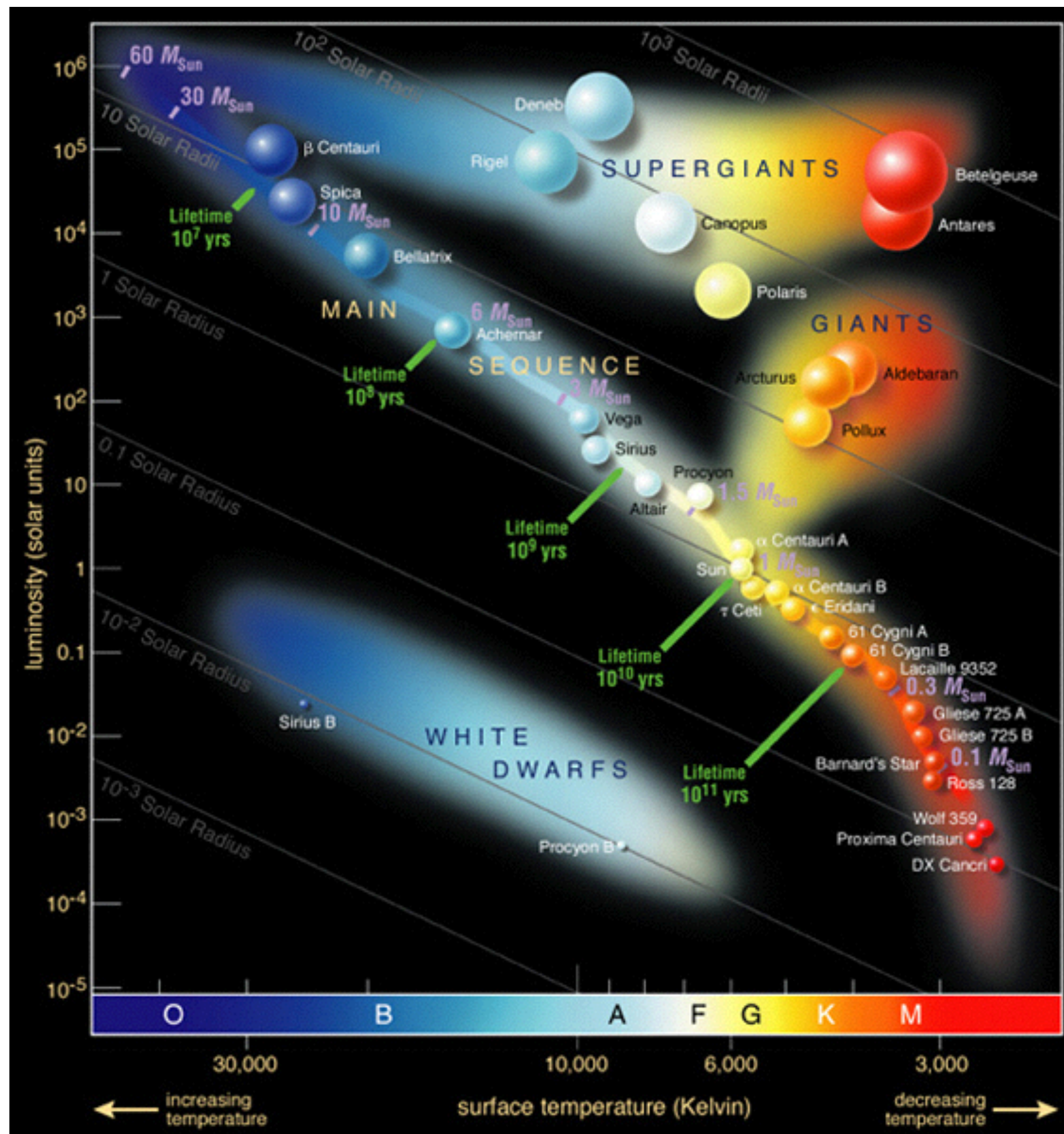


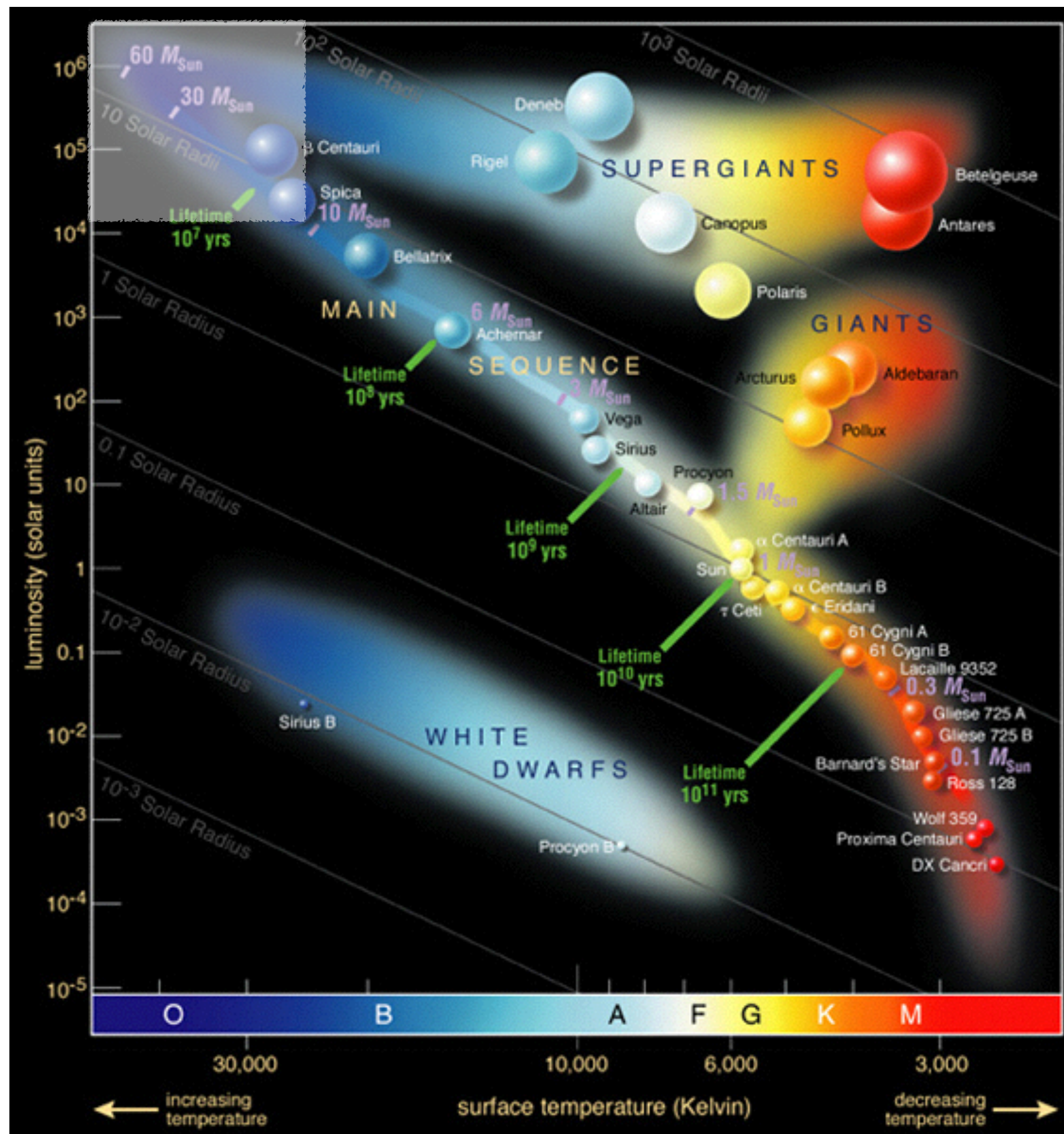
STAR workshop

Massive stars, HRT, and Gaia

Laurent Mahy





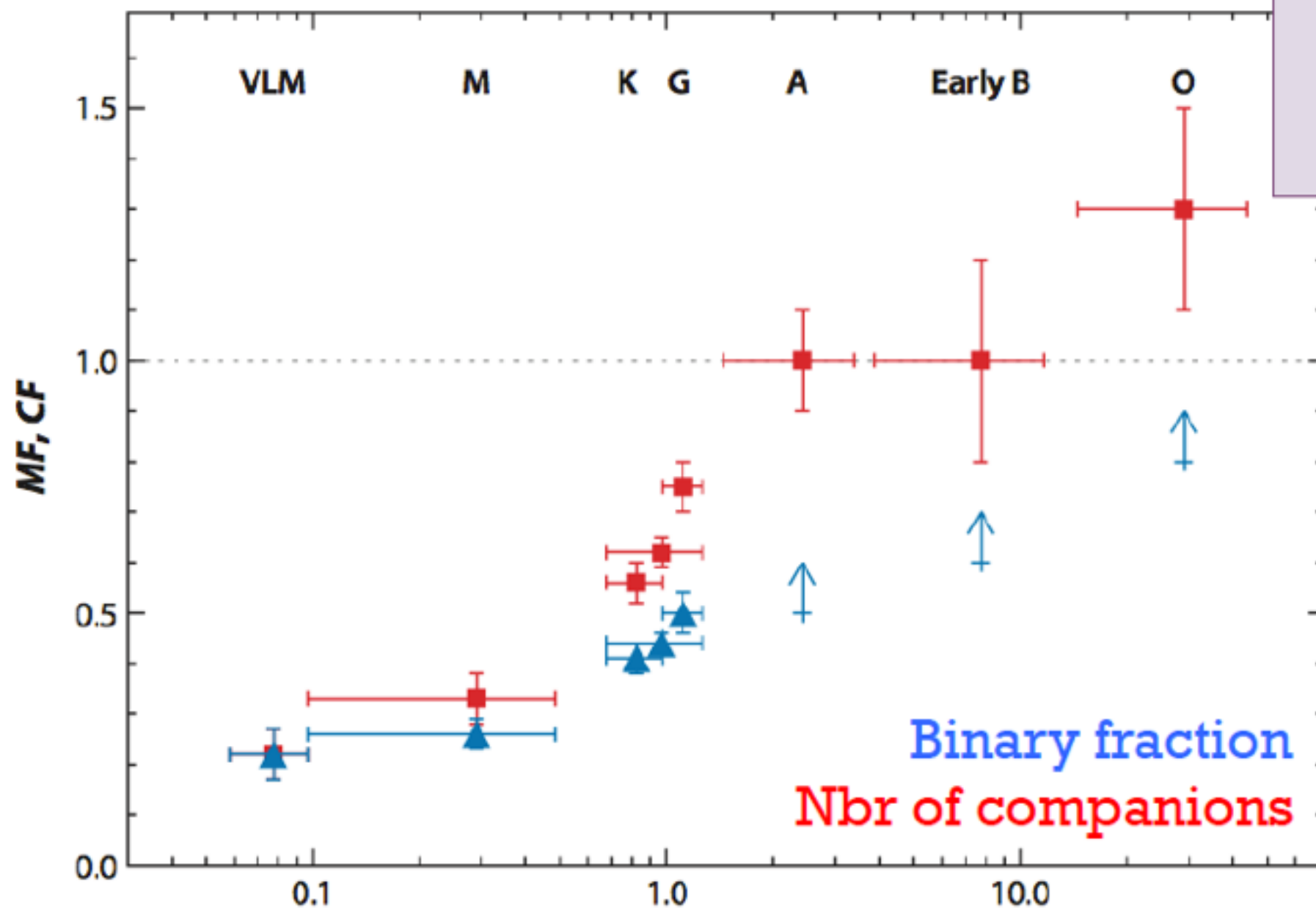


Massive stars

- $M > 8-10 M_{\odot}$
- Main source of UV radiation
with $T_{\text{eff}} > 20000\text{K}$ and $\log(L/L_{\odot}) > 4.5$
- Strong winds \longrightarrow huge influence on their environment
 $\dot{M} \sim 10^{-7}-10^{-5} M_{\odot}/\text{yr}$ and $v_{\text{inf}} \sim 1000-3000 \text{ km/s}$
- Key role in the chemical composition of the galaxies
- Age $< 10 \text{ Myrs}$ \longrightarrow Rare...

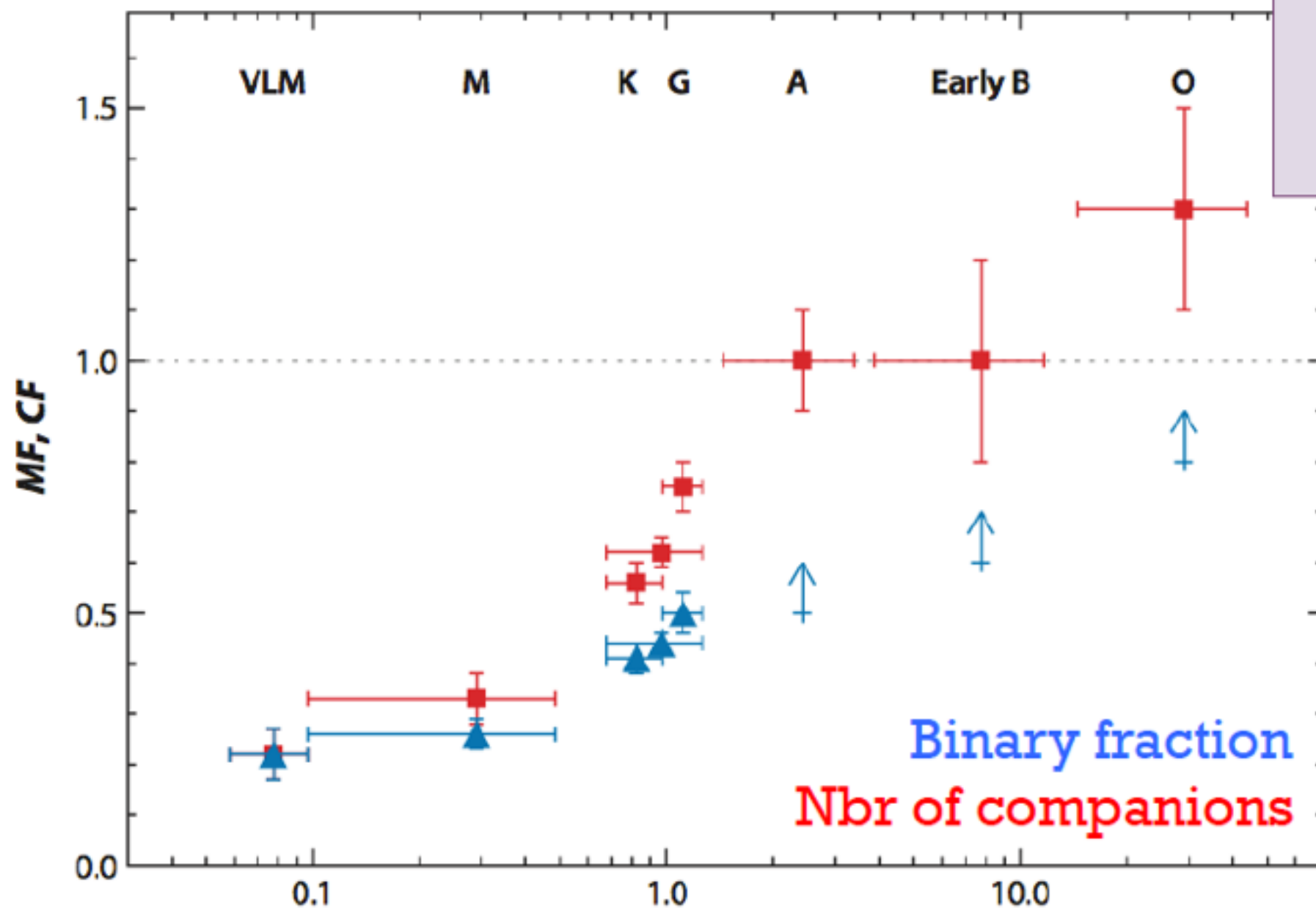
Massive stars

Most massive stars
belong to a binary
or higher multiplicity
system



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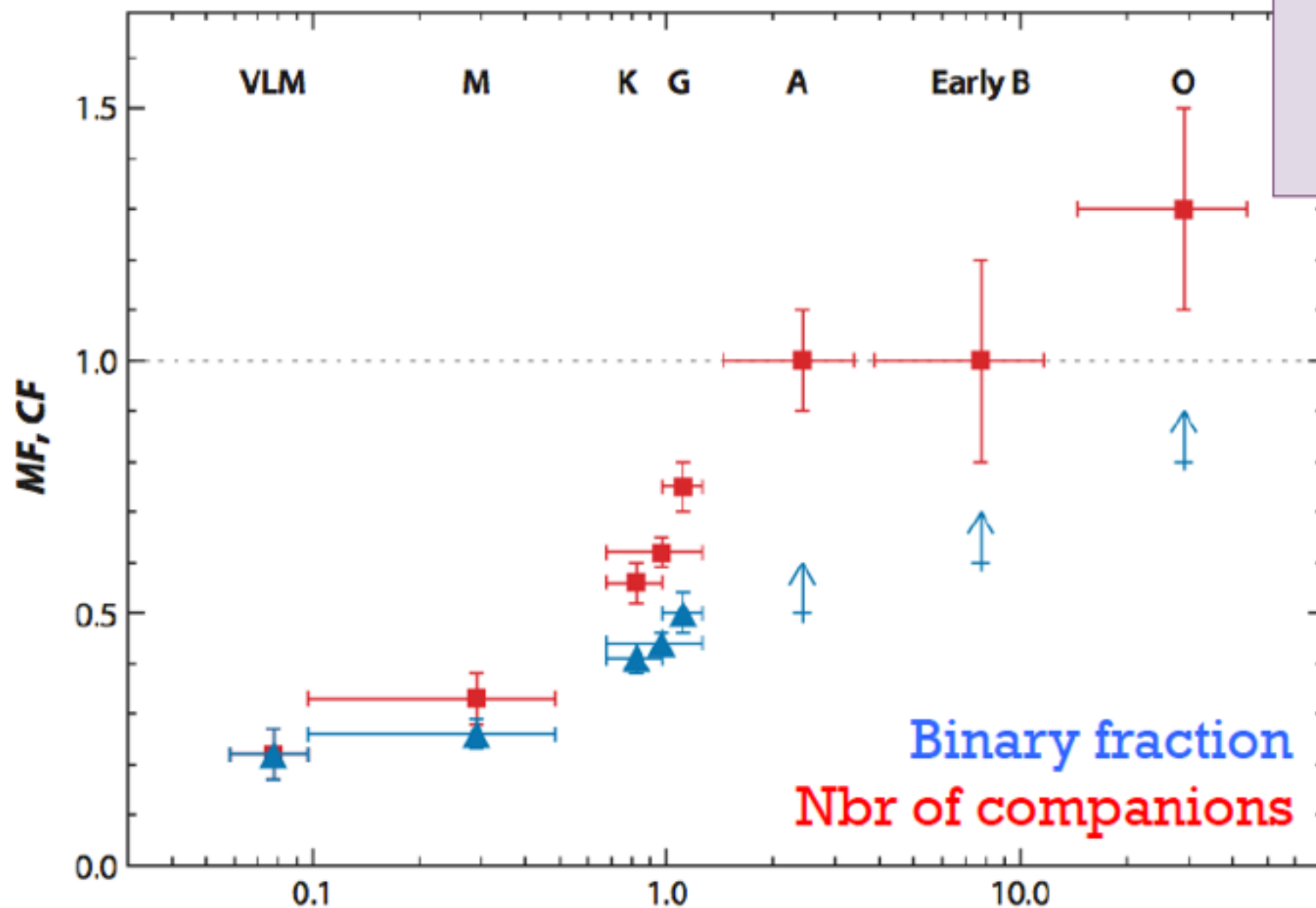


Duchene & Kraus (2013)

Massive stars

Most massive stars
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or higher multiplicity
system

A unique chance of
determining the
masses of the
stars

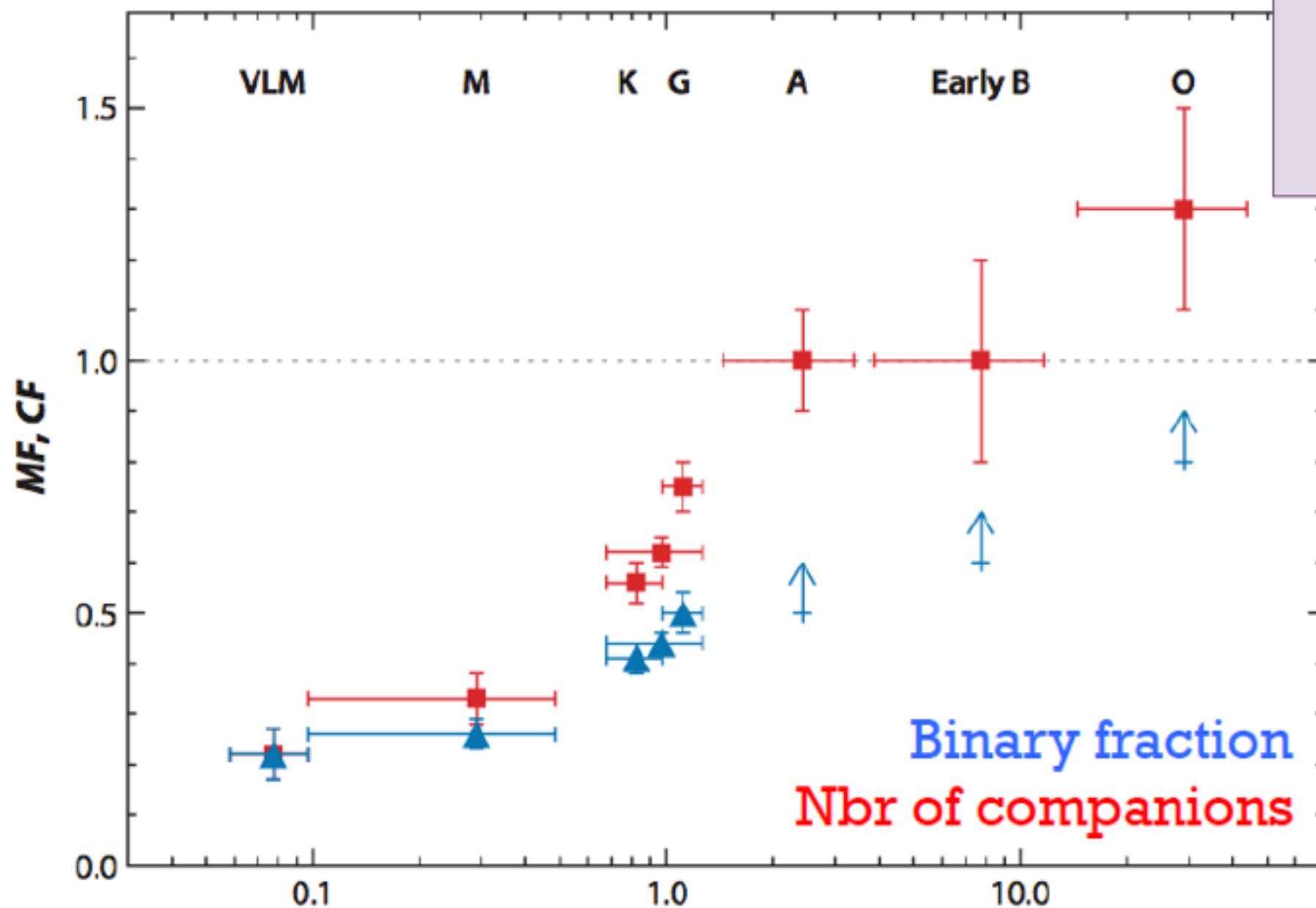


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BUT



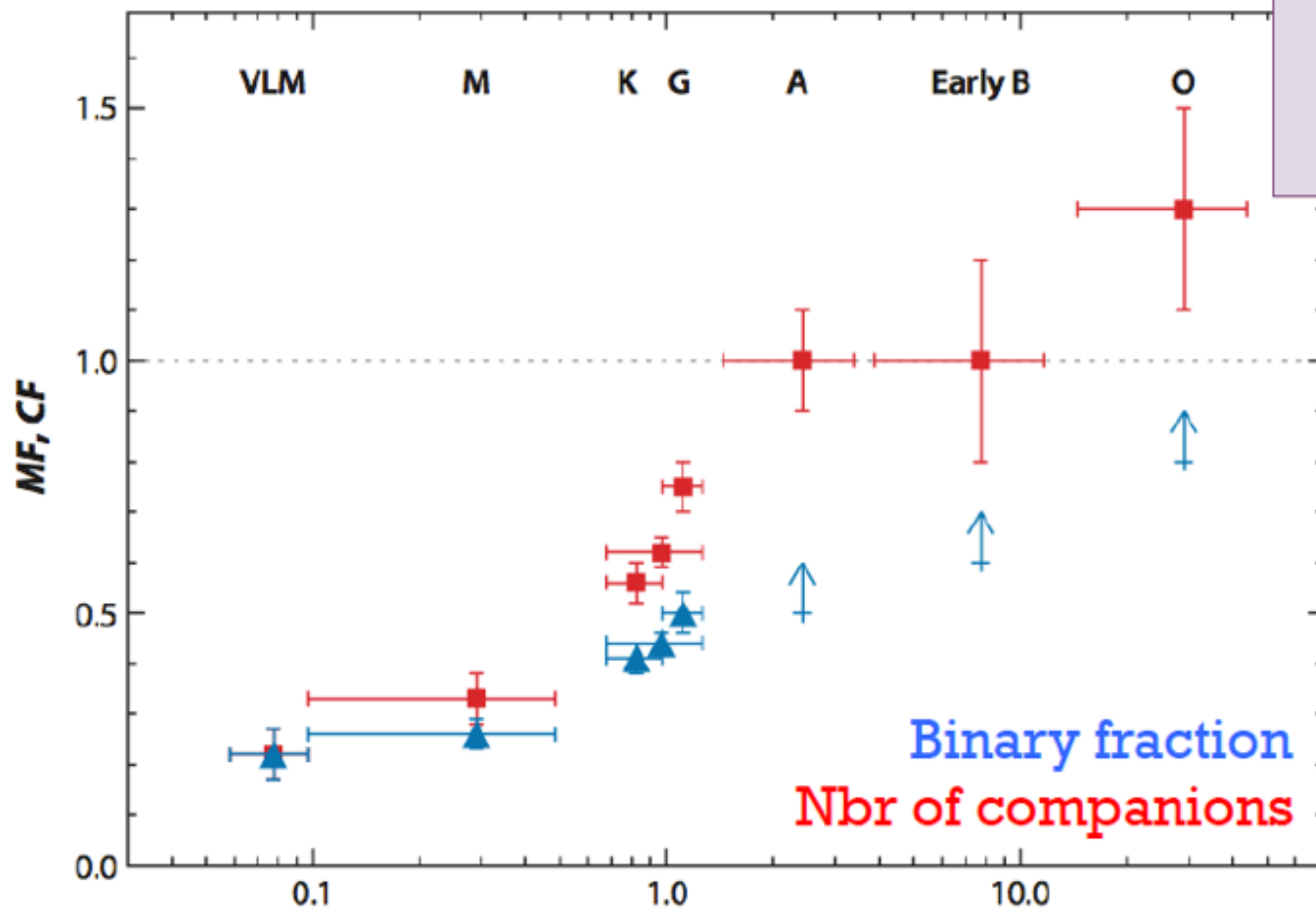
Massive stars

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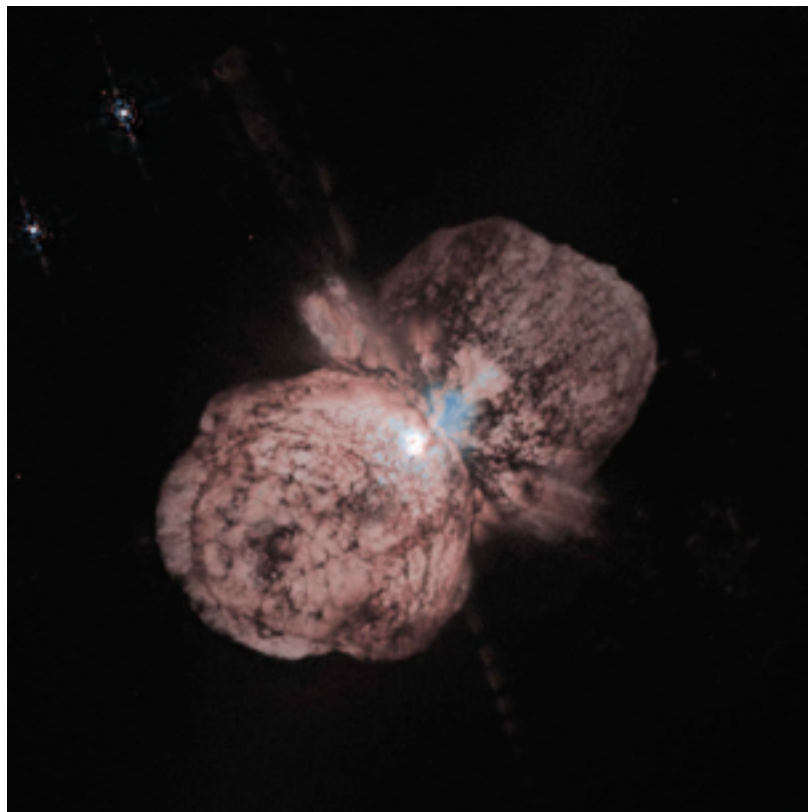
BUT

Interactions between
the components
affect their
subsequent evolution

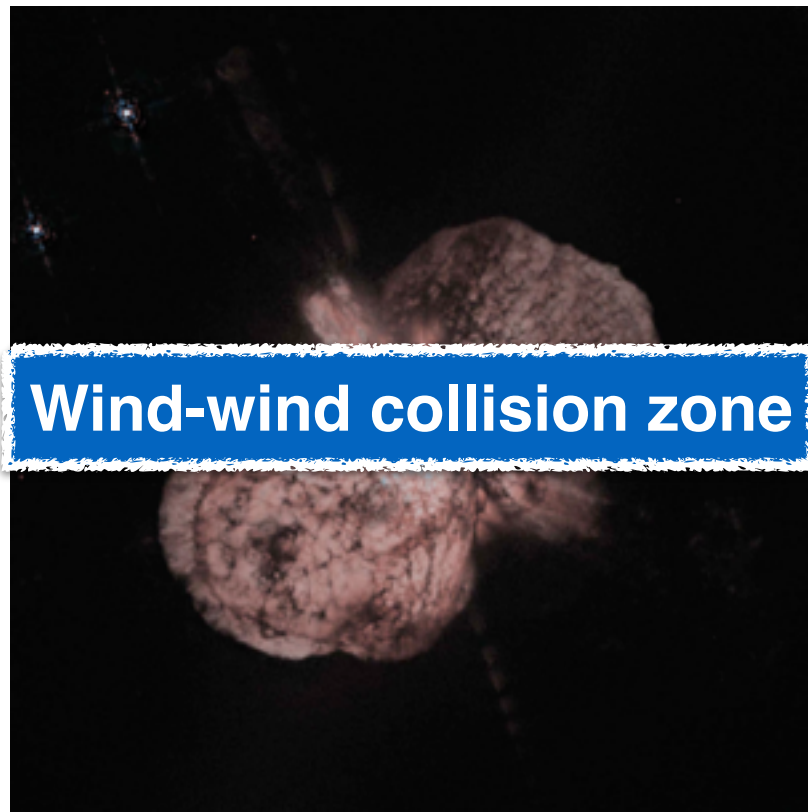


Massive stars

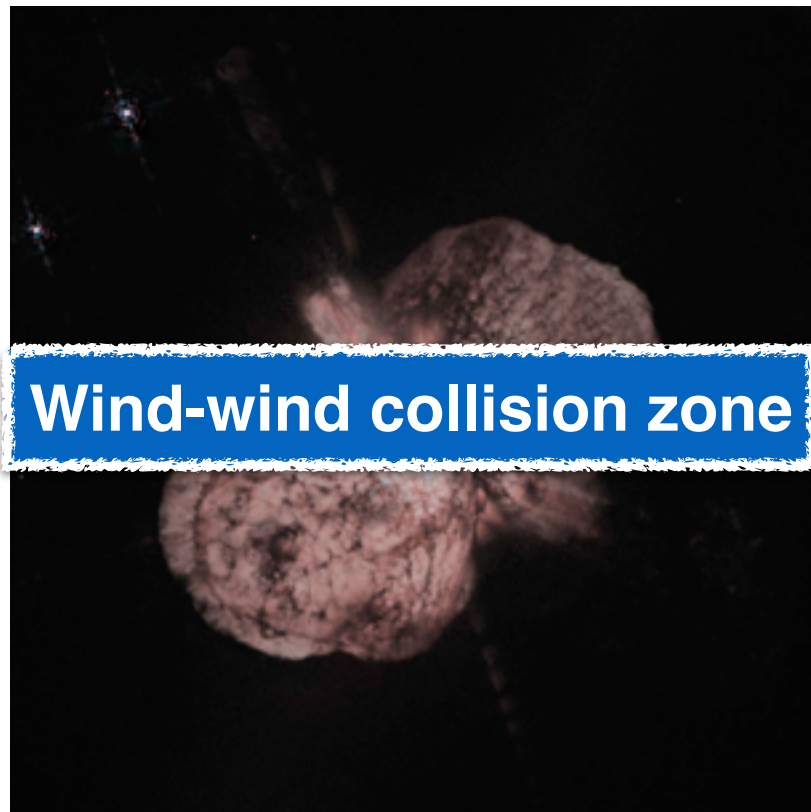
Massive stars



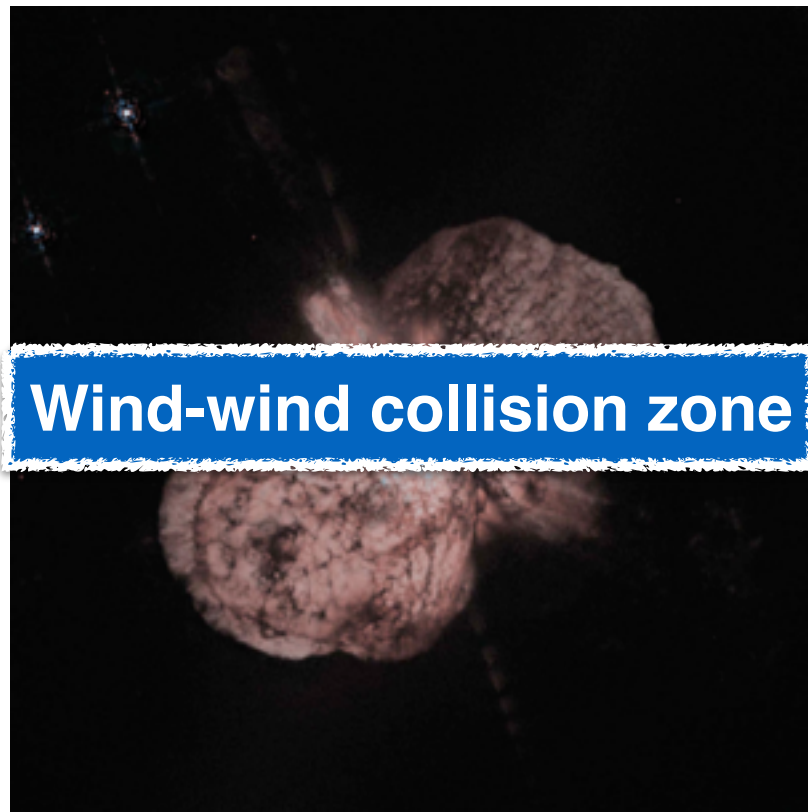
Massive stars



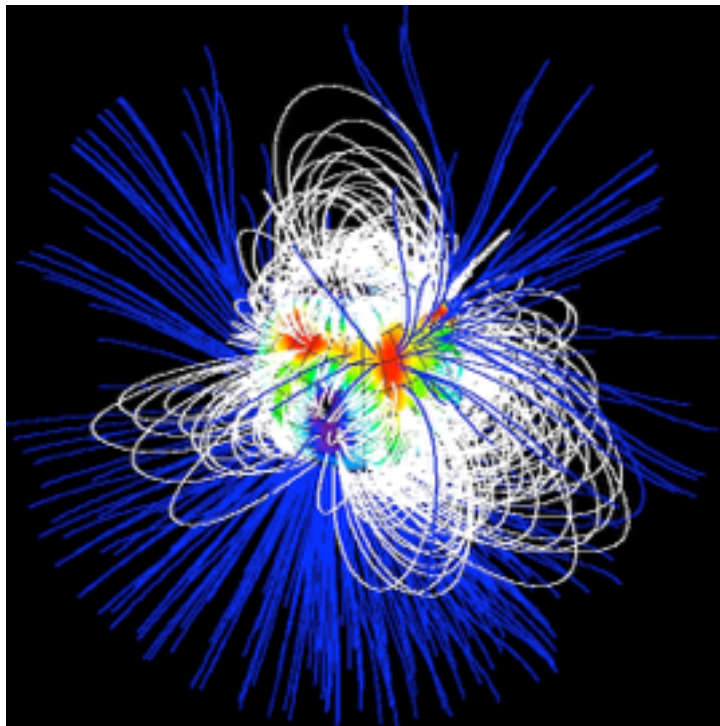
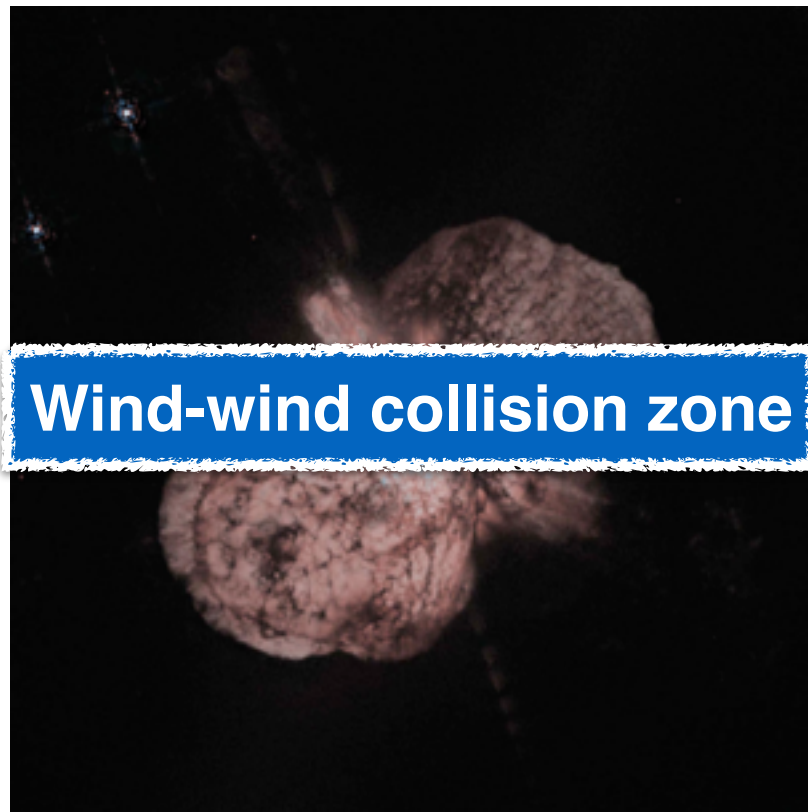
Massive stars



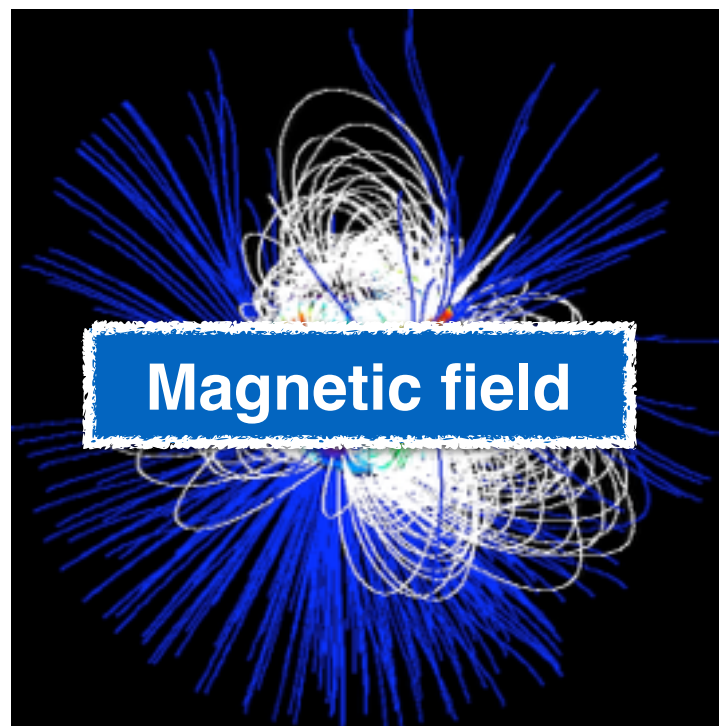
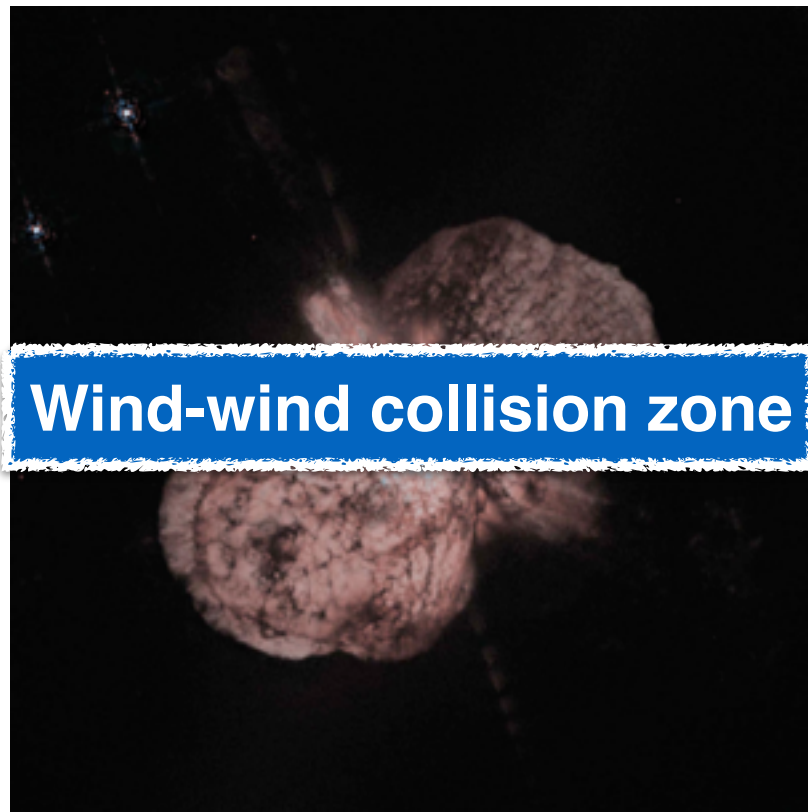
Massive stars



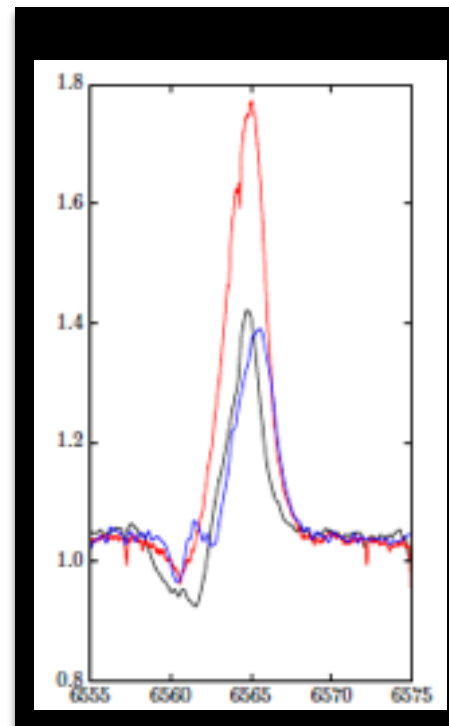
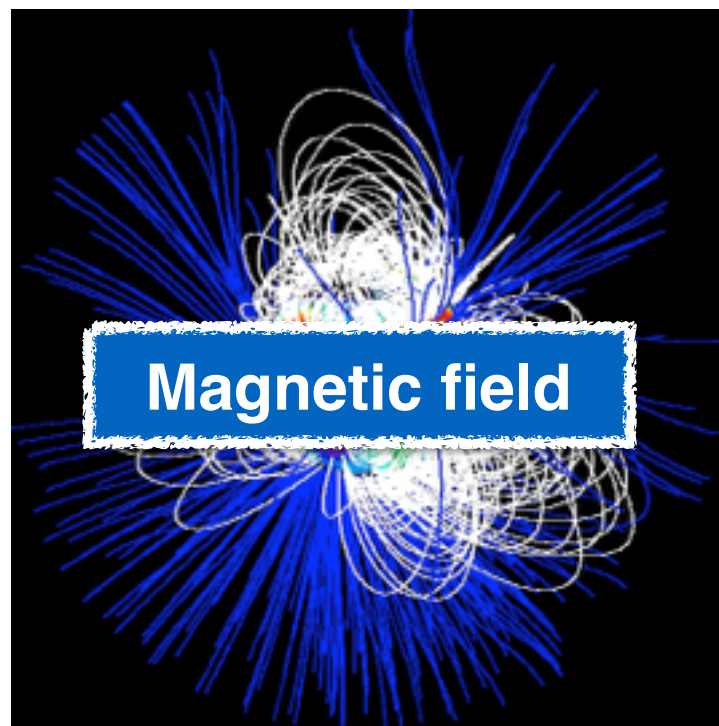
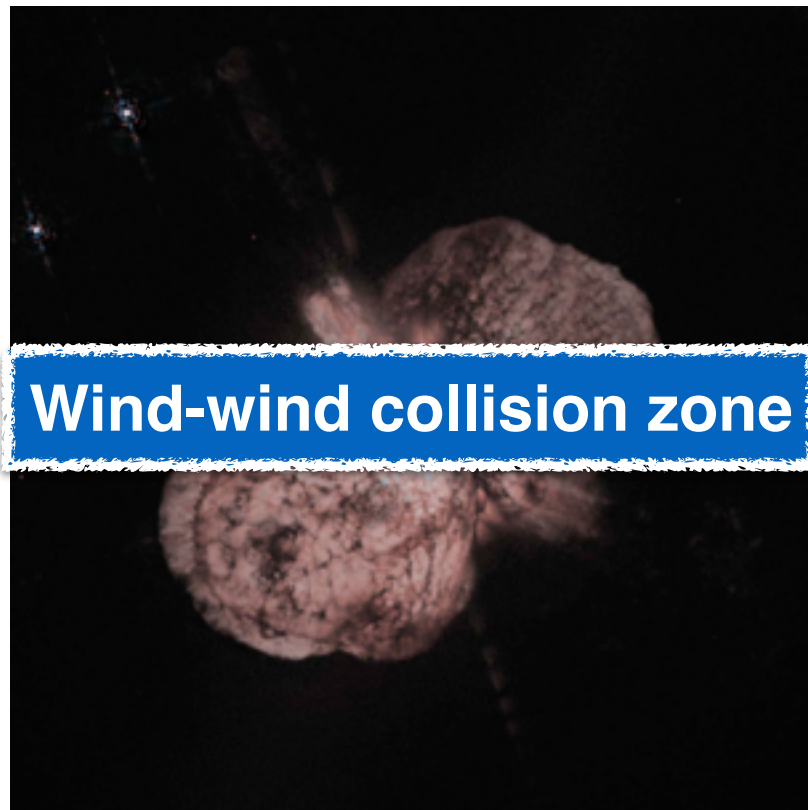
Massive stars



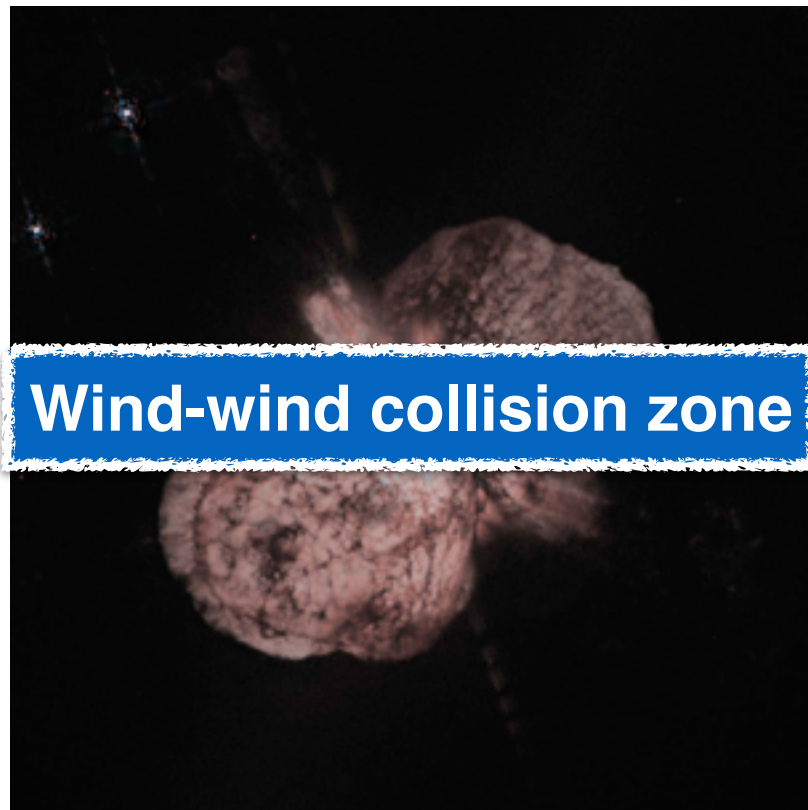
Massive stars



Massive stars



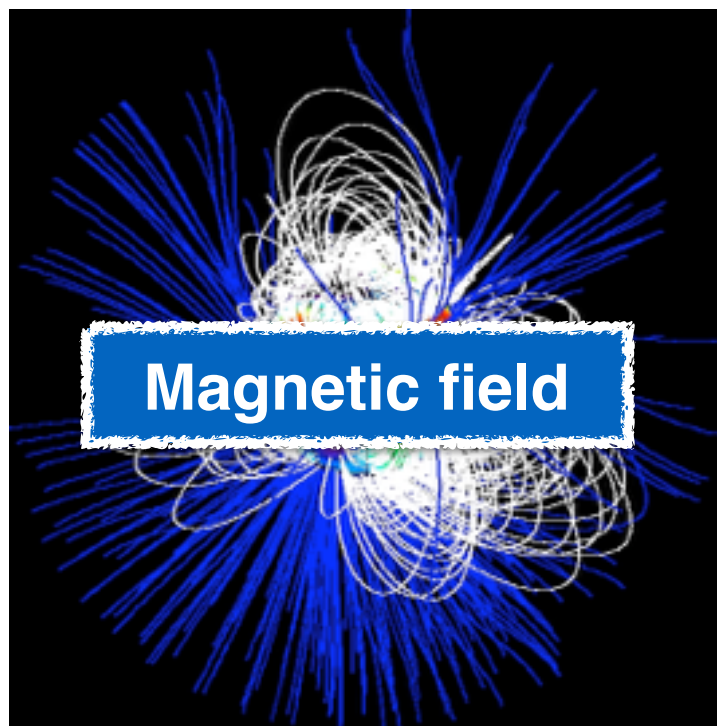
Massive stars



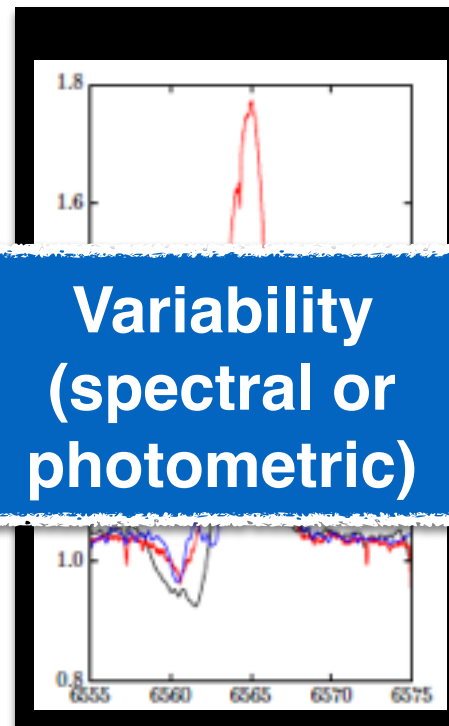
Wind-wind collision zone



Luminous Blue Variable
/
circumstellar nebula

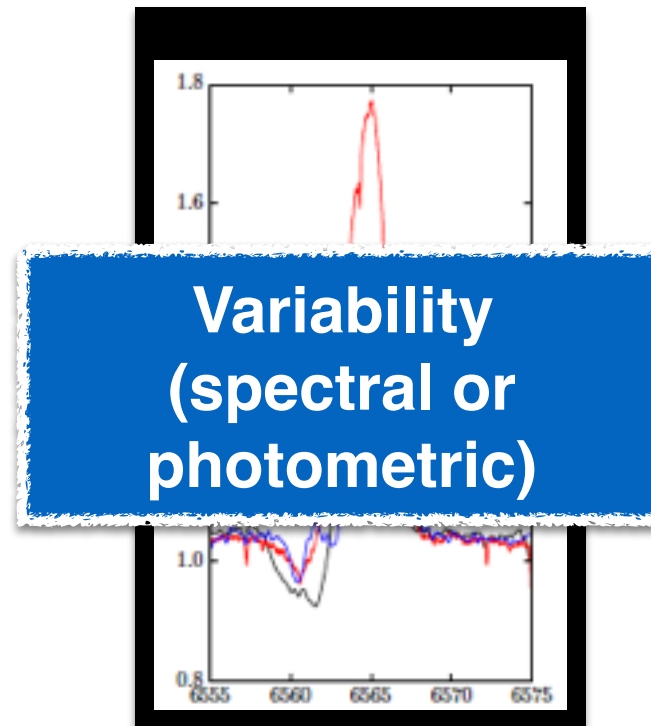
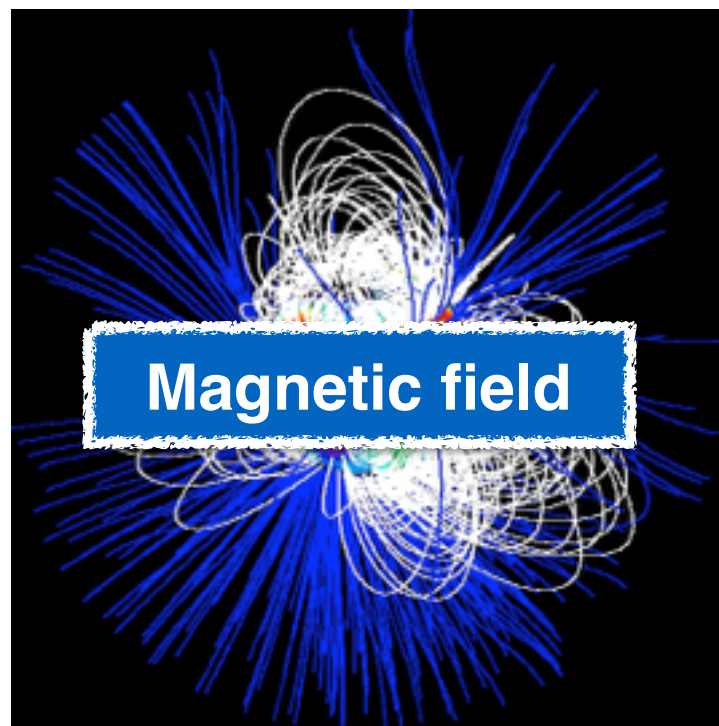
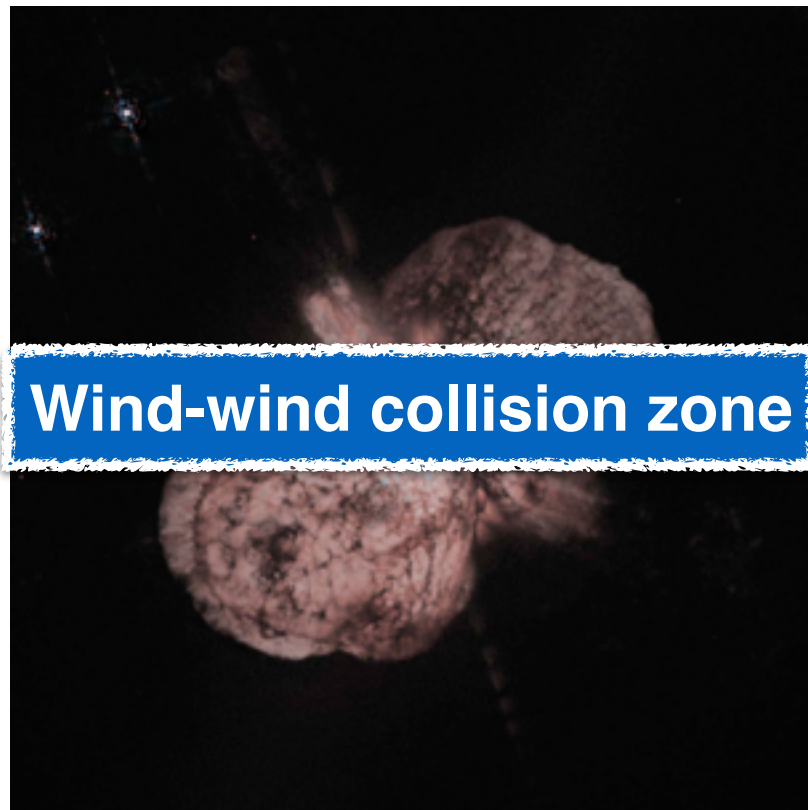


Magnetic field

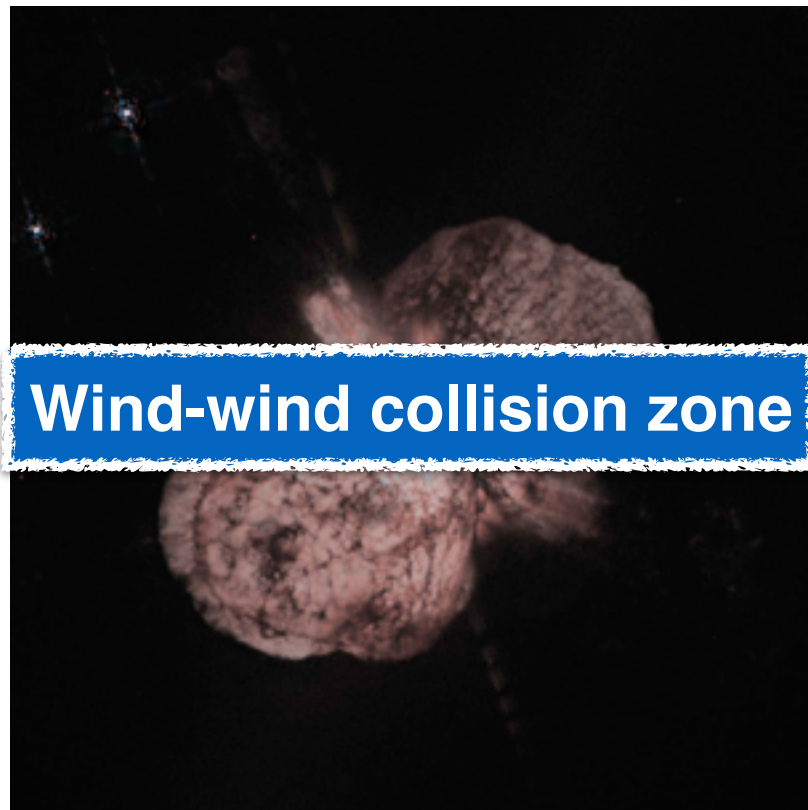


Variability
(spectral or
photometric)

Massive stars



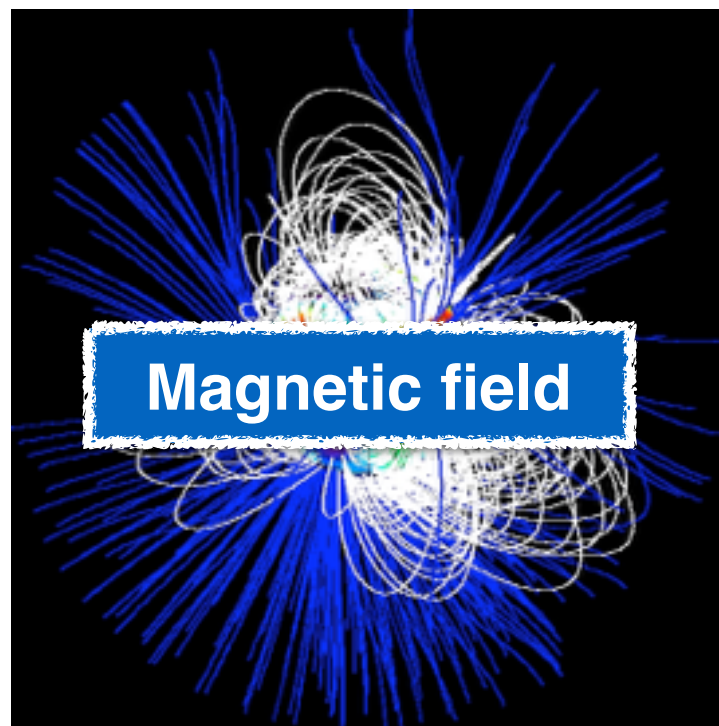
Massive stars



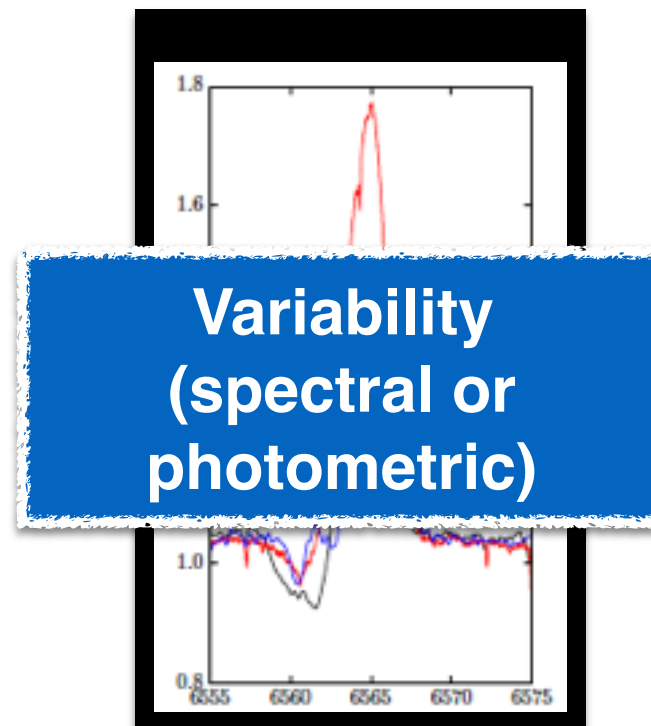
Wind-wind collision zone



Luminous Blue Variable
/
circumstellar nebula



Magnetic field



Variability
(spectral or
photometric)



Wolf-Rayet

H_{amburg} R_{obotic} T_{elescope}

H_{amburg} R_{obotic} T_{elescope}



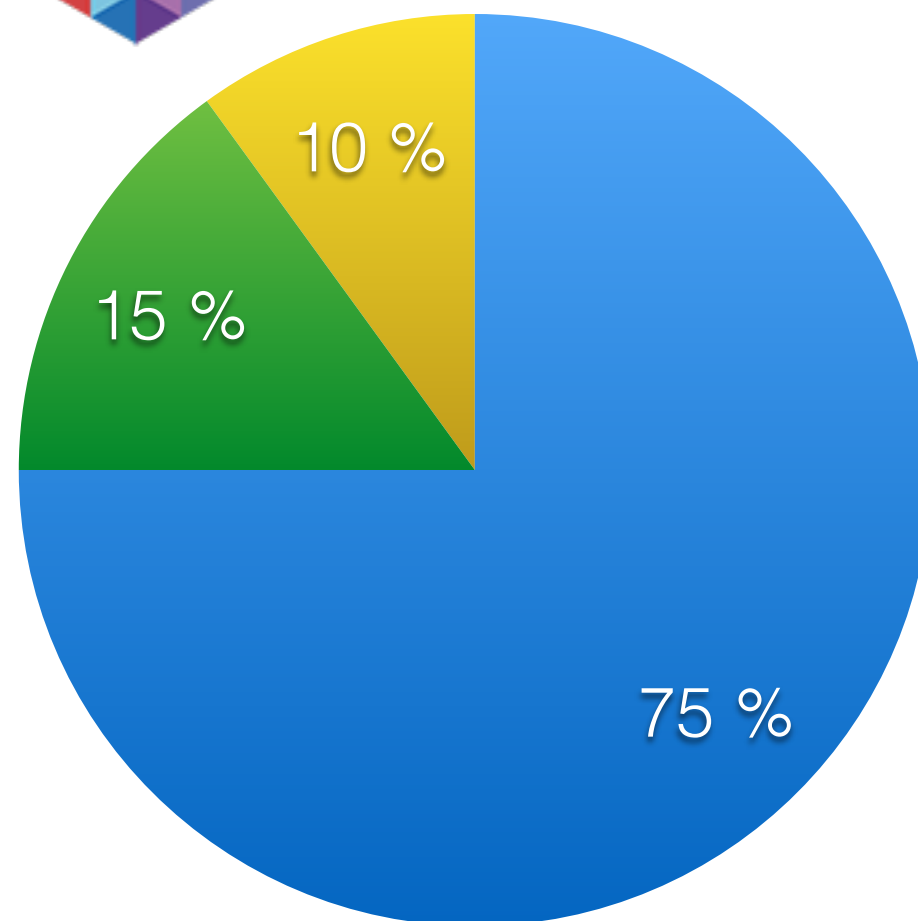
H_{amburg} R_{obotic} T_{elescope}



H_{amburg} R_{obotic} T_{elescope}



H_{amburg} R_{obotic} T_{elescope}

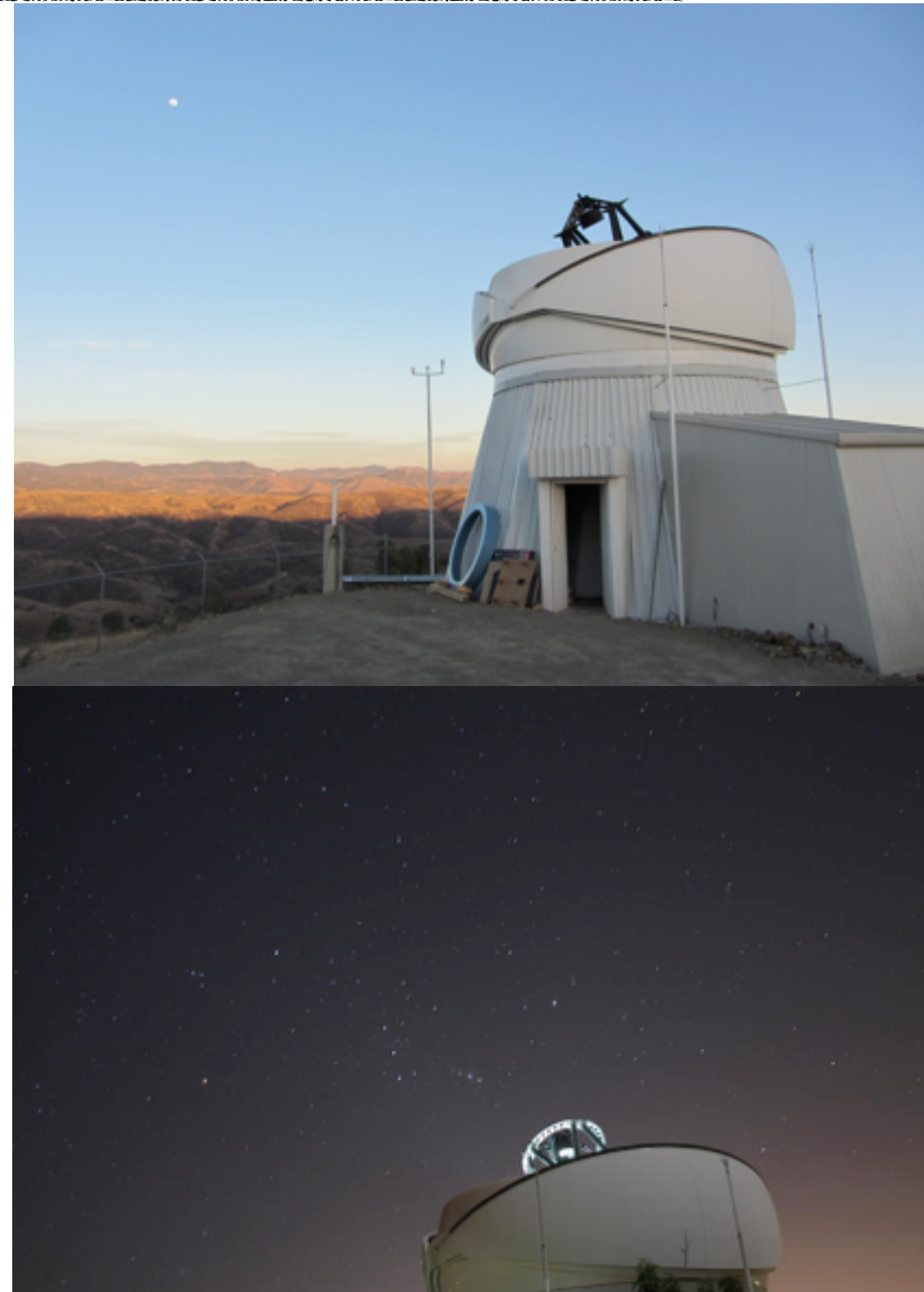


H_{amburg} R_{obotic} T_{elescope}



H_{amburg} R_{obotic} T_{elescope}

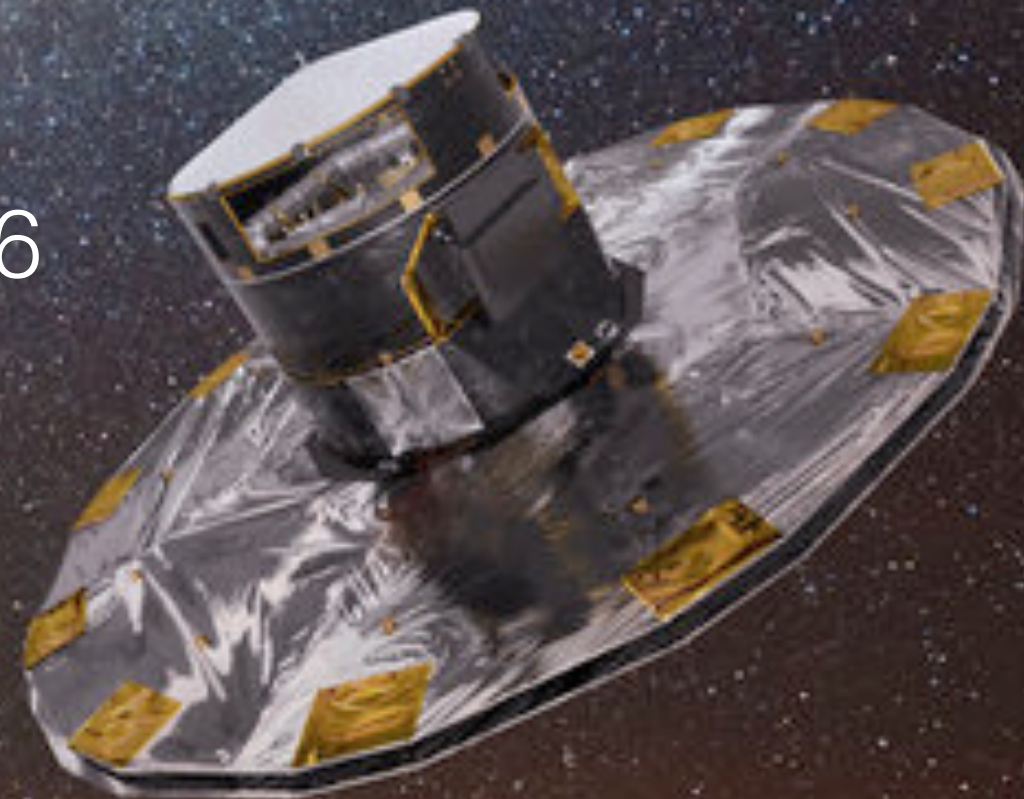
- TIGRE: 1.2m robotic telescope using the HEROS échelle spectrograph
- Installed in March 2013
- Resolving power of the spectrograph: ~ 20000
- Wavelength coverage: $[3800-8800]\text{\AA}$ with a gap of 130\AA at 5700\AA
- Project to install a NIR-spectrograph (see C.Kintziger's talk)
- and a photometric instrument...



Gaia

- Full European mission to chart a 3-D map of our Galaxy ($\sim 10^9$ stars)
- provides parallaxes, proper motions, photometric and spectroscopic data, ...
- DR1 available since August 2016
- DR2 foreseen for April 2018...

WAIT FOR IT...



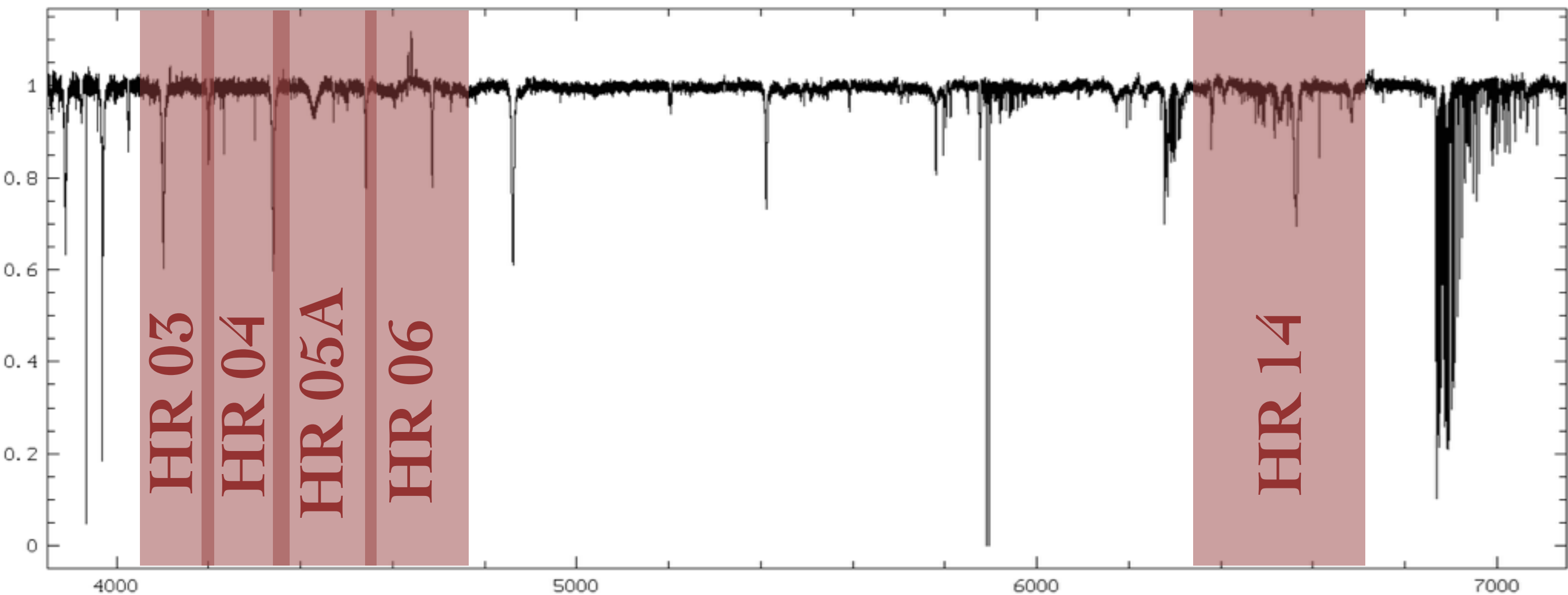
Gaia-ESO survey

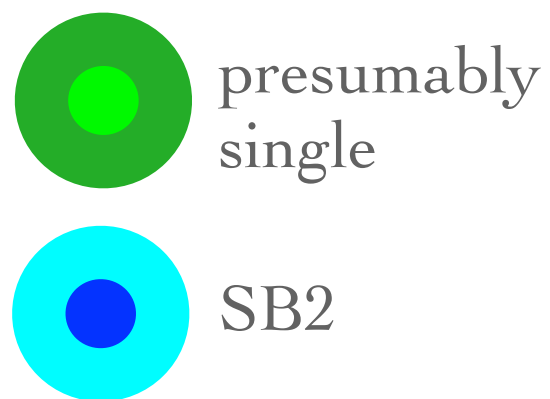
- ~300 nights on GIRAFFE + FLAMES & UVES
- Liège is involved in the determination of stellar parameters (Teff, logg, surface abundances) of B stars (T. Morel) and of O- and early B- stars (A. Blazère + L. Mahy)
- Other partners on O stars: IAC (Herrero,...) + LUPM (Martins)
- Up to now, ~80 O and early B-type stars have been observed in Carina region



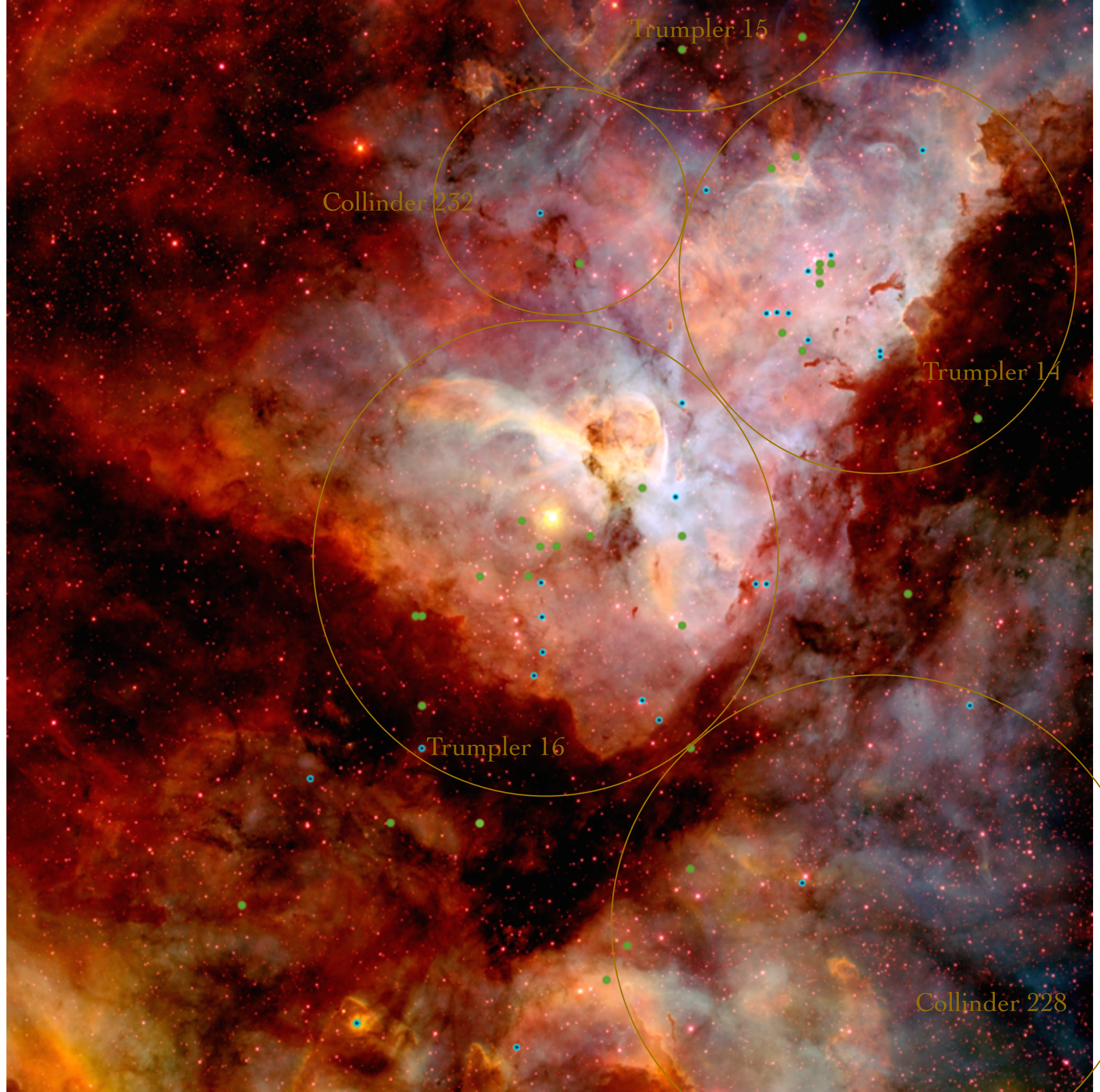
Gaia-ESO survey

- GIRAFFE setup...

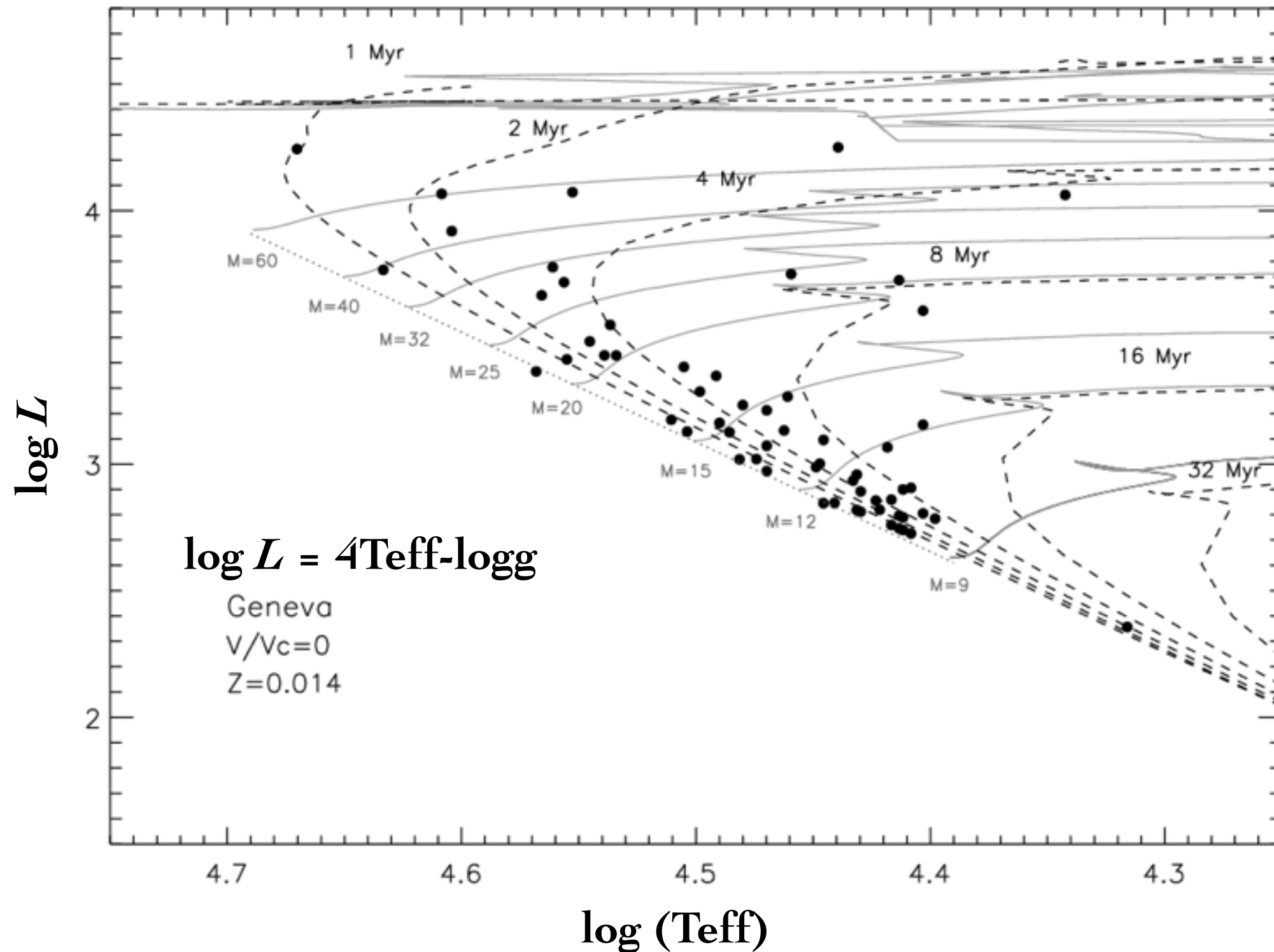




But other
brighter
massive stars
exist in
Carina nebula



Gaia-ESO survey

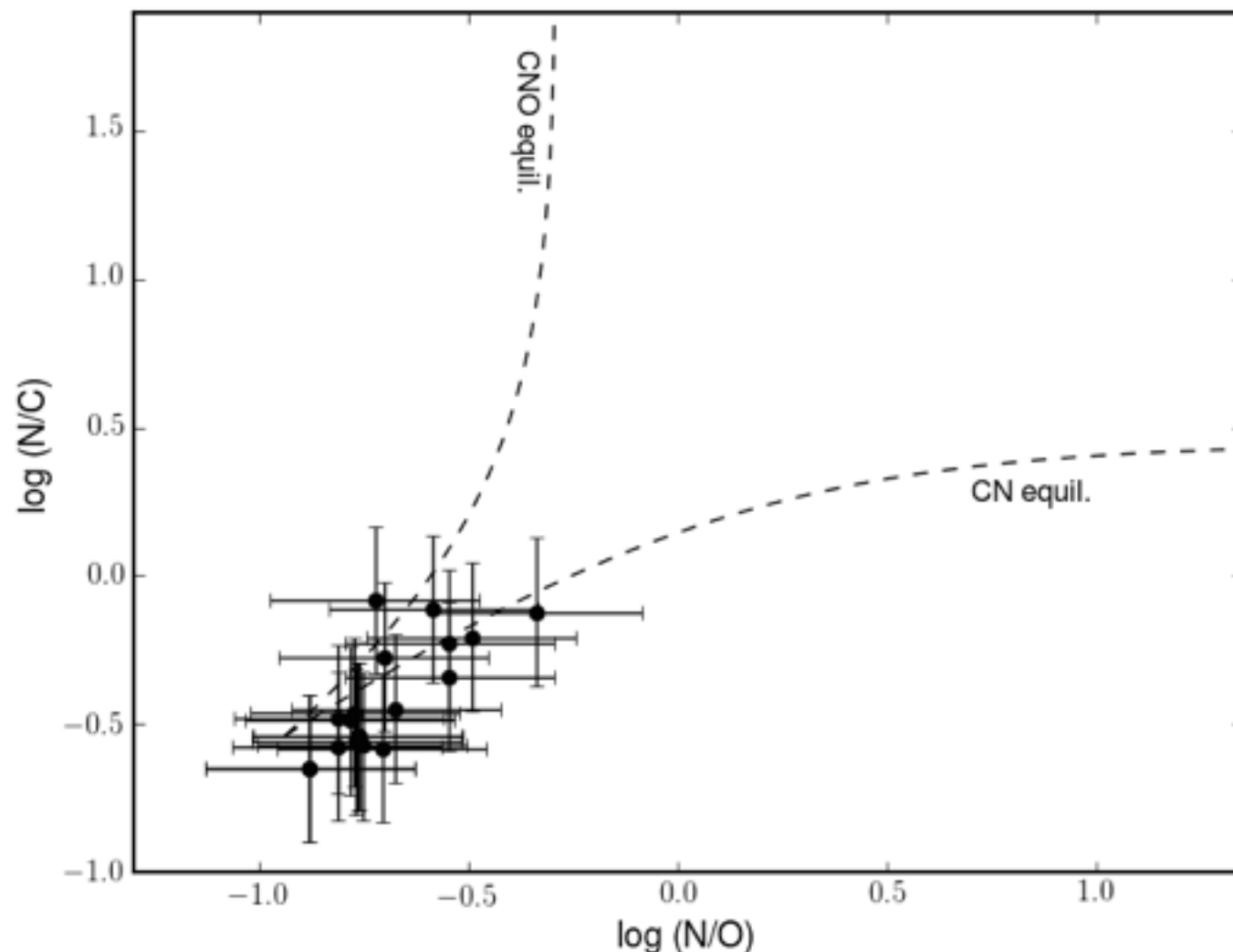


Gaia-ESO survey

- Preliminary values for 20 O and early B-type stars out of 42 objects.

GES

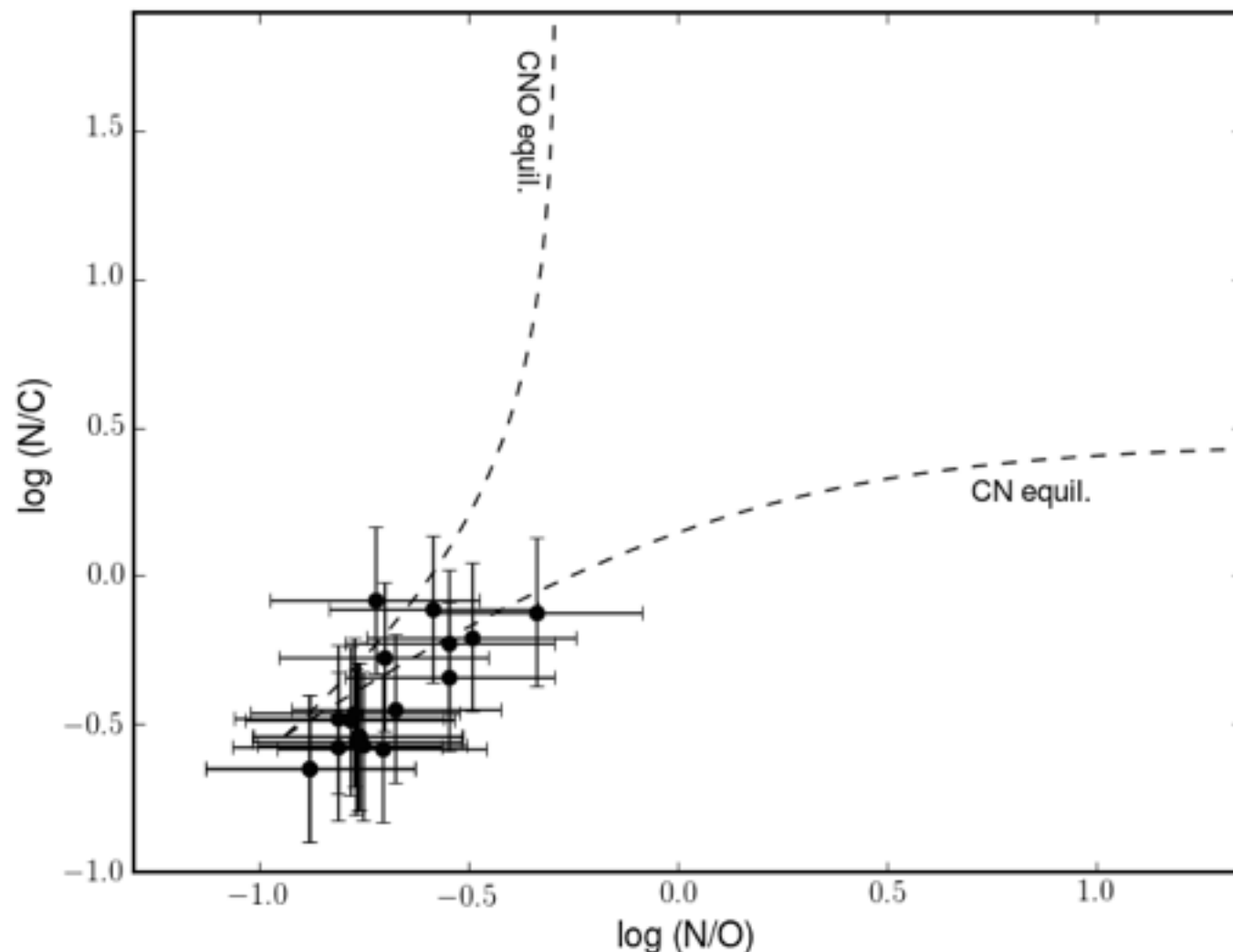
MiMES



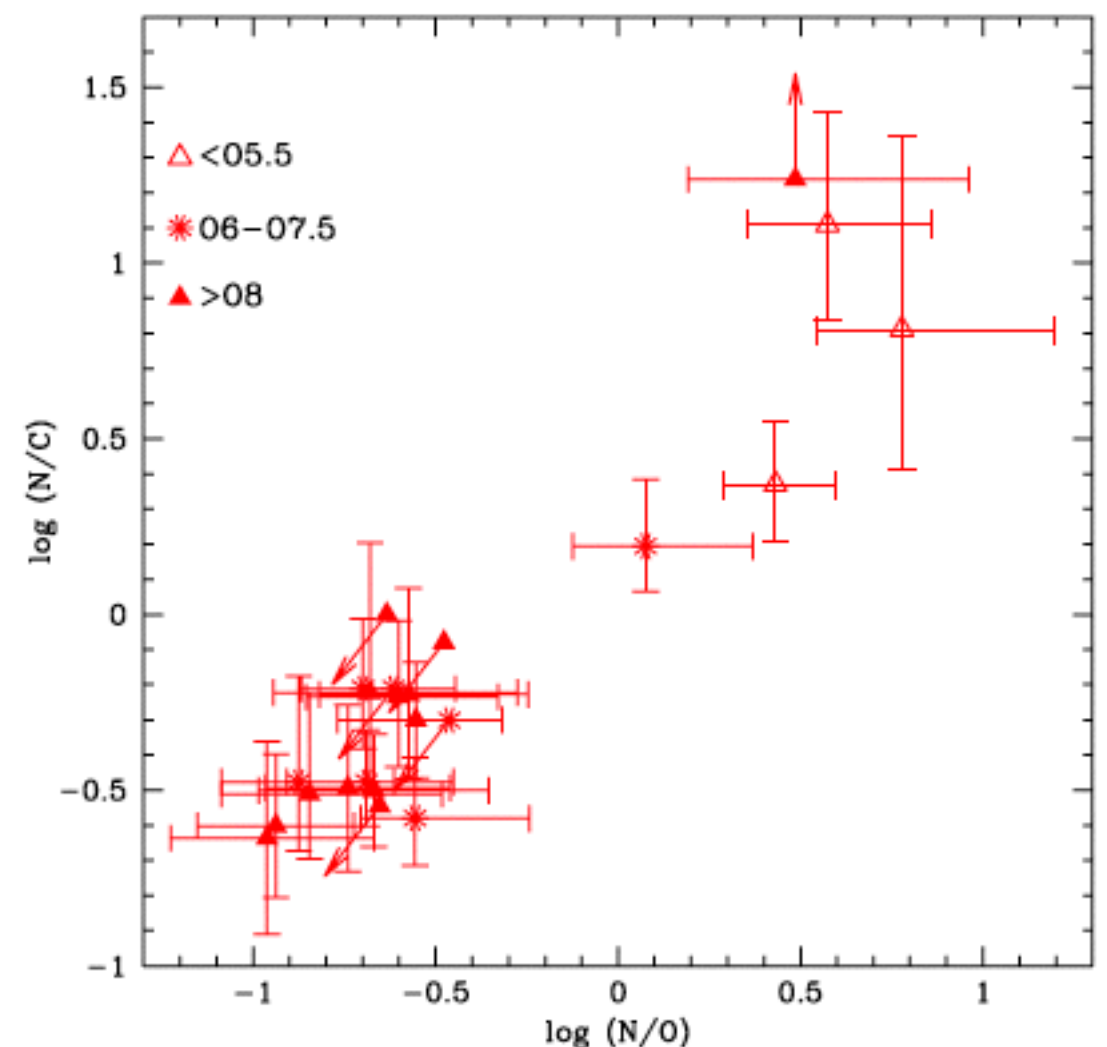
Gaia-ESO survey

- Preliminary values for 20 O and early B-type stars out of 42 objects.

GES



MiMES



Thank you