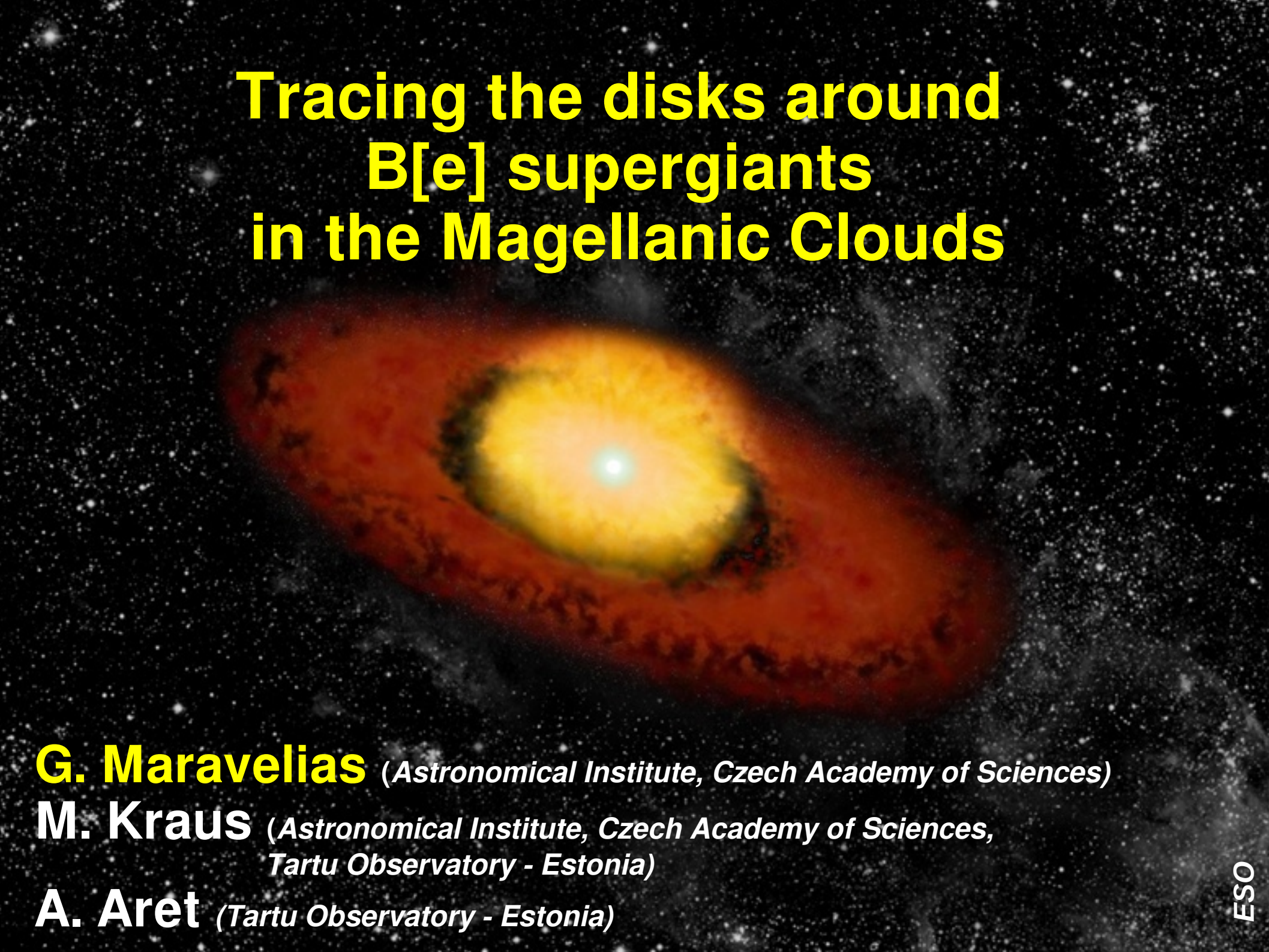
Tracing the disks around B[e] supergiants in the Magellanic Clouds



G. Maravelias (*Astronomical Institute, Czech Academy of Sciences*)
M. Kraus (*Astronomical Institute, Czech Academy of Sciences, Tartu Observatory - Estonia*)
A. Aret (*Tartu Observatory - Estonia*)

ESO

The B[e] phenomenon

" The B[e] classification designates those stars of spectral type B which show forbidden emission lines in their optical spectrum, where the notation "[e]" follows that for forbidden lines."

Conti 1976

Definition:

1. Strong Balmer emission lines.

2. Low excitation permitted emission lines of predominantly low ionization metals in the optical spectrum, e.g. Fe ii.

3. Forbidden emission lines of [Fe ii] and [O i] in the optical spectrum.

4. A strong near or mid-infrared excess due to hot circumstellar dust.

Lamers et al. 1998 (Allen & Swings, 1976; Zickgraf, 1998)

Stars with B[e] phenomenon

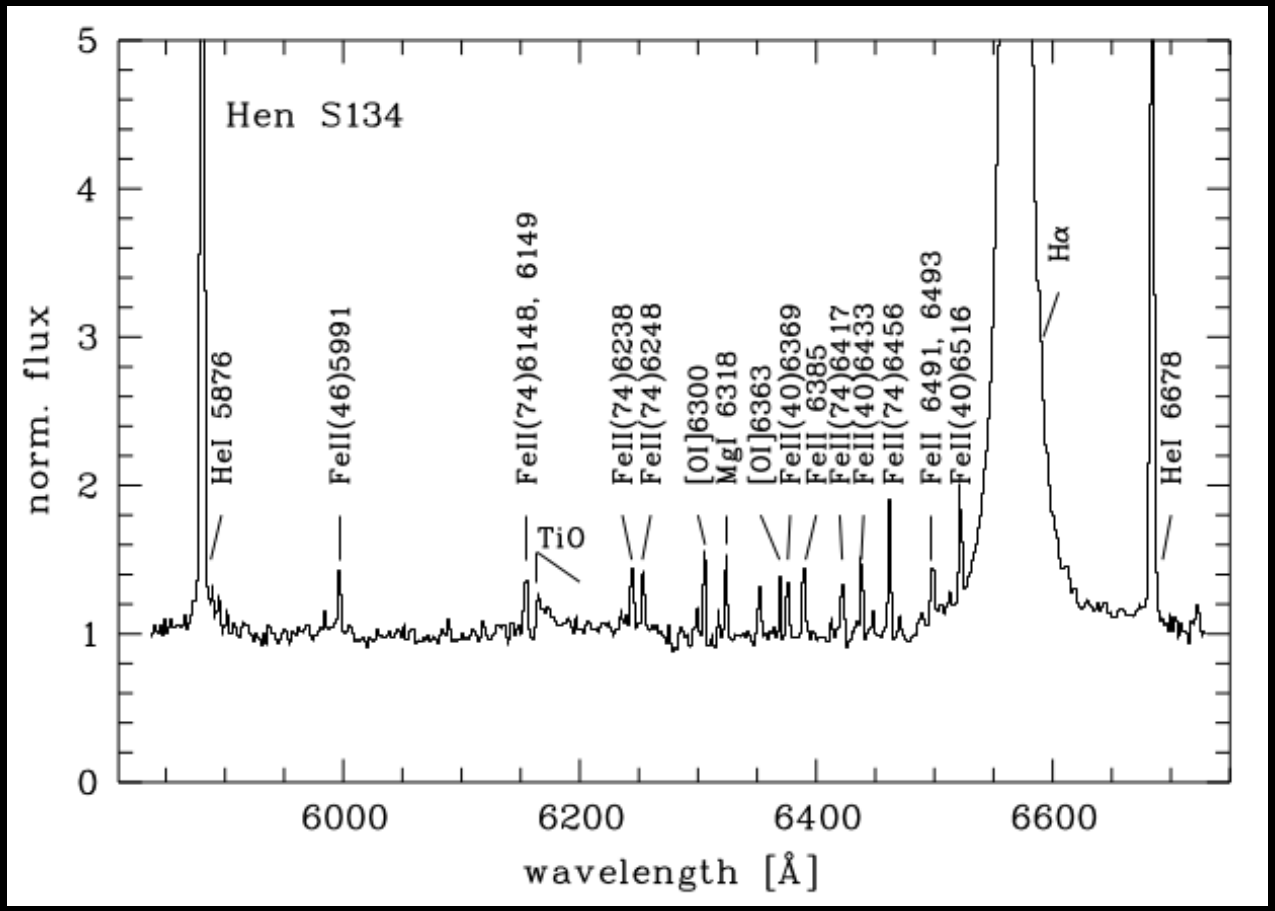
1. *B[e] supergiants*

2. *pre-main sequence B[e]-type stars*

3. *compact planetary nebulae B[e]-type stars*

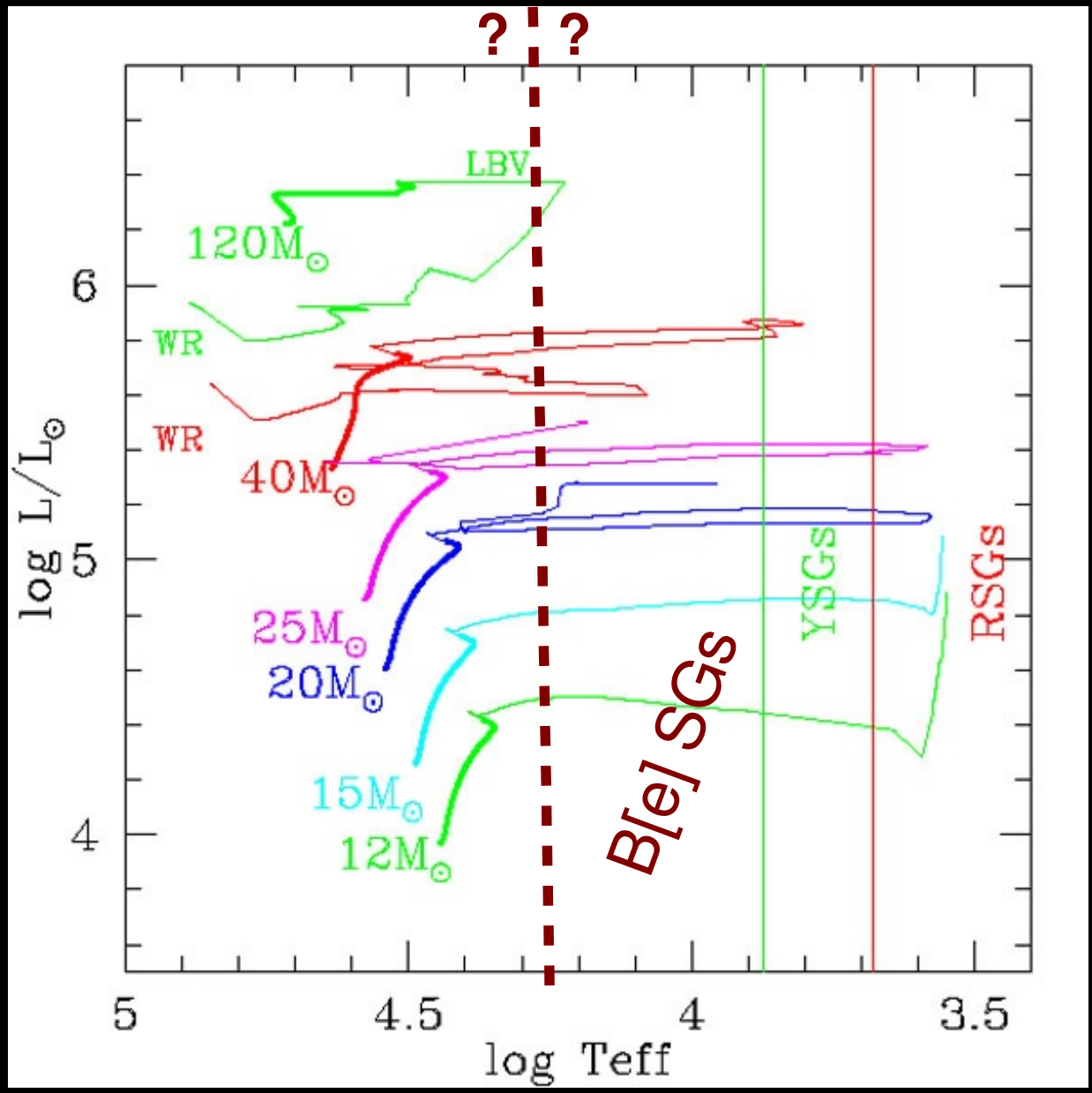
4. *symbiotic B[e]-type stars*

5. *unclassified B[e]-type stars*



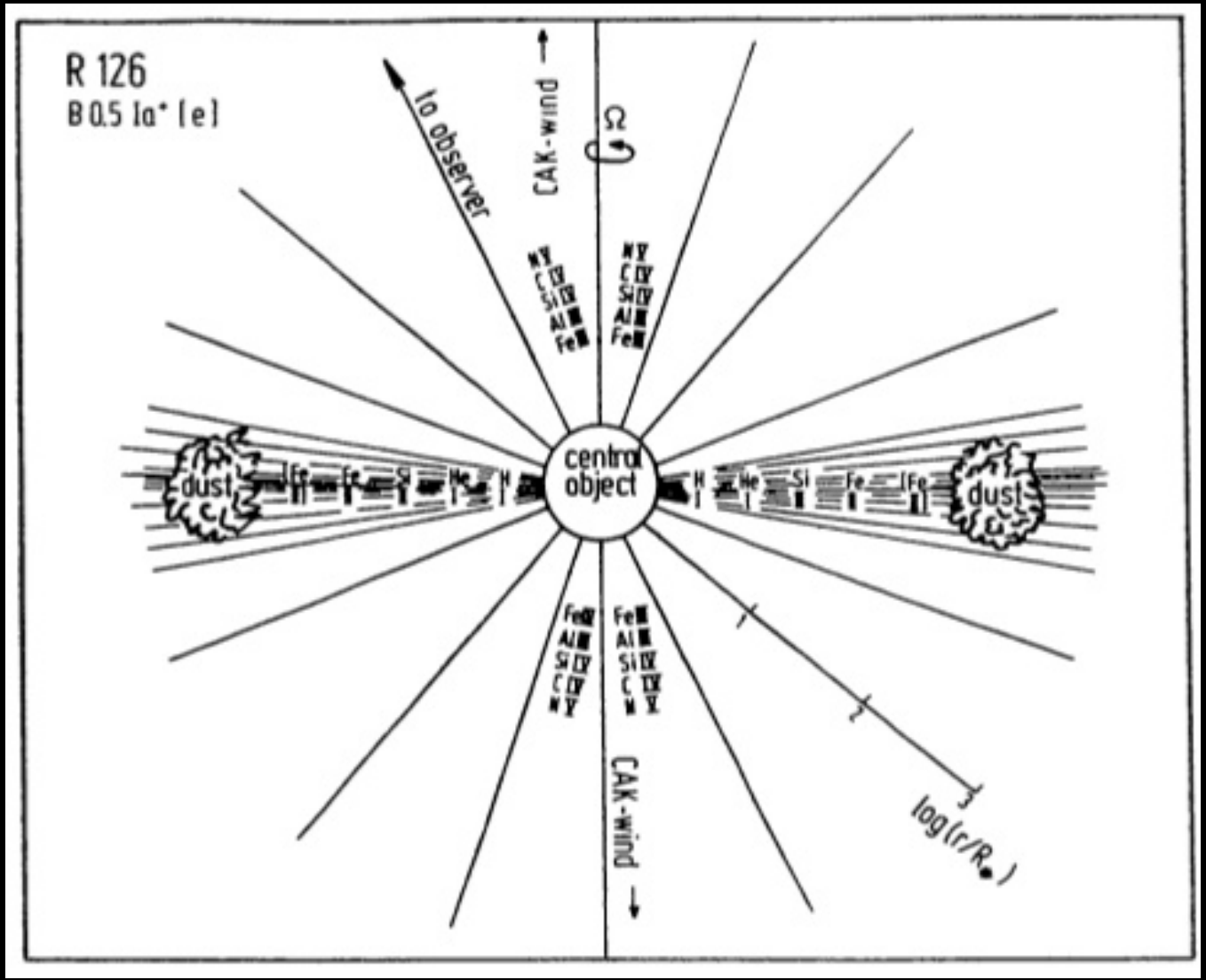
Lamers et al. 1998

Position in HR diagram



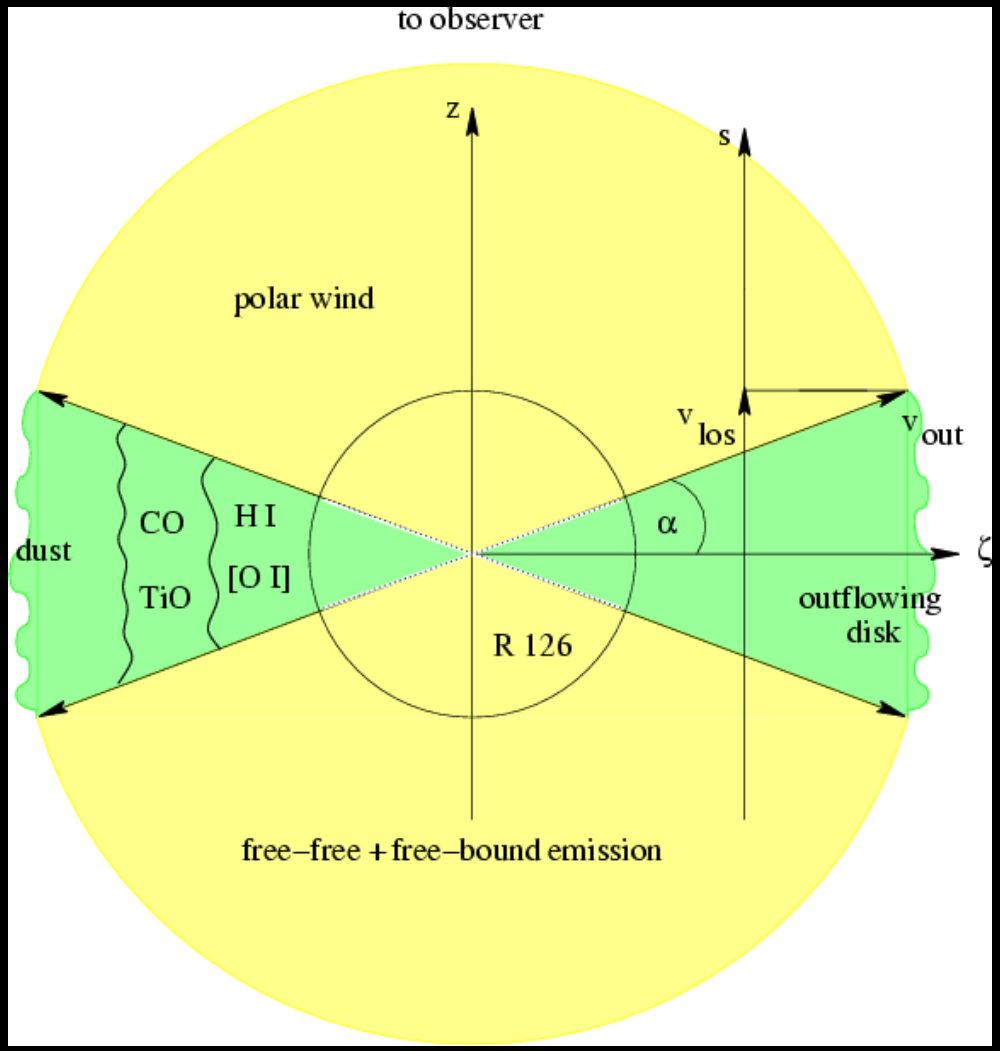
Massey 2013

Outflow wind model ...



Zickgraf et al. 1985

or Keplerian rotation ?



Kraus et al. 2007, 2010

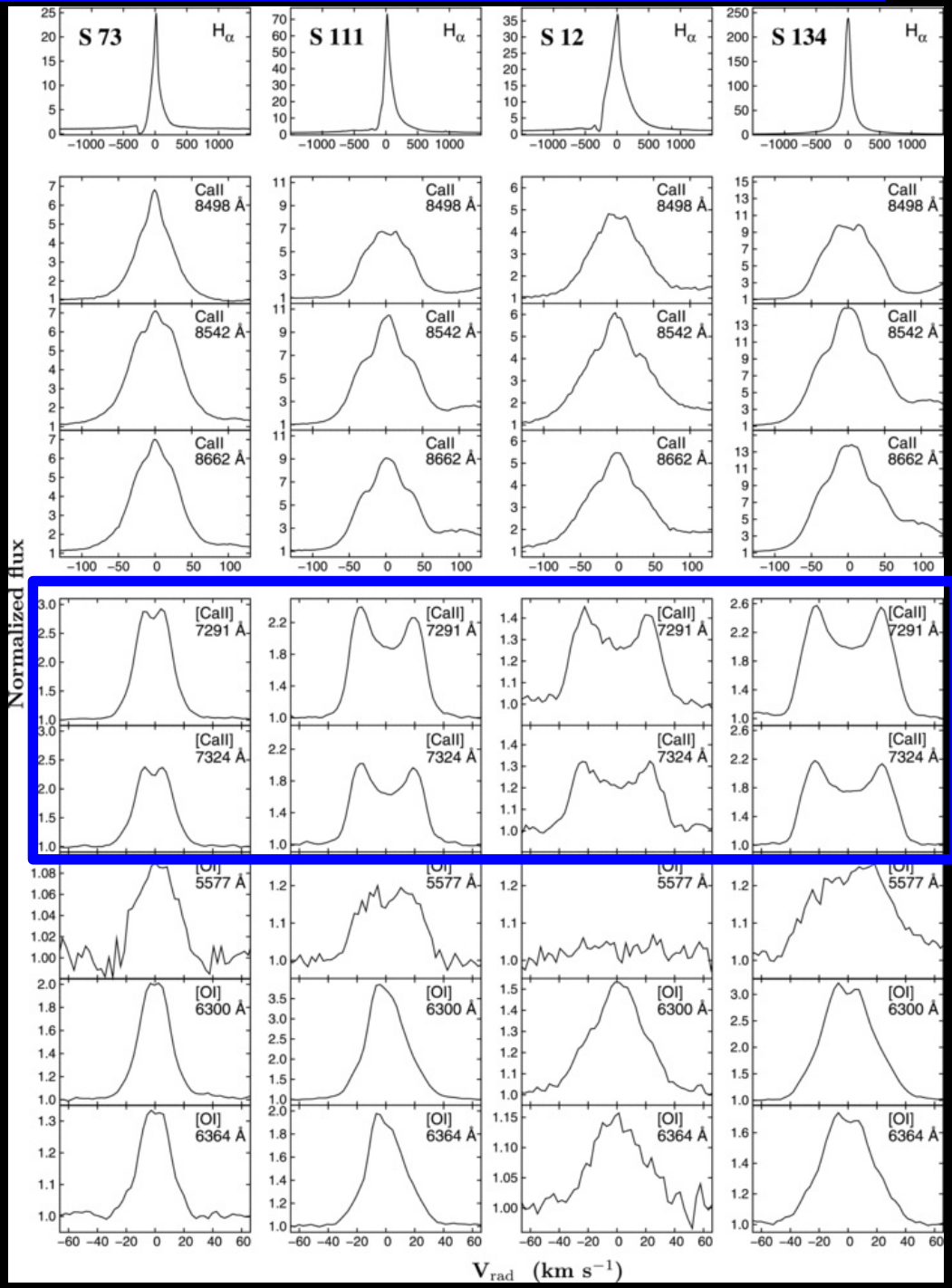
> HI very close to the star

> [OI]/[CaII] lines produced within HI (relatively denser regions)

[OI] λλ5577,6300 and [CaII] λ7291 profiles and intensities are sensitive to density and temperature
→ can probe different regions

> No indication for outflow, but Keplerian rotation

Observational evidence



> 8 sources in the Magellanic Clouds

> Systematic presence of [CaII] λλ7291,7324

→ good disk tracers

> Double-peaked lines are indicative of rotationally-disk structure

Aret et al. 2012

Extending our sample

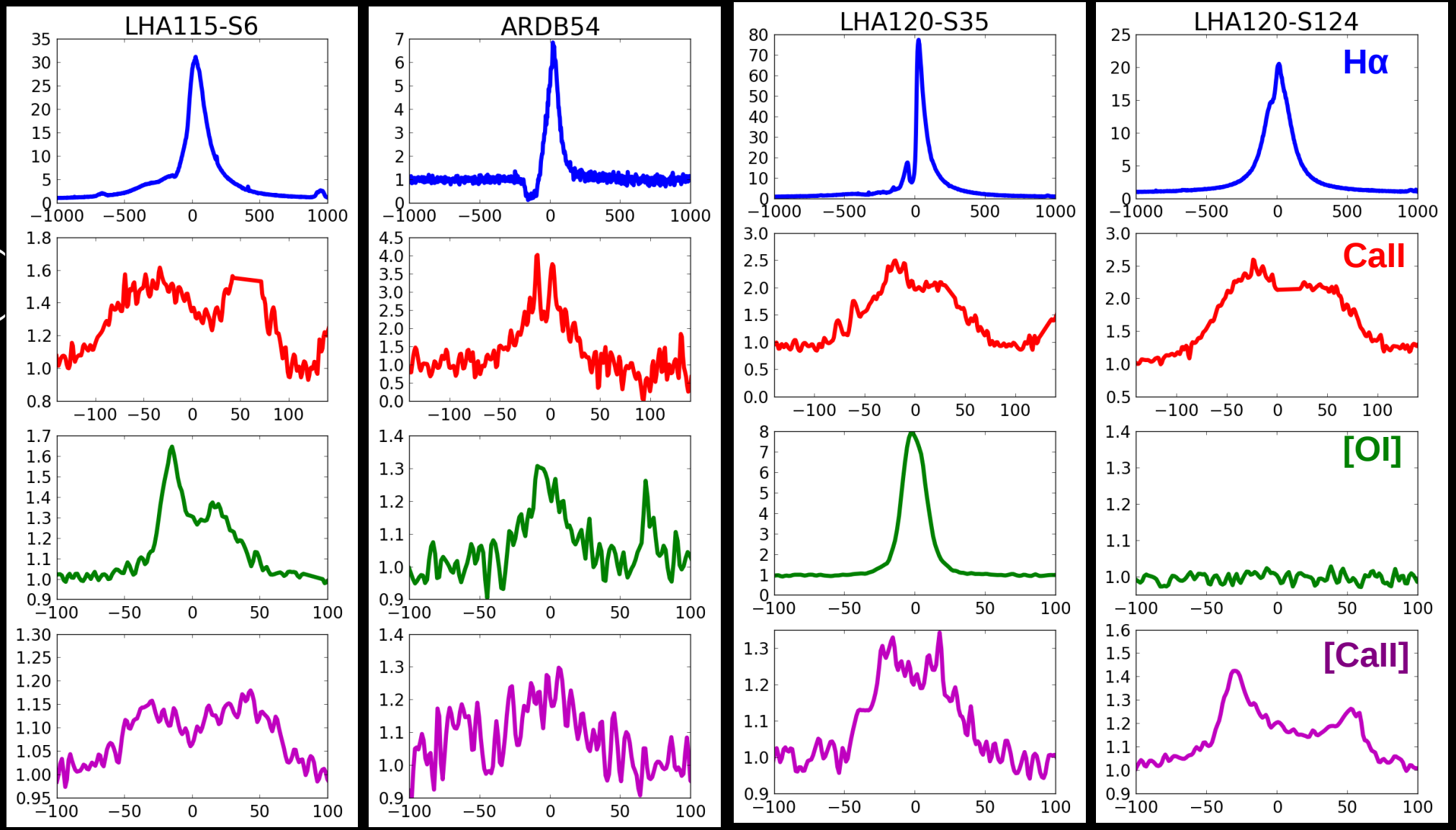
Observations: FEROS instrument at 2.2m MPG/ESO telescope
high-resolution R~48000, ~3600-9200 Å

Runs: Nov 24 – Dec 4 (2014), May 10 – 18 (2015)

Sample: 4 SMC and 8 LMC B[e] SGs

Data reduction: processing of FEROS pipeline products:
(i) combine spectra (increase SNR)
(ii) identify and eliminate cosmic rays/bad columns
(iii) telluric correction

New identifications

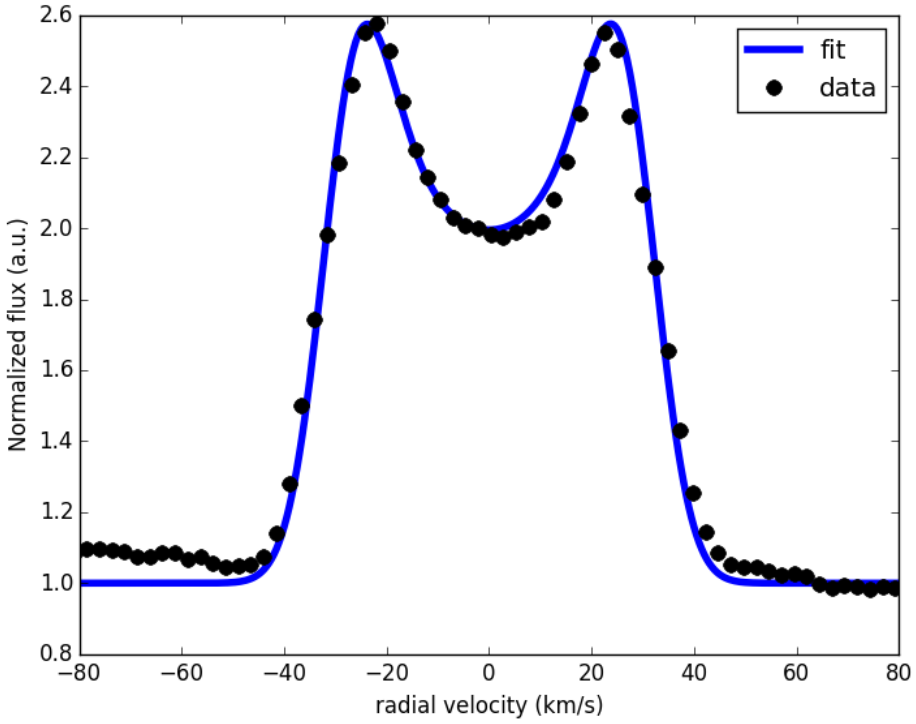


Investigating the kinematics

PRELIMINARY

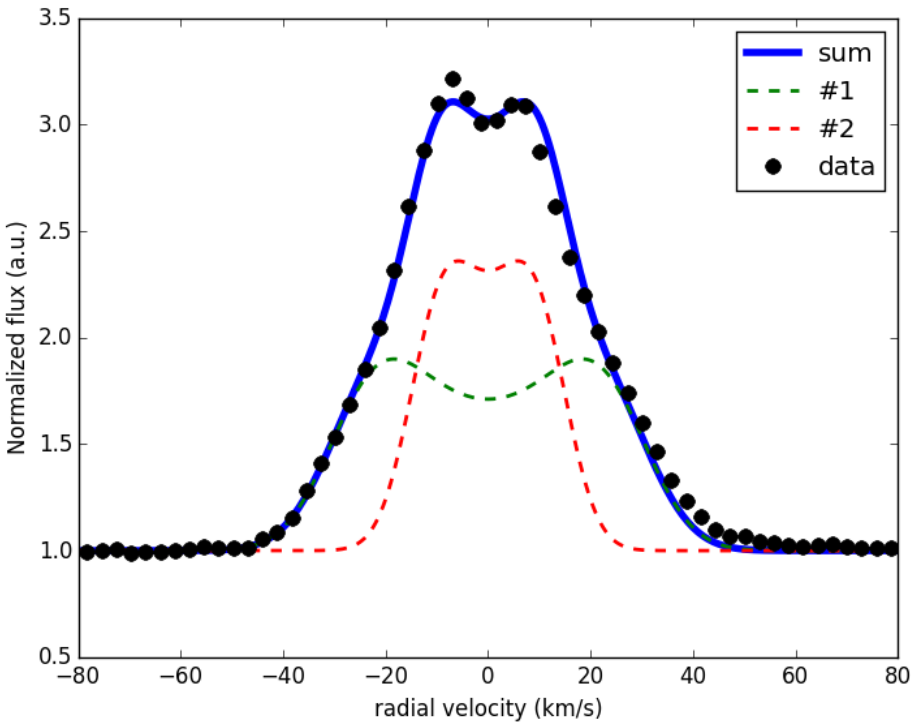
LHA120-S134

[CaII] 7291 Å



Vrot = 29 km/s

[OI] 6300Å



Vrot = 26 km/s + 12 km/s

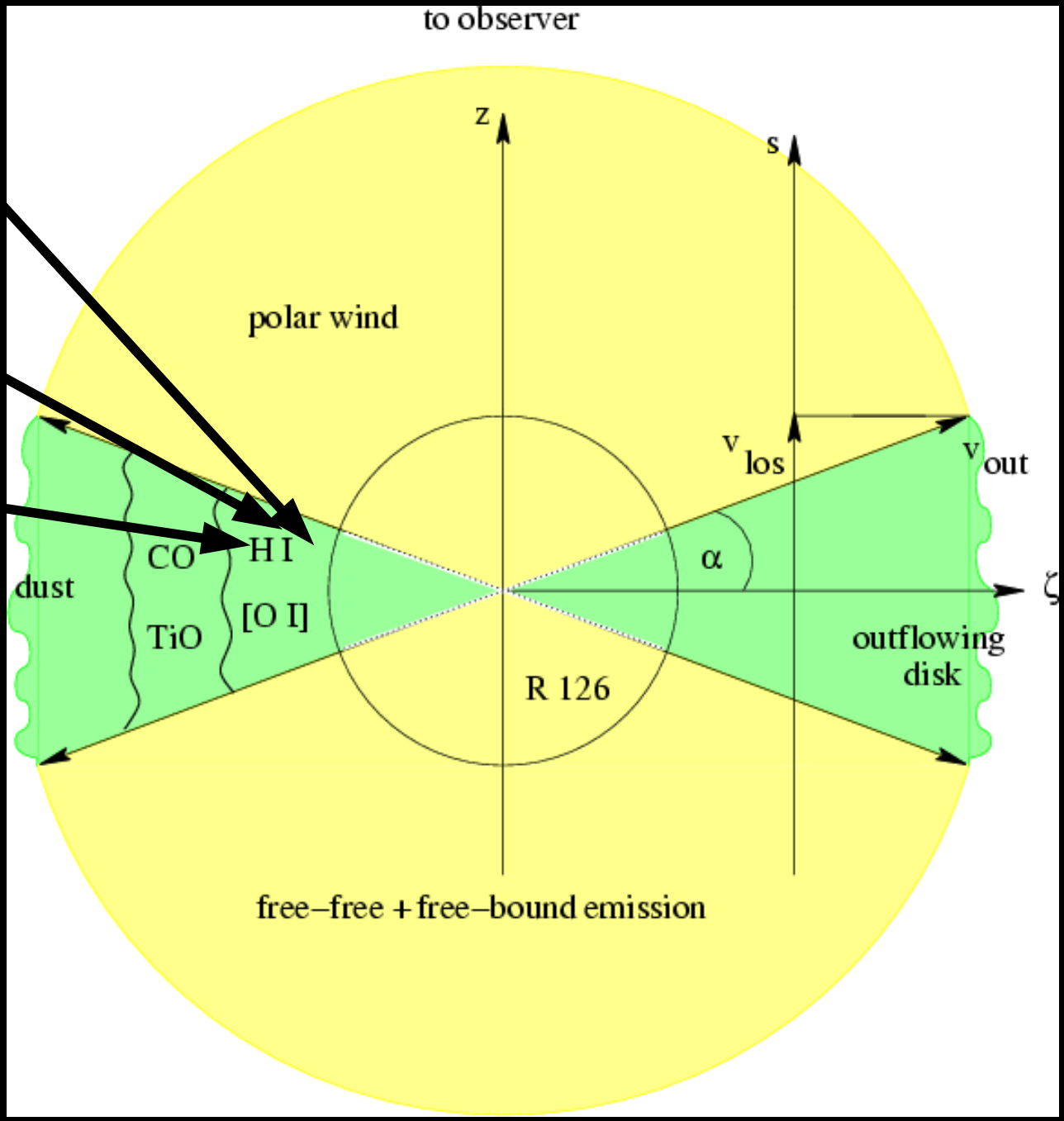
True for (almost) all Aret et al. 2012 sample !

Or rings ?

[CaII] λ7291

[OI] λ5577

[OI] λ6300

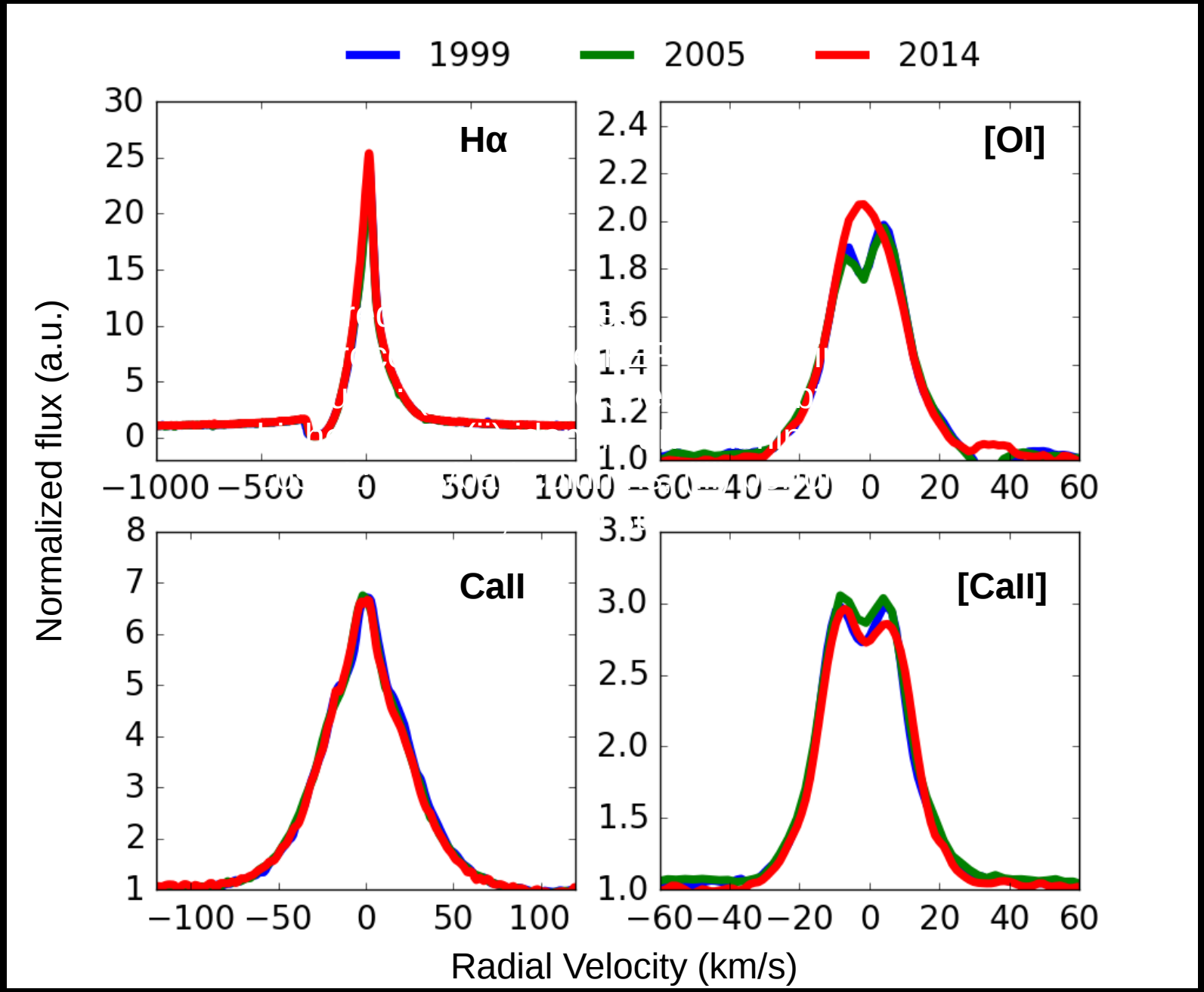


Kraus et al. 2007

Variability studies

PRELIMINARY

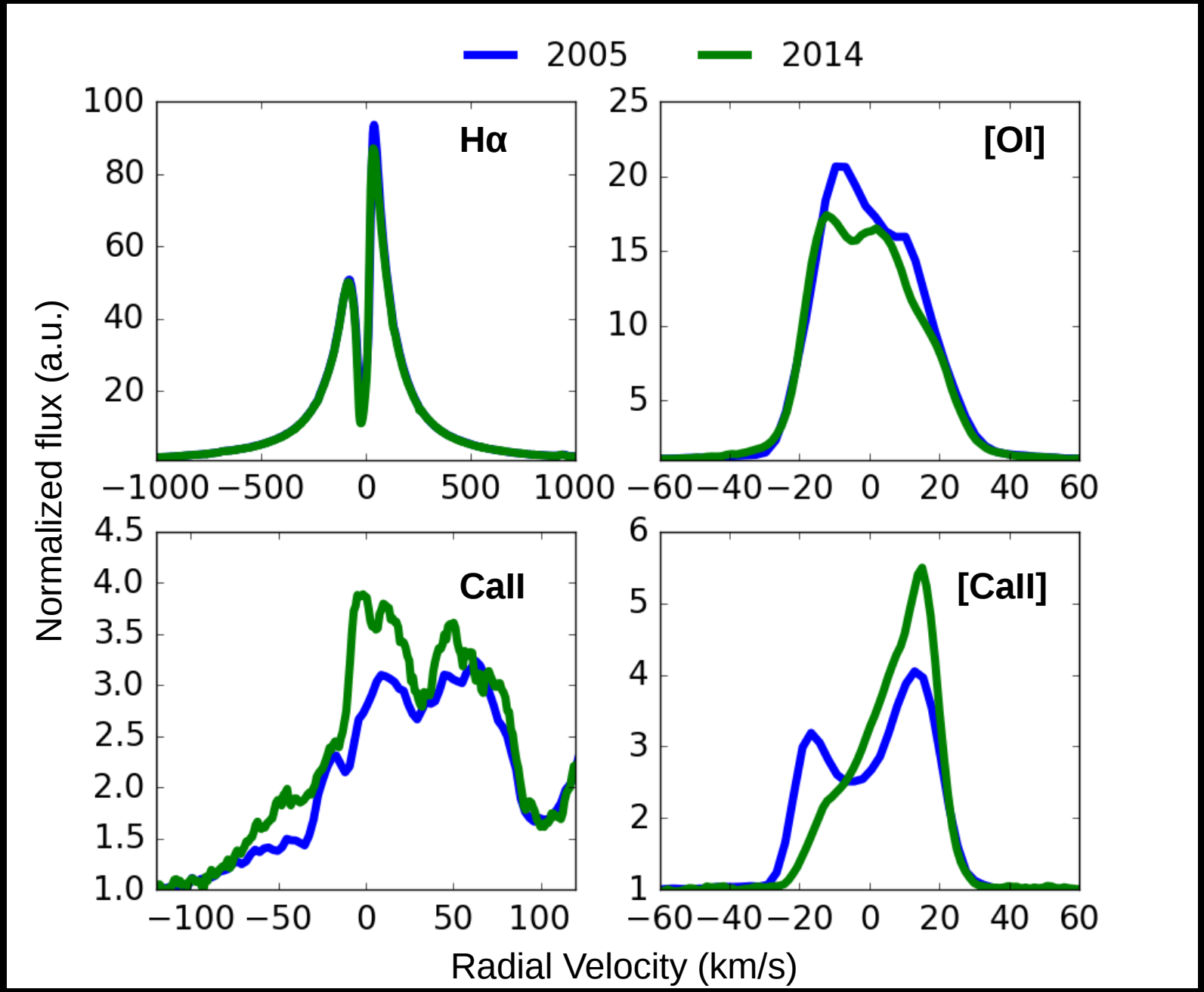
LHA120-S73



Variability studies

PRELIMINARY

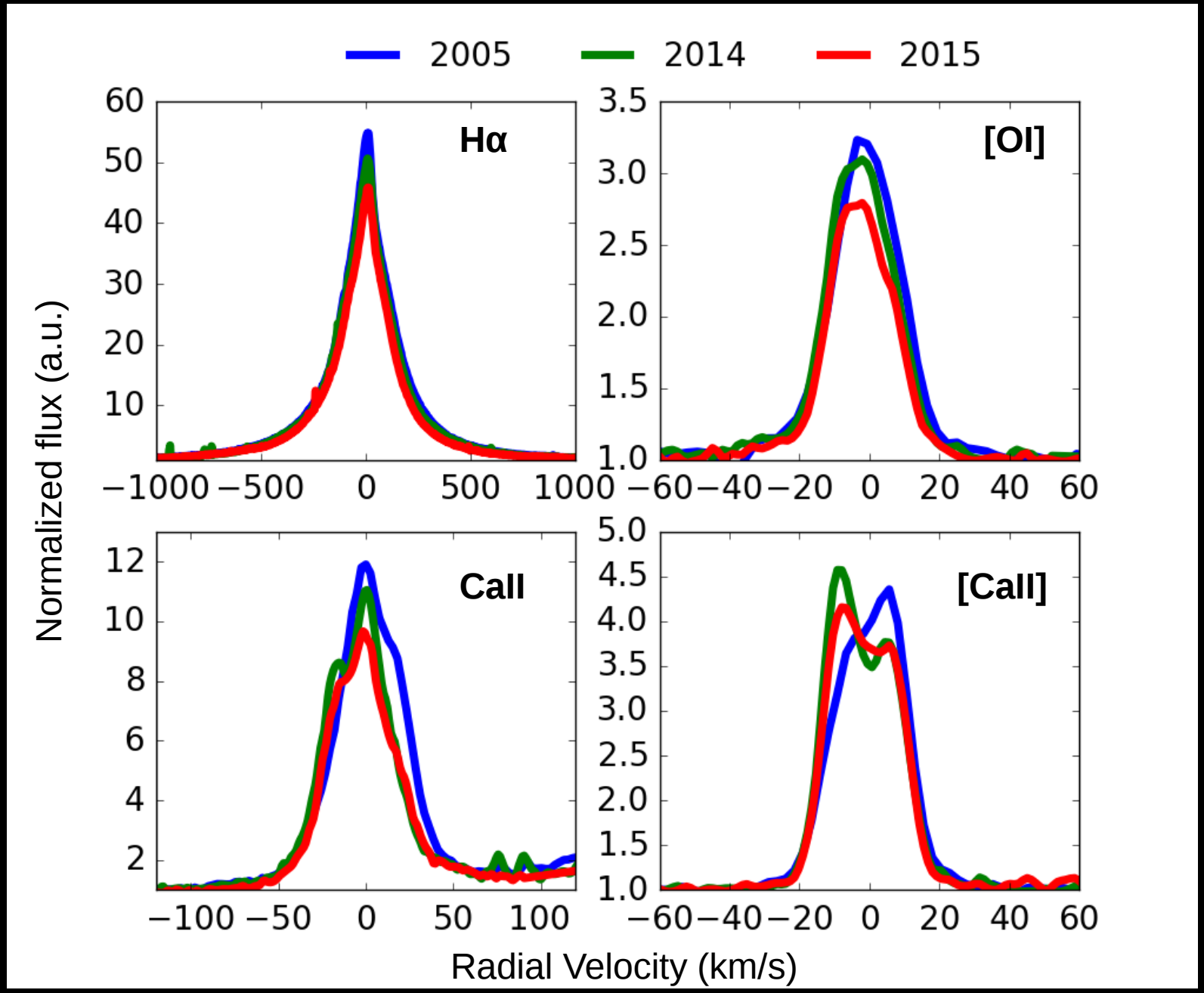
LHA120-S22



Variability studies

PRELIMINARY

LHA120-S18



Summary

- ✔ Emission lines ([OI] λλ5577,6300 and [CaII] λ7291)
  - → probe regions of different temperature and density
  - → provide information about the kinematics
- ✔ Spectroscopic campaign of Galactic and Magellanic B[e] SGs
- ✔ Identify 4 new identifications in the Magellanic Clouds
- ✔ Investigate kinematics for Aret et al. 2012 sample (8 sources)
- ✔ Investigate variability
- ✔ Understand mass-loss history

Summary + Future

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- ✔ Spectroscopic campaign of Galactic and Magellanic B[e] SGs
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new FEROS runs

new data
(12 Magellanic + 10 Galactic sources)