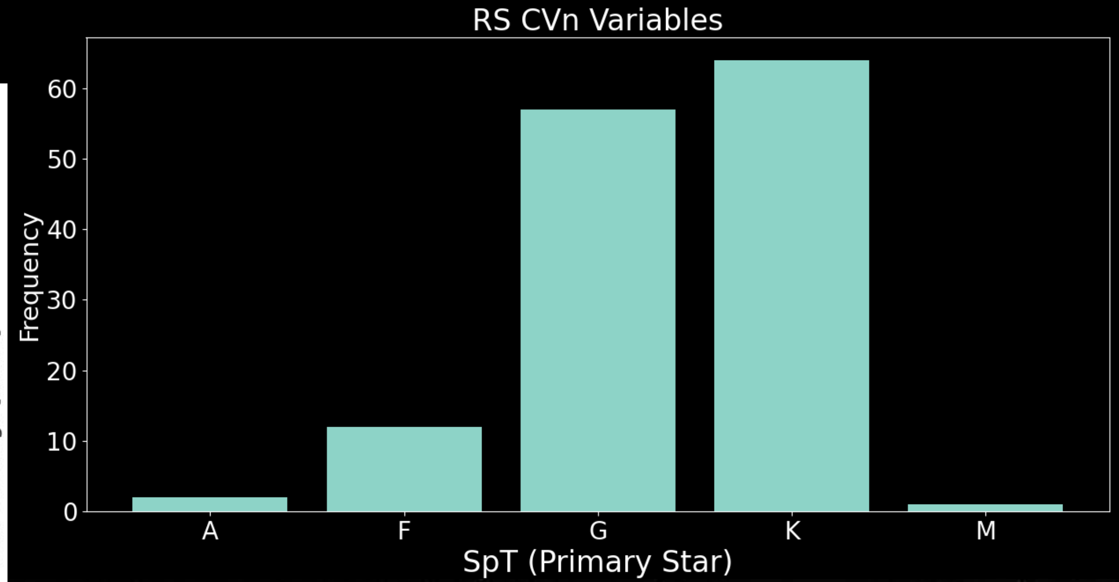
Preliminary Results

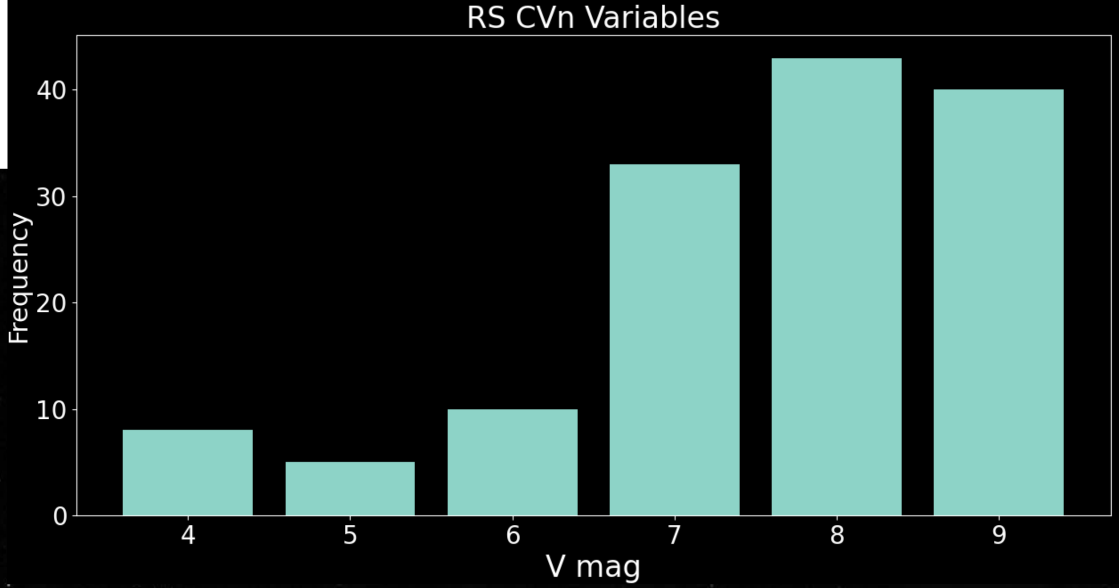




RS CVn Variables (Statistics)



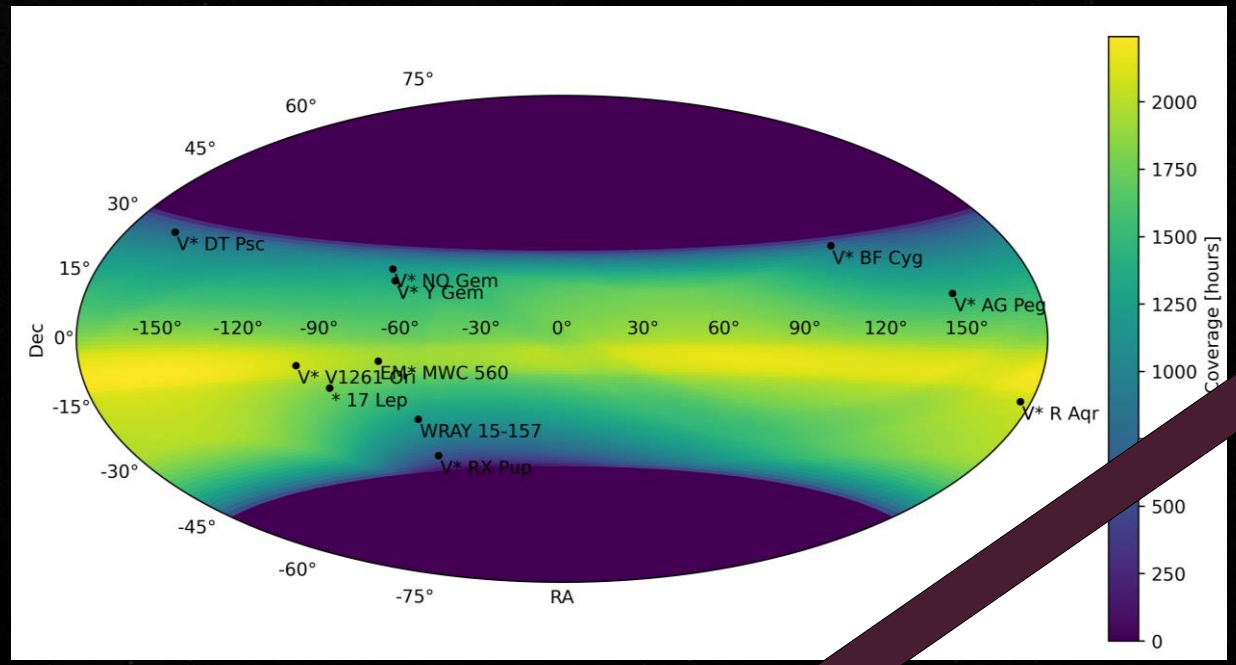


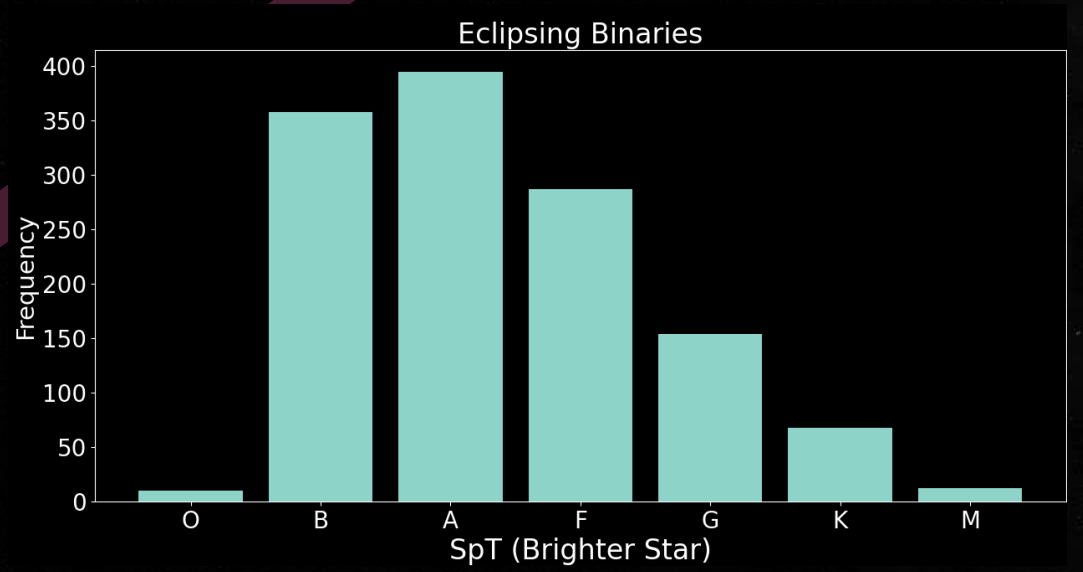


Grand total of 140 **Targets**

(Simbad database)

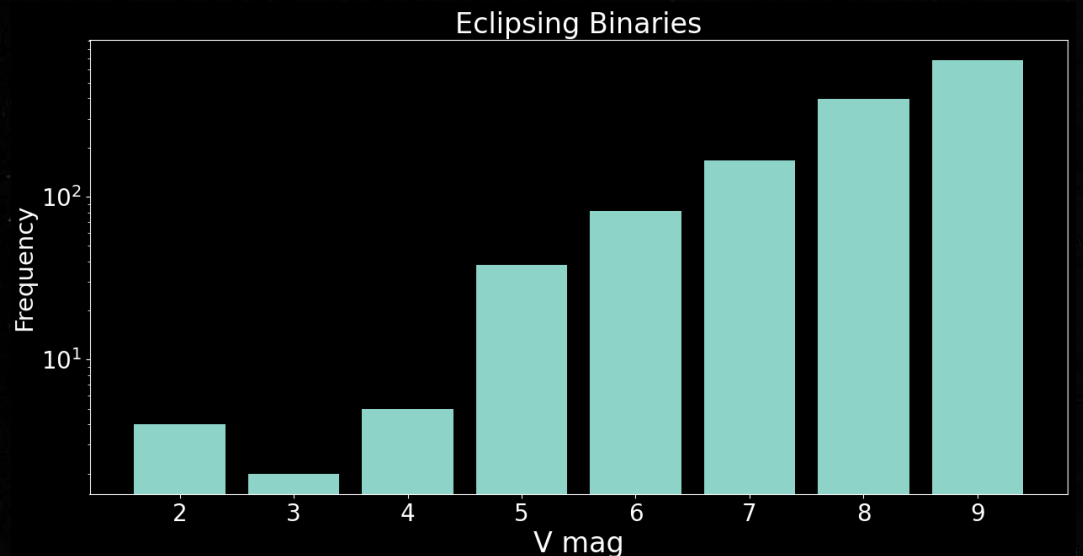
Symbiotic Stars [WD/NS + Red Giant] (Statistics)





Grand total of **11 Targets**
(Simbad database)

Grand total of **1380 Targets**
(Simbad database)



Eclipsing Binaries (Statistics)

Example of Bright Source (Exoplanet Host)

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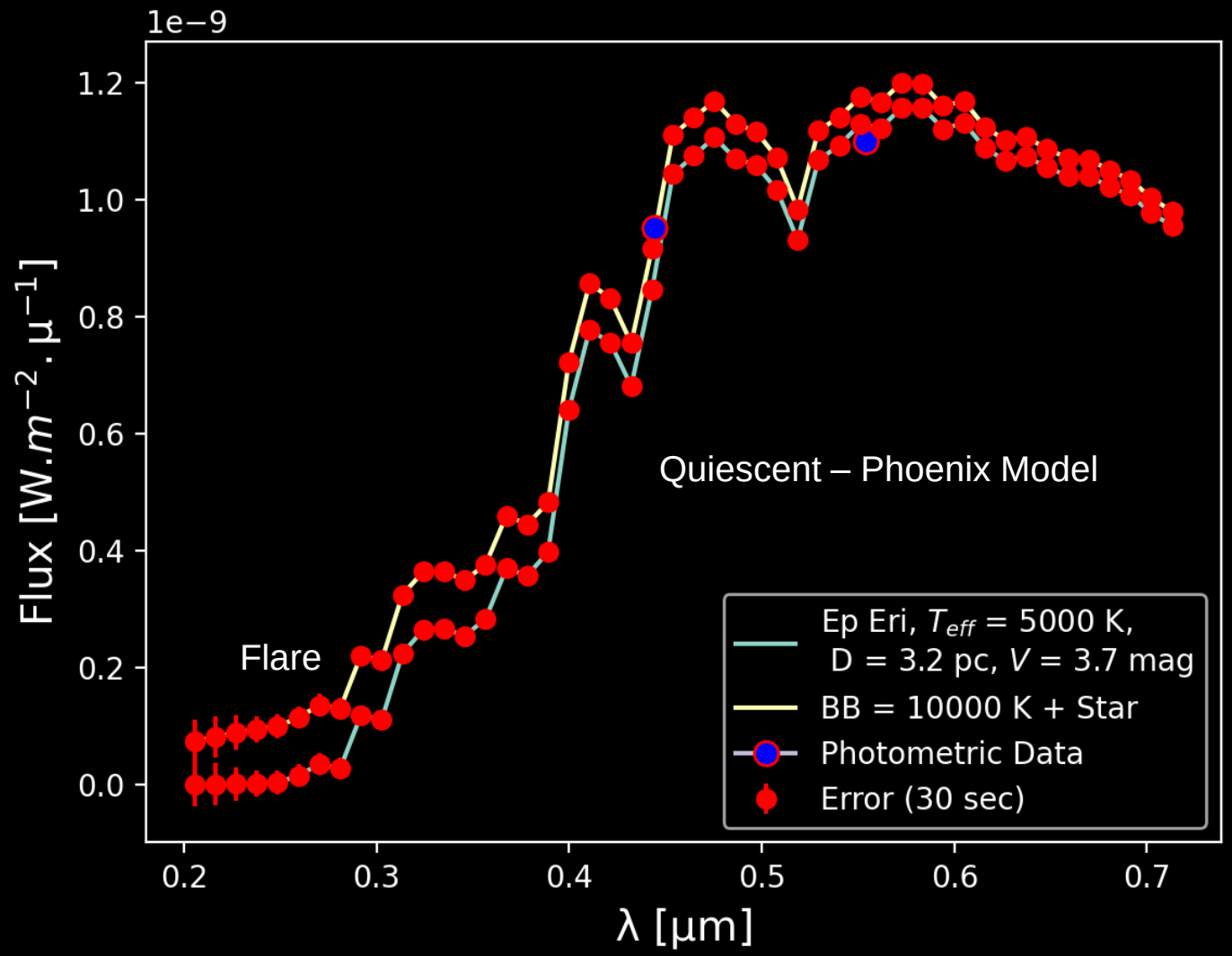
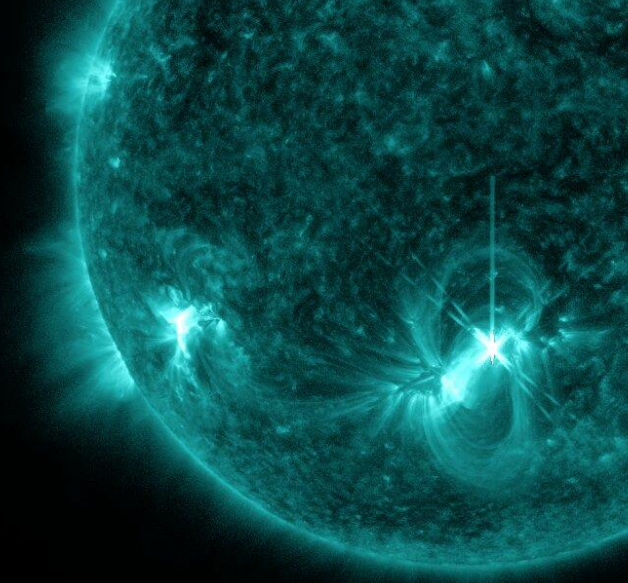
Epsilon Eridani Flare Simulation - K2V , V = 3.7 mag



Preliminary Results

Mauve can monitor flares at different frequencies, with cadence of 30 s

What makes Mauve different?



- White-light photometric facilities (TESS, Kepler, K2, etc.)
  - Fainter targets
  - High precision flux in a single passband

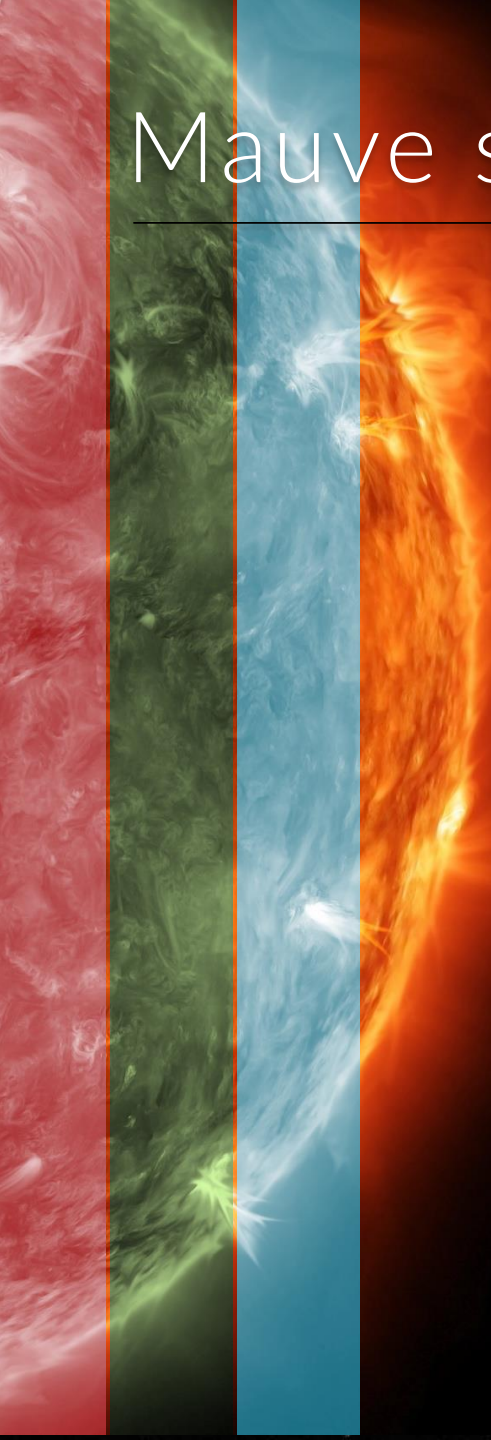
MAUVE

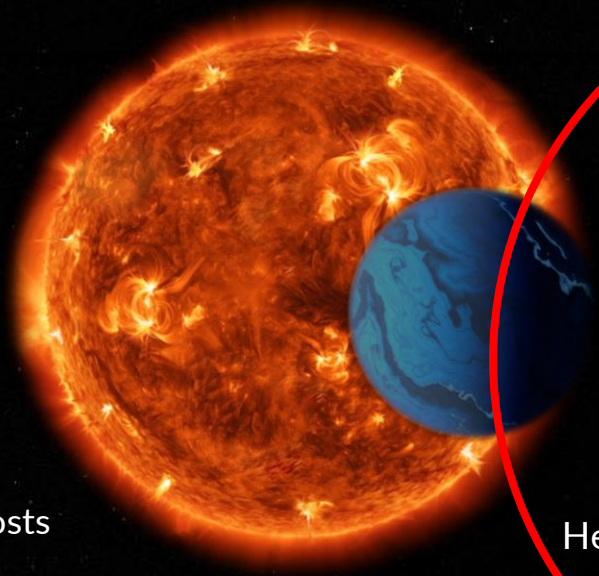
- Shorter cadences are proven to be more suitable for sampling flares (20 sec cadence TESS data)
- Bright targets (IUE/GALEX)
- Wide wavelength range coverage (NUV+Vis), which makes all the difference! (Best example, AD Leo)
- Repeat/Continuous observations of targets (hundreds of hours available)

Mauve science cases

MAUVE

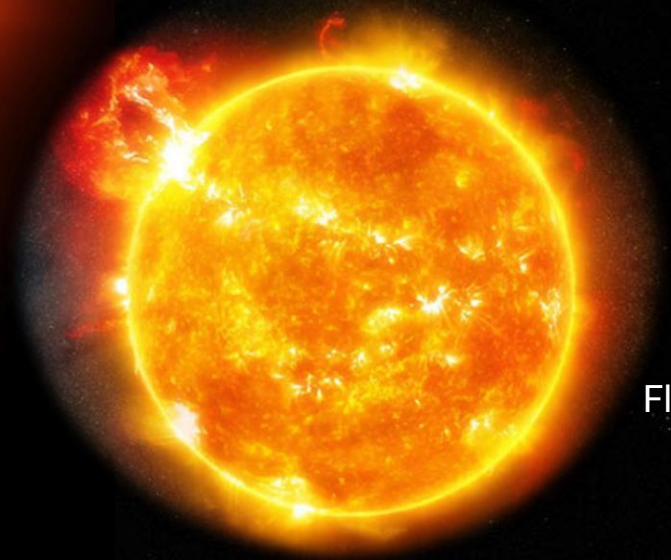
Spectral Characterisation &
Classification of Stars



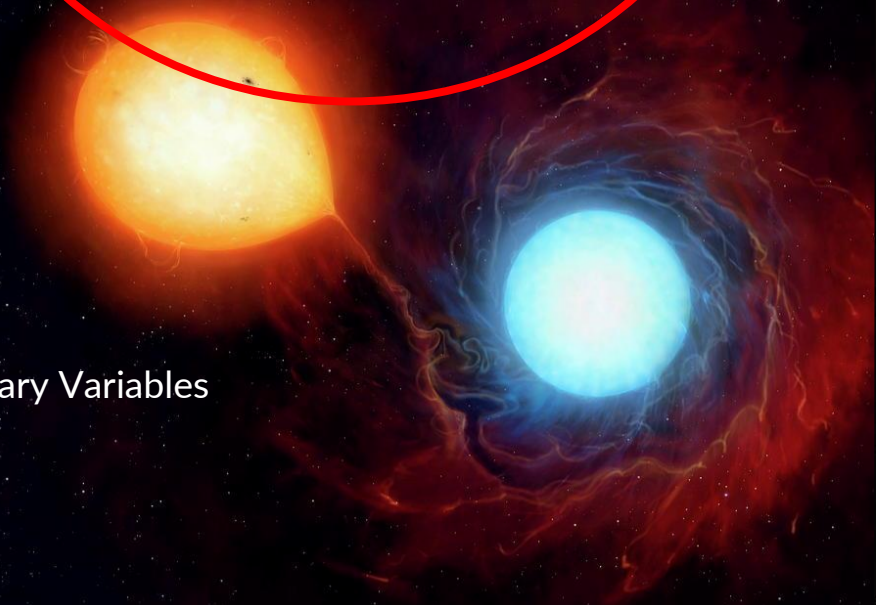


Exoplanet Hosts

Herbig Ae/Be Stars



Flaring Activity

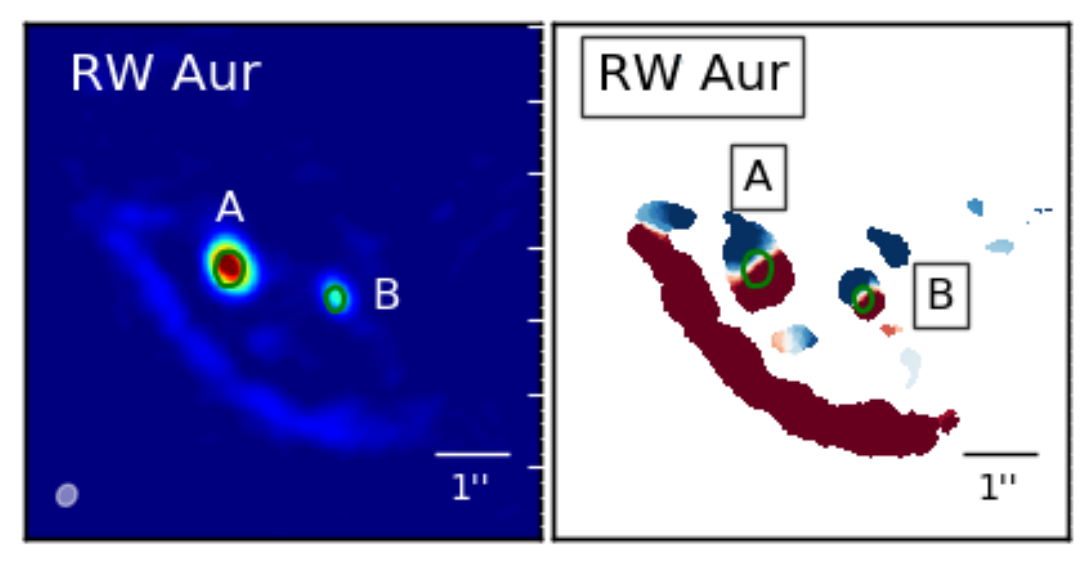


Contact Binary Variables

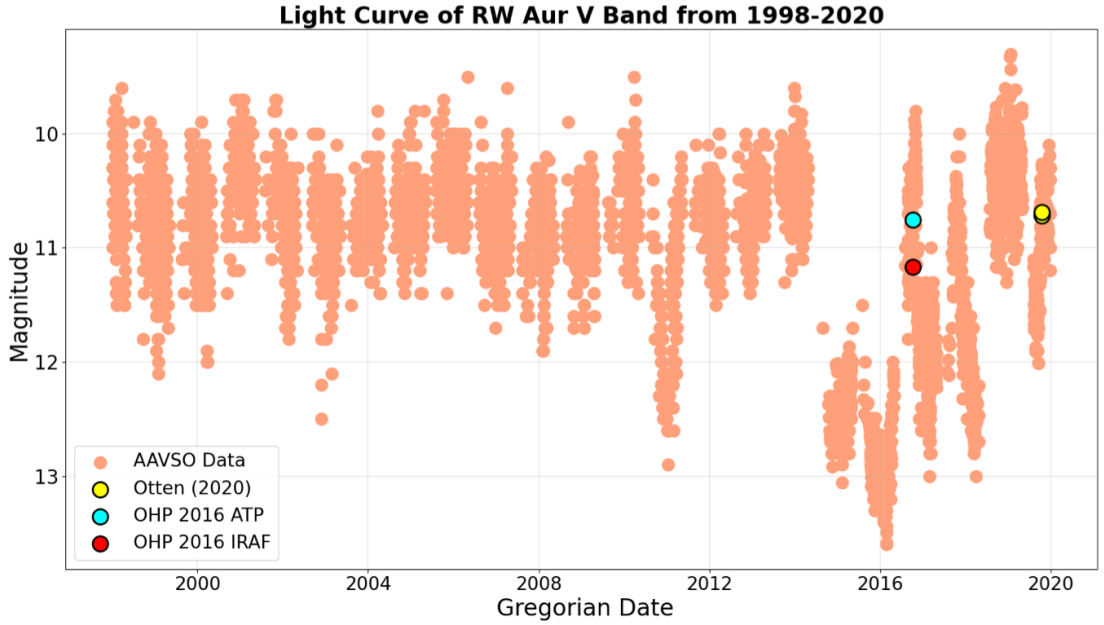
Mauve science case III: Motivation / CTTS

RW Aur A: SpeX Spectral Evidence for Differentiated Planetesimal Formation, Migration, and Destruction in an ∼3 Myr Old Excited CTTS System

C. M. Lisse[1], M. L. Sitko[2], S. J. Wolk[3], H. M. Günther[4], S. Brittain[5], J. D. Green[6], J. Steckloff[7,8], B. Johnson[9,10], C. C. Espaillat[11], M. Koutoulaki[12], S. Y. Moorman[13], and A. P. Jackson[14]



Rota et al. 2022

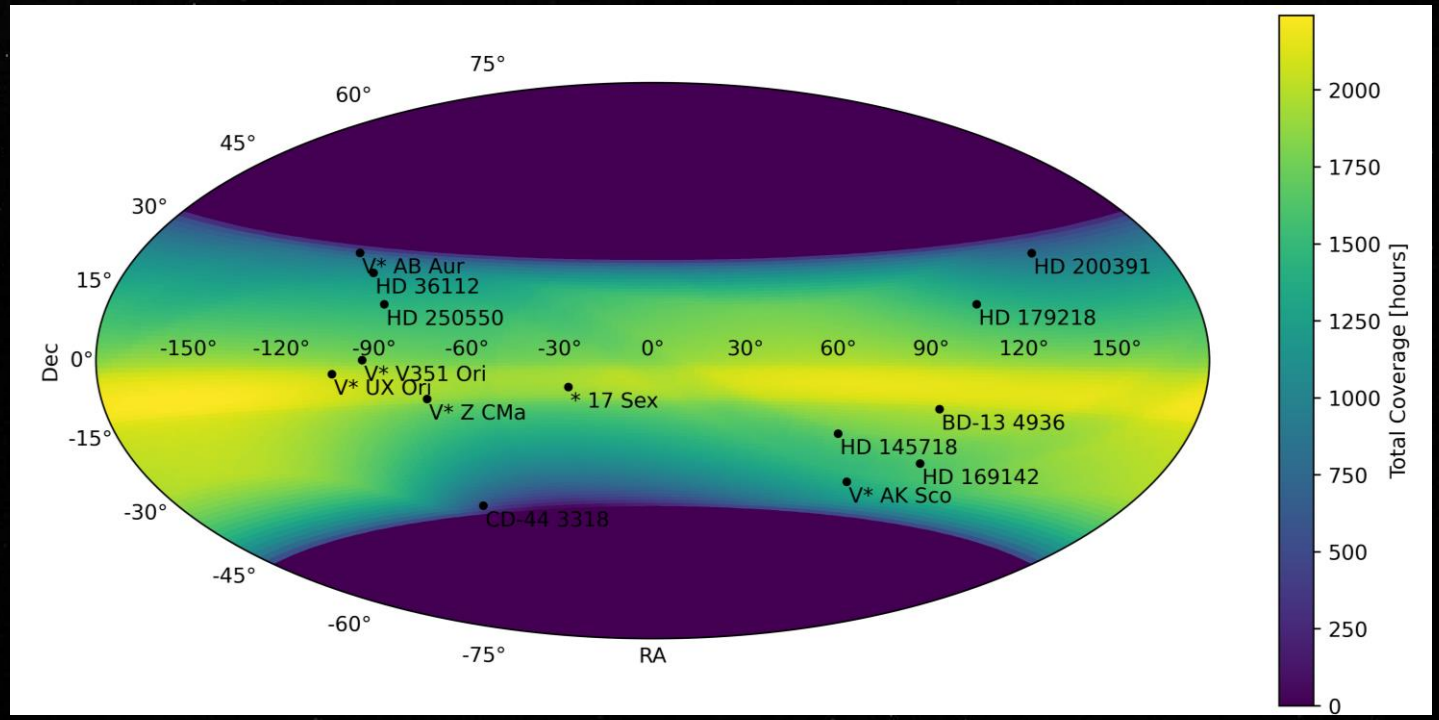


53

Figure 4.11: Light curve showing the long term variability of the magnitude of RW Aur A in the V band between 1998-2020 using OHP and AAVSO measurements.

Credits to: K. Dowd, E. Whelan

Mauve science case III: Herbig Ae/Be Stars



Grand total of **54 Targets**

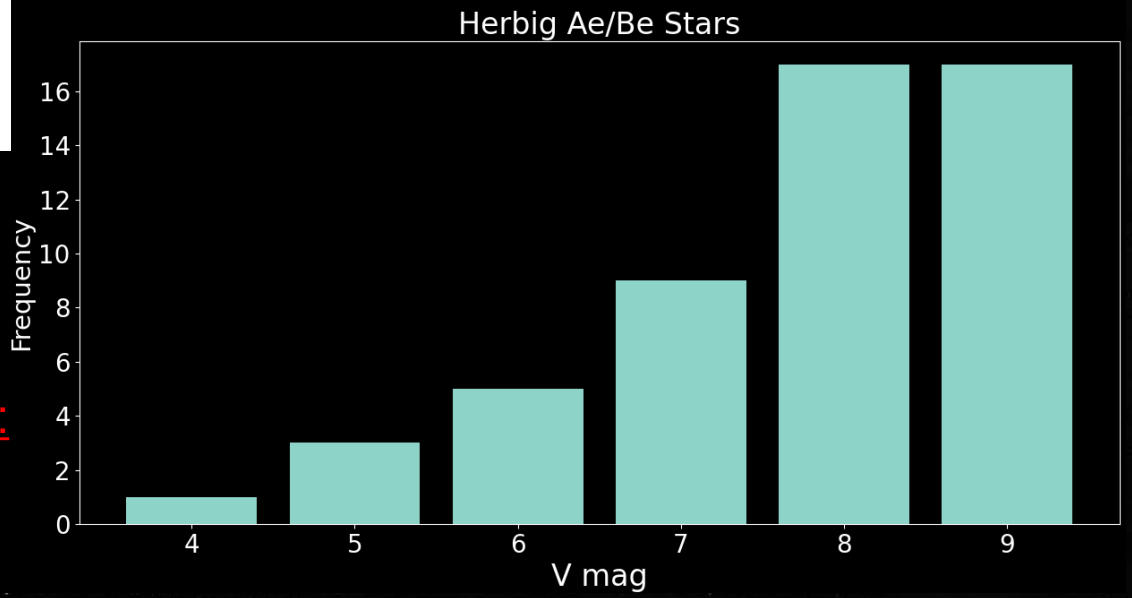
(Simbad database + Valenti et al. 2003)

34/54 with protoplanetary disks

Taurus-Auriga OB Association

Scorpius-Centaurus OB Association

Orion OB Association **



Disc Bearing Systems :

V* AB Aur	HD 31648	HD 37258	HD 50138	V* ER Vul	HD 163296	HD 142666
HD 142666	CD-38 4381	HD 37357	HD 53367	HD 144432	HD 190073	HD 35929
V* AK Sco	HD 36112	HD 250550	HD 52721	HD 169142	HD 179218	HD 35929
V* AB Aur	HD 245185	HD 259431	V* Z CMa	HD 145718	HD 142527	HD 36917

Orion sample (Protoplanetary disks):

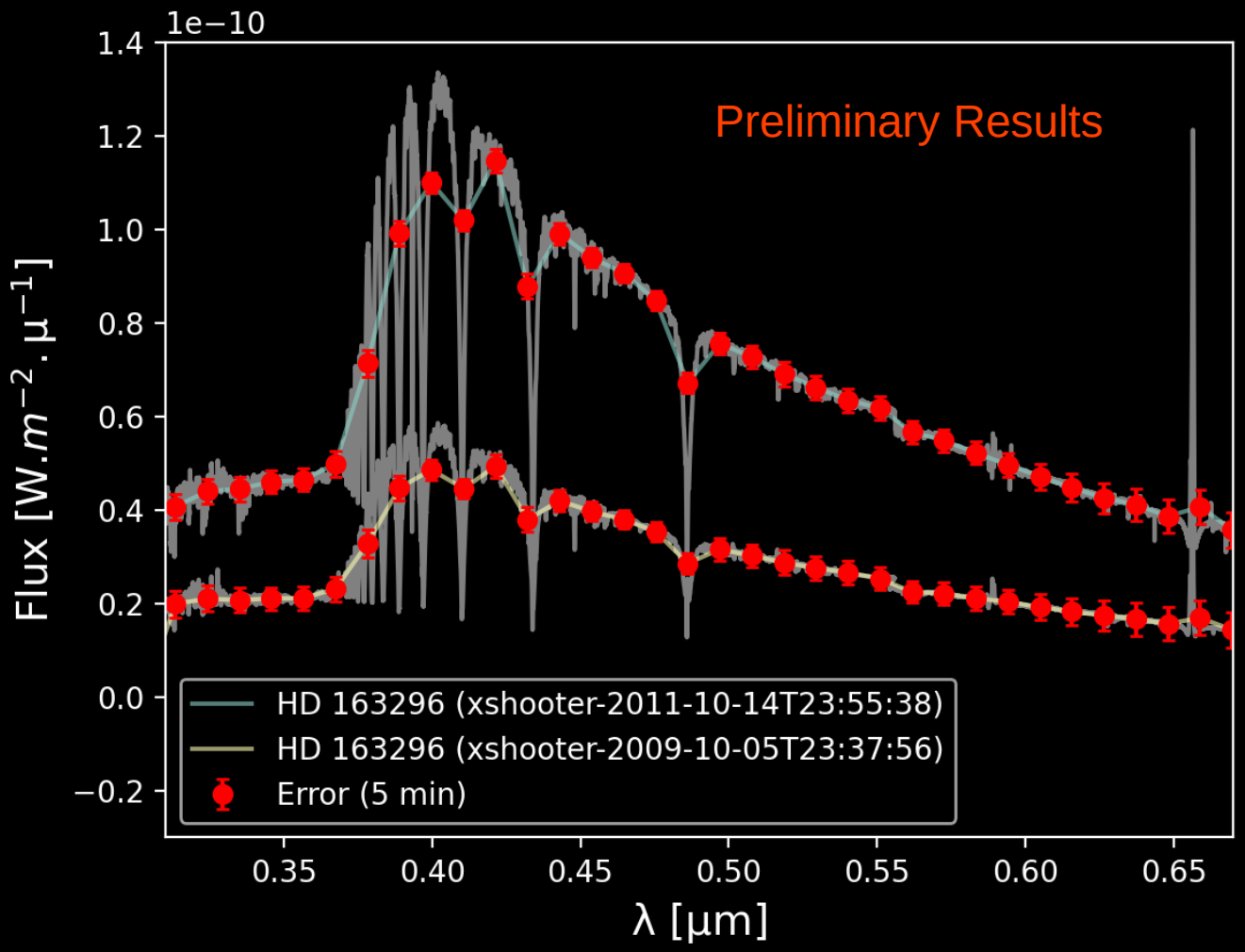
V* BF Ori
V* V351 Ori
V* UX Ori
V* V1366 Ori
* tet01 Ori A (HD 37020)
V372 Ori (HD 36917)
V* BN Ori

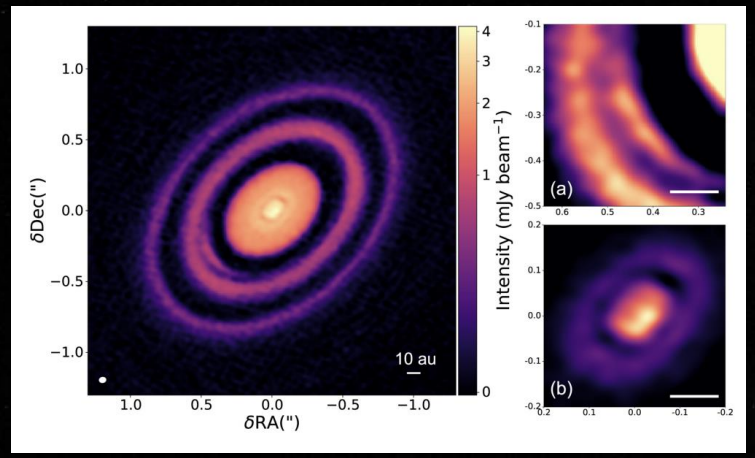
Orion sample (W/O Disk):

V* NV Ori
V359 Ori
V* V1230 Ori
LP Ori

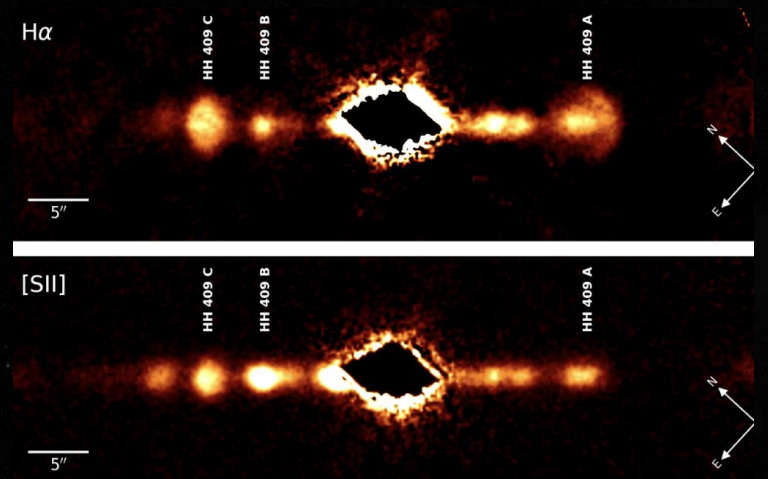
Mauve science case III: Herbig Ae/Be Stars

HD 163296 Variability in Different Epochs – A1Vep – V = 6.9 mag





Isella et al. 2018



Kirwan et al. 2022

Target List

V* AB Aur
HD 31648
V* UX Ori
V* V1366 Ori
HD 36112
HD 244524
HD 245185
V* BN Ori
* tet01 Ori A
HD 36412
HD 37258
V* BF Ori
V* V351 Ori
HD 37357
HD 250550
HD 259431
HD 50138
HD 53367
HD 52721
V* Z CMa
HD 200391
* 17 Sex
V* AK Sco
V* TY CrA
HD 144432
HD 169142
HD 145718
CD-24 13510
HD 163296
HD 313571
HD 190073
HD 179218
CD-44 3318
HD 142527
V* V856 Sco
BD-13 4936
HD 150193A
V* NV Ori
HD 142666
CD-38 4381

What makes Mauve different?

- So far no devoted campaign to monitoring Herbig Ae/Be stars
  - Bright targets
  - Random epochs

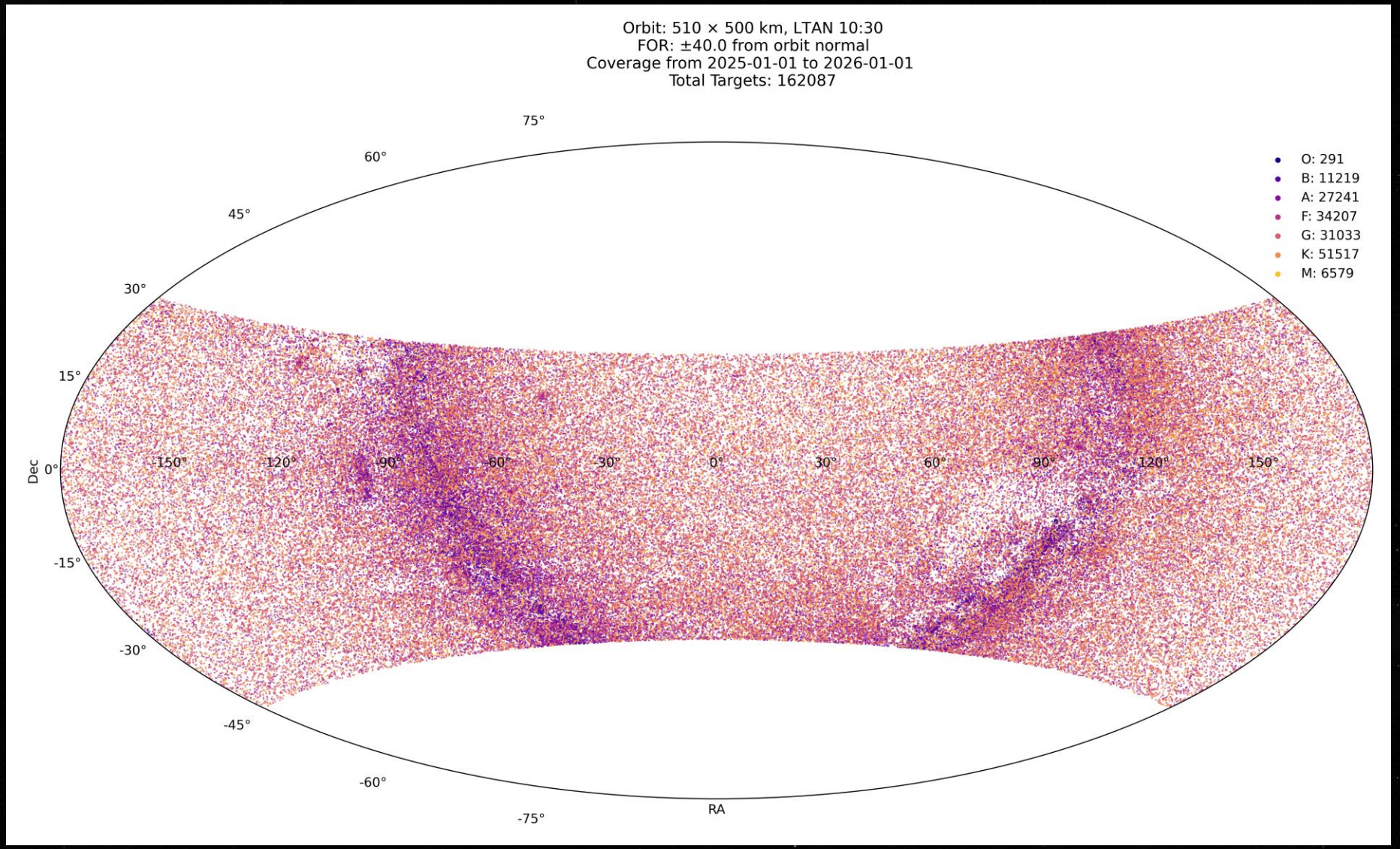
MAUVE

- Monitoring of bright stars (Herbig Ae/Be stars, 4 < Vmag < 10)
- Wide wavelength range coverage (NUV+Vis) / flux-calibrated in U & V bands (Macc & Lacc)
- Accretion variability time scale (daily/monthly/annually)

Target List

HD 35929
LP Ori
HD 36939
HD 37806
V* AE Aur
HD 35929
EW CMa (* 27 CMa)
V372 Ori (HD 36917)
HD 316285
HD 36981
* 93 Tau
V* V1230 Ori
V359 Ori
V* XY Per

Mauve Targets (~200,000 , V < 10 mag)



MAUVE

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Example of Balmer Jump in Flares