

On the possible new shell-phase and the slow-down of the galactic unclassified B[e] star HD50138



Marcelo Borges Fernandes

(Observatoire de la Côte d'Azur, France)



In collaboration with:

Dr. Michaela Kraus (Astronomický ústav, Ondřejov)

Dr. Olivier Chesneau (OCA, France)

Dr. Armando Domiciano de Souza (UNICE, France)

Dr. Francisco X. de Araújo (ON, Brazil)

Dr. Daniela Korčáková (Astronomický ústav, Ondřejov)

and also other people from the french group

B[e] phenomenon (Zickgraf, 1998)

The presence in the optical spectrum of B-type stars:

1 – Strong Balmer emission lines;

2 – Permitted and forbidden low-excitation emission lines of metals singly ionized, as FeII, and also [O I];

Strong near to mid-IR excess due to hot circumstellar dust

HD50138 = HAeB[e] or classical Be star = unclassified B[e]

Doubts due to strong spectral variations seen in the optical and in the UV
and the absence of reliable stellar parameters for this object



From B5 to A0 and from III to Ia



Suggestion: shell-phases or outbursts

Based on polarimetry and spectro-polarimetry:



Intrinsic polarization (non-spherical symmetry) – disk ?



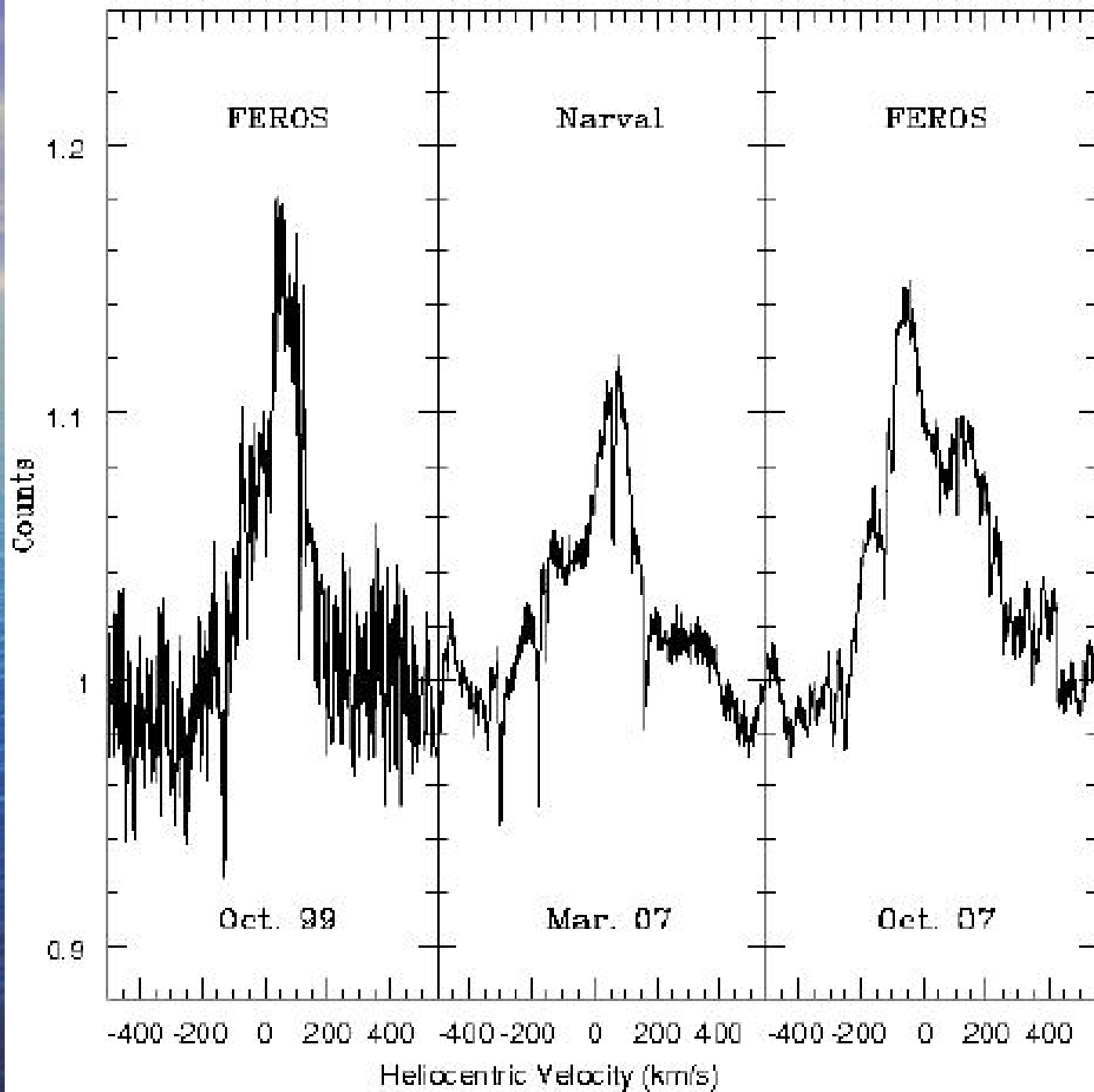
The possibility of binarity

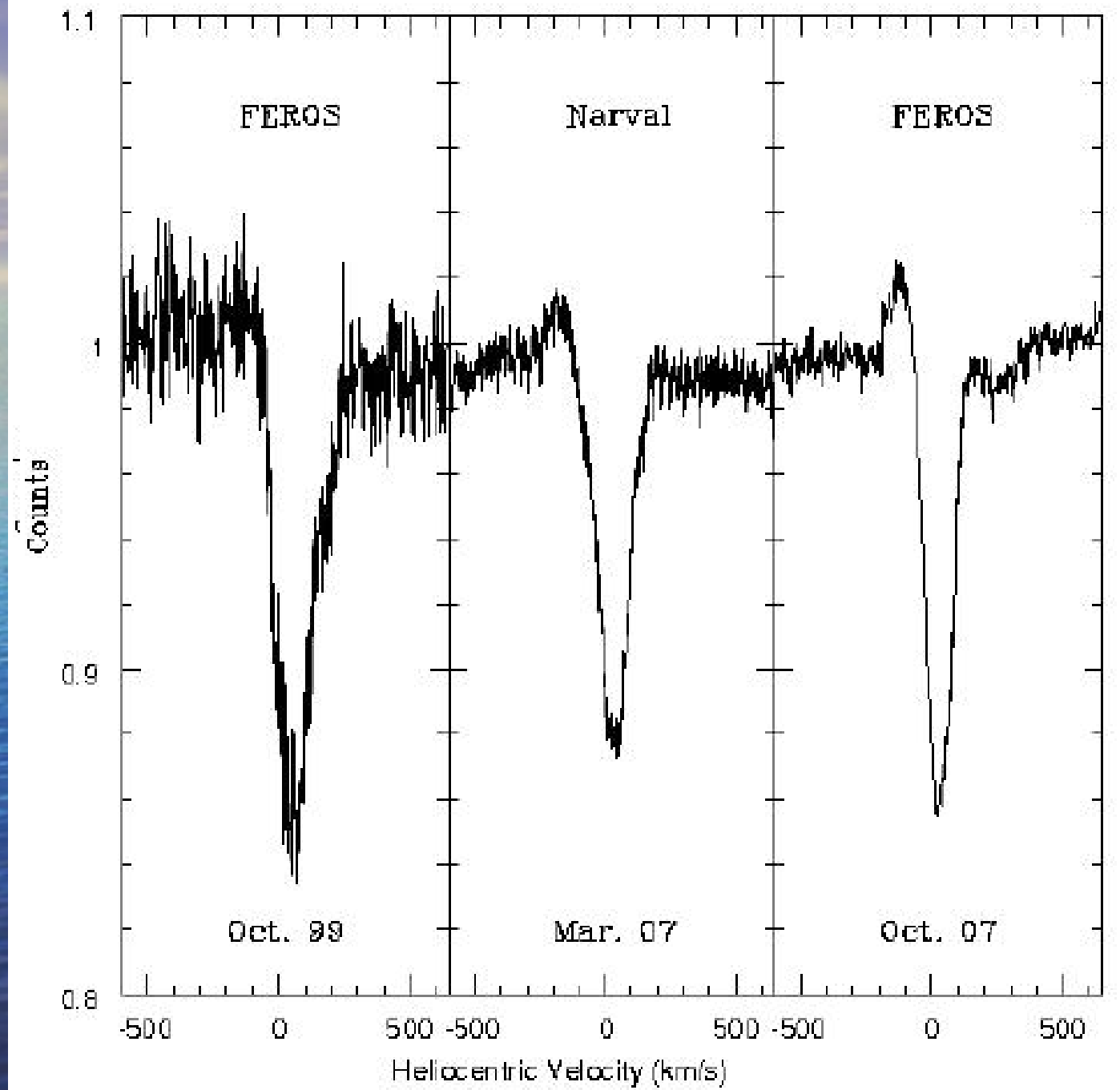
We have decided to make a photometric and spectroscopic analysis of HD50138:

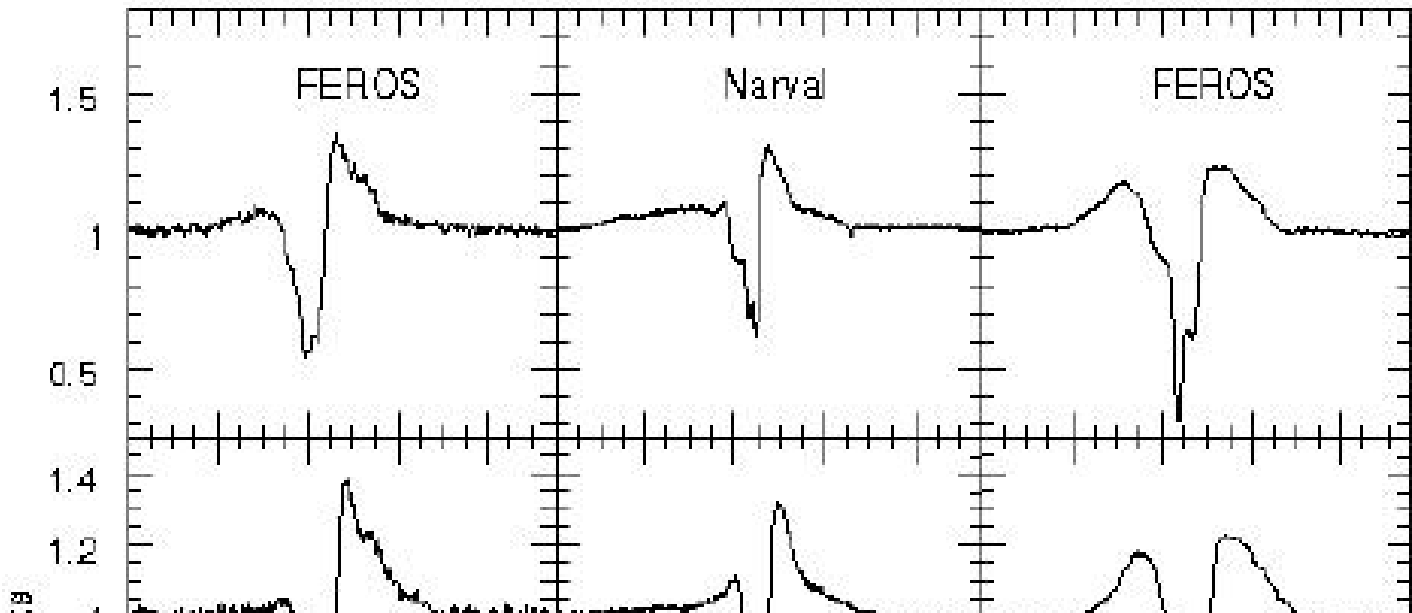
High-resolution spectroscopic data: Feros (Oct. 1999)

Narval (Mar. 2007)

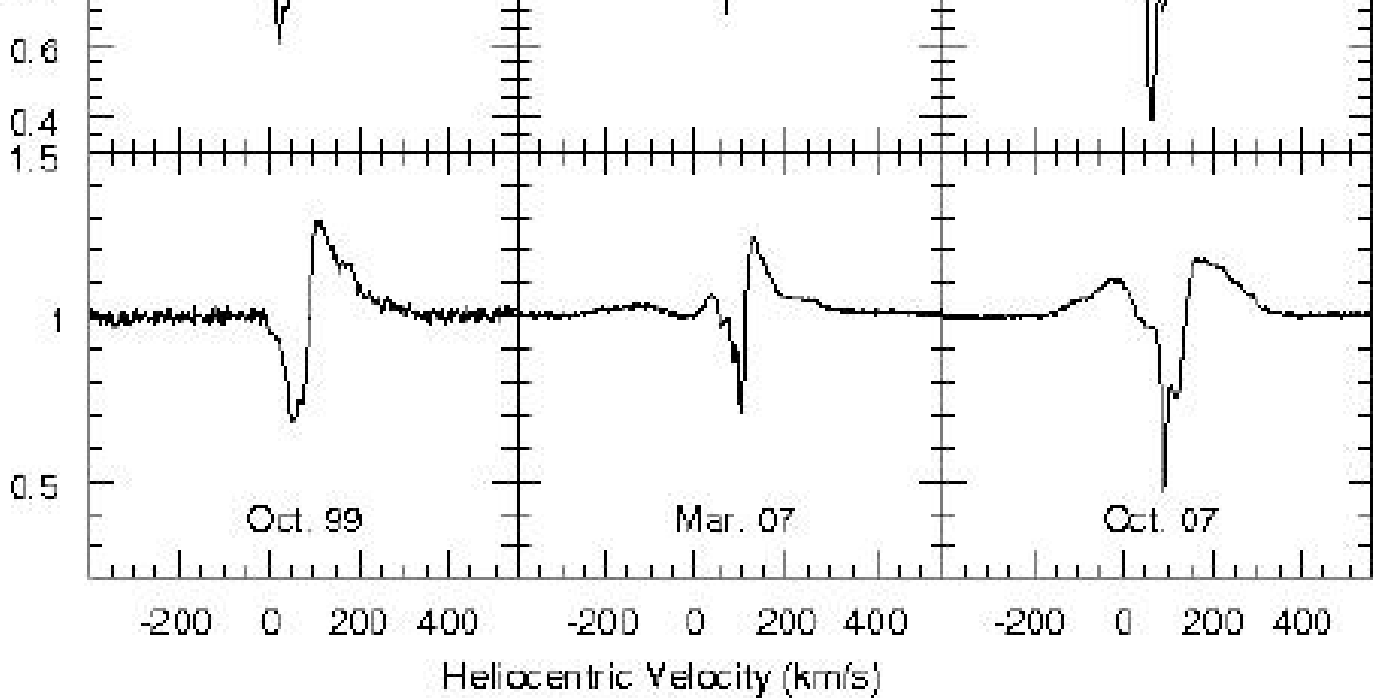
Feros (Oct. 2007)



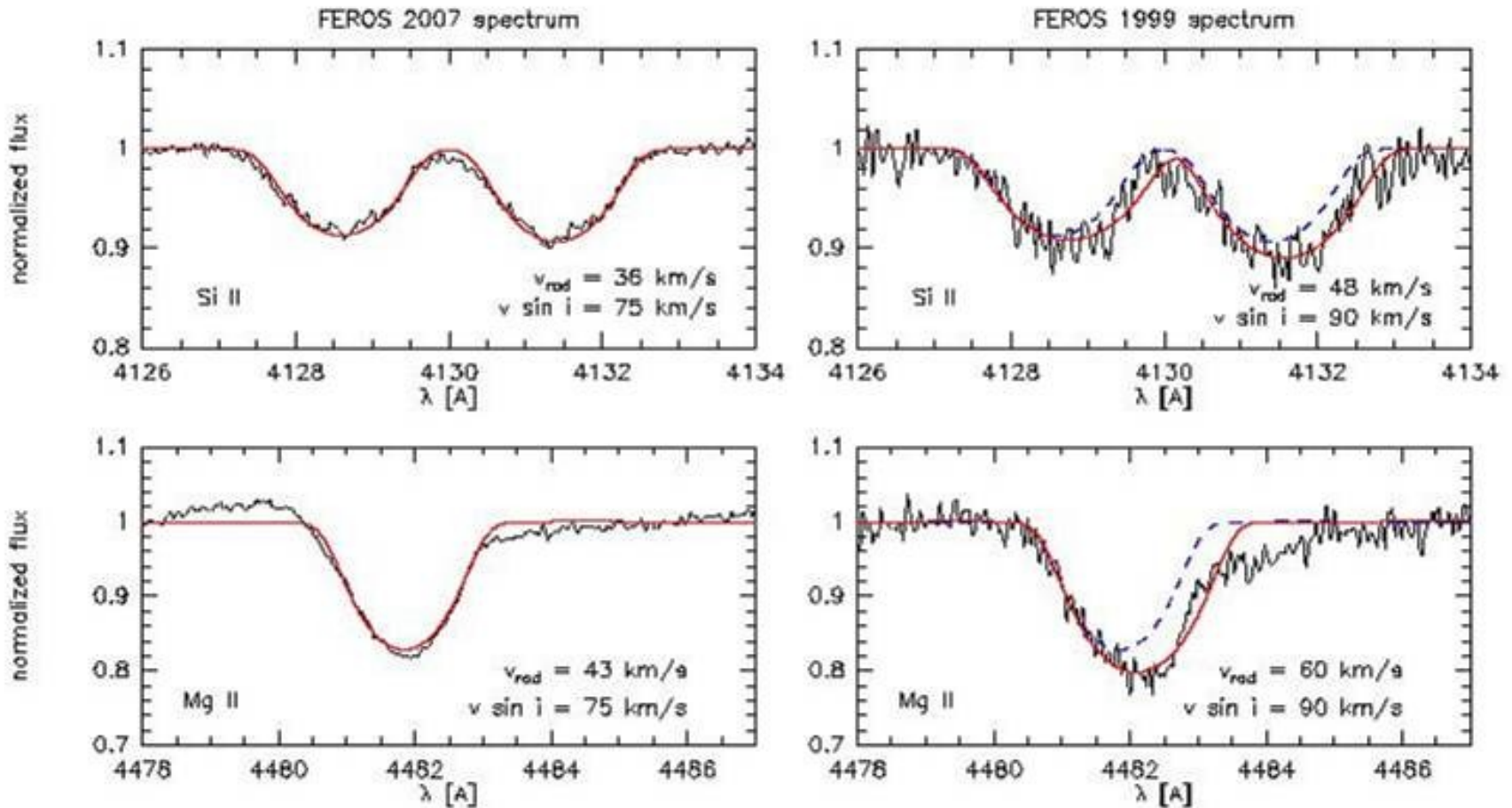




Temporal evolution from Oct. 1999 to Oct. 2007



Some of the lines present in our spectra, which are in absorption, we believe that are “photospheric” in origin. So we have tentatively derived the $v \sin i$:



From 1999 to 2007, the star would have slowed-down by 20% (from 90 to 75 km/s) and 50% compared to observations taken in 1958!

Possible explanations:

- A new ring or envelope with a lower outflow velocity would have started to expand before 2007. This new shell would also explain the

More observations with a better time resolution and a deeper analysis of different scenarios and modeling of line profiles are definitely necessary!!!

spiral”, as already suggested for classical Be stars (strong blue-shifted emission)

There are indications that the amount of dust in the line of sight is not so important, based on:

-the polarimetric analysis from Bjorkman et al. (1998), which shows there is a disk, but the polarization is caused mainly by electron scattering and not by the dust scattering;

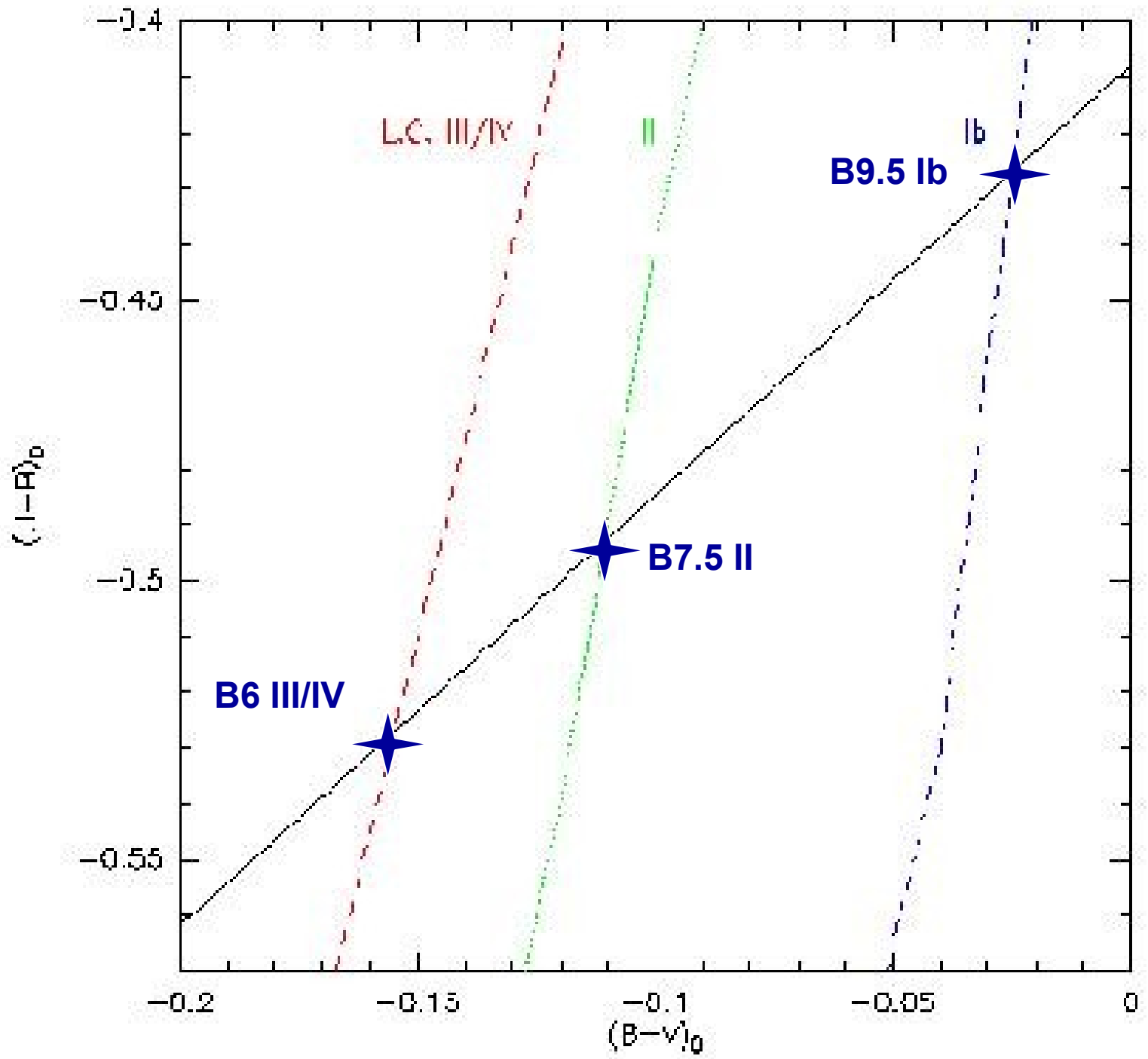
- there are small photometric variations.



The disk should not be seen edge-on.

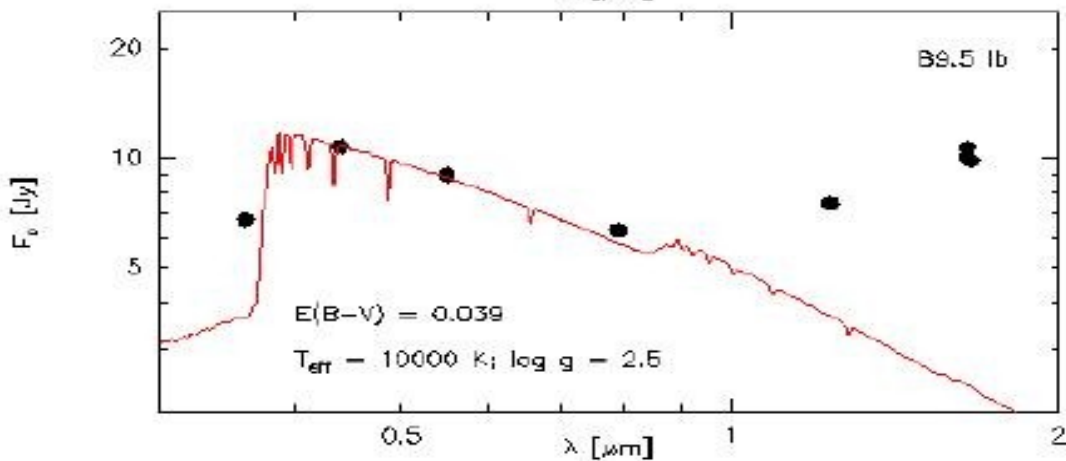
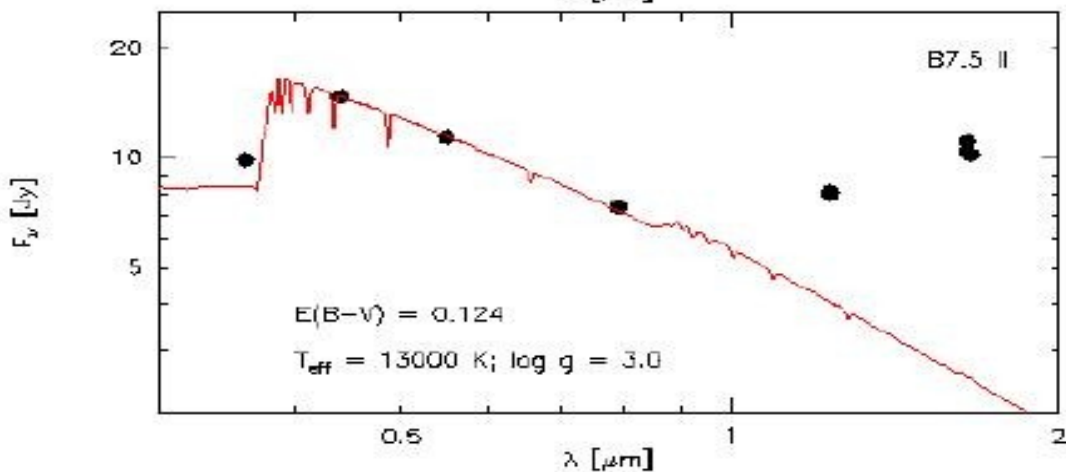
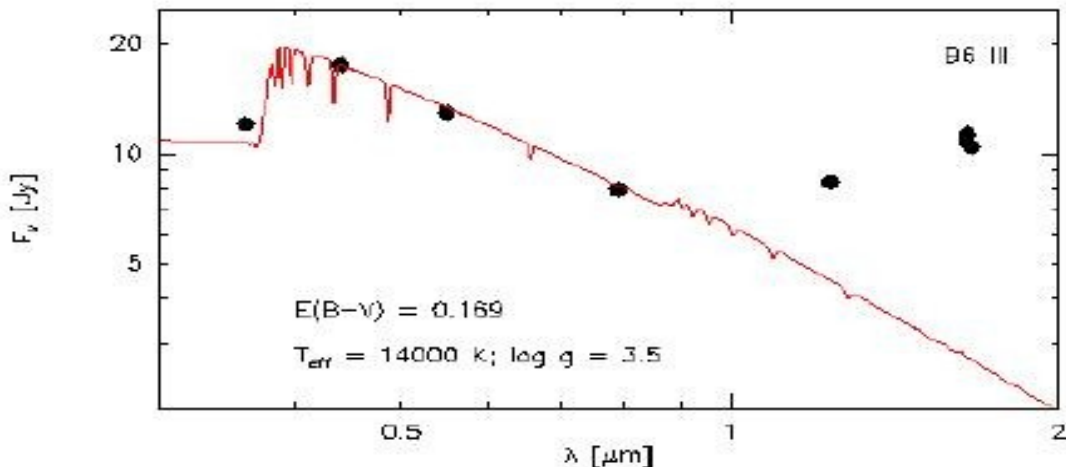


The extinction towards the star is of pure interstellar origin.



For each of the
colors of S

The observed
Kurucz model
and T_{eff})



the intrinsic

ted to the
ns ($\log g$

Assuming this star is a B6III or a B7.5 II and considering the two distances derived from the Hipparcos mission (290 pc and 500 pc), we have the following set of parameters for this star:

. d = 290 pc:

$$T_{\text{eff}} [\text{K}] = 13500 \pm 1000$$

$$\log g = 3.25 \pm 0.5$$

$$R_* [R] = 4.4 \pm 1.1$$

$$\log (L_*/L_\odot) = 2.7 \pm 0.3$$

$$V_{\text{crit}} [\text{km/s}] = 440 \pm 5$$

. d = 500 pc:

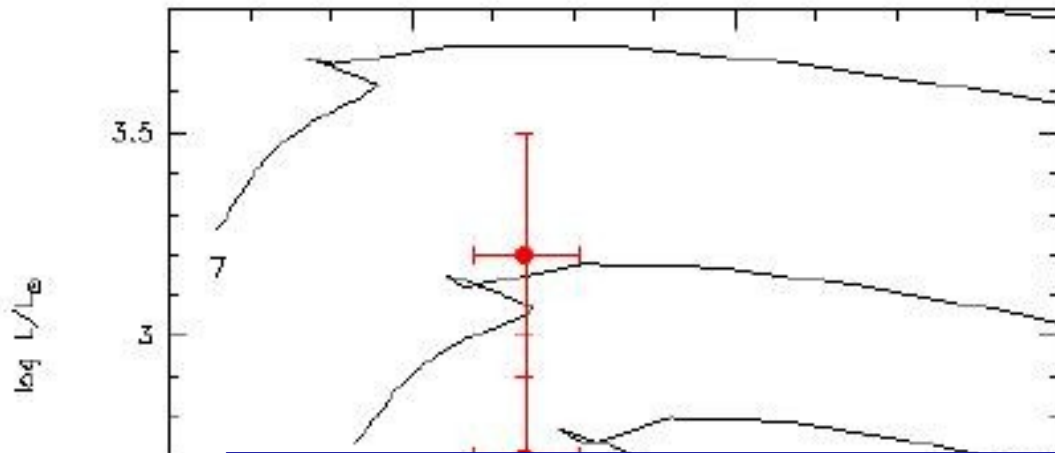
$$T_{\text{eff}} [\text{K}] = 13500 \pm 1000$$

$$\log g = 3.25 \pm 0.5$$

$$R_* [R] = 7.6 \pm 2.3$$

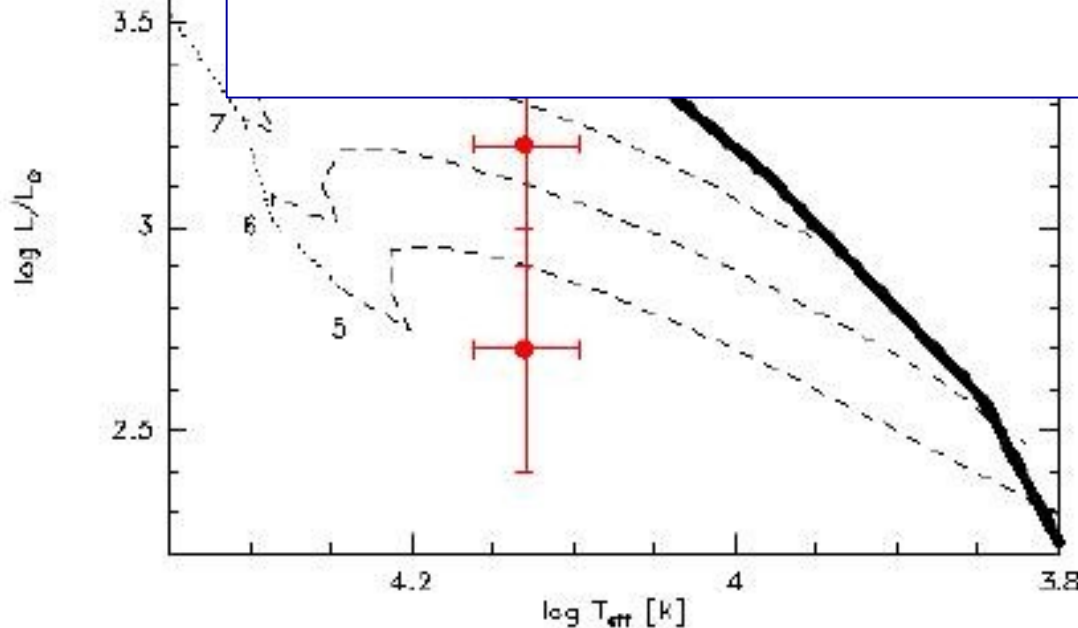
$$\log (L_*/L_\odot) = 3.2 \pm 0.3$$

$$V_{\text{crit}} [\text{km/s}] = 387 \pm 5$$



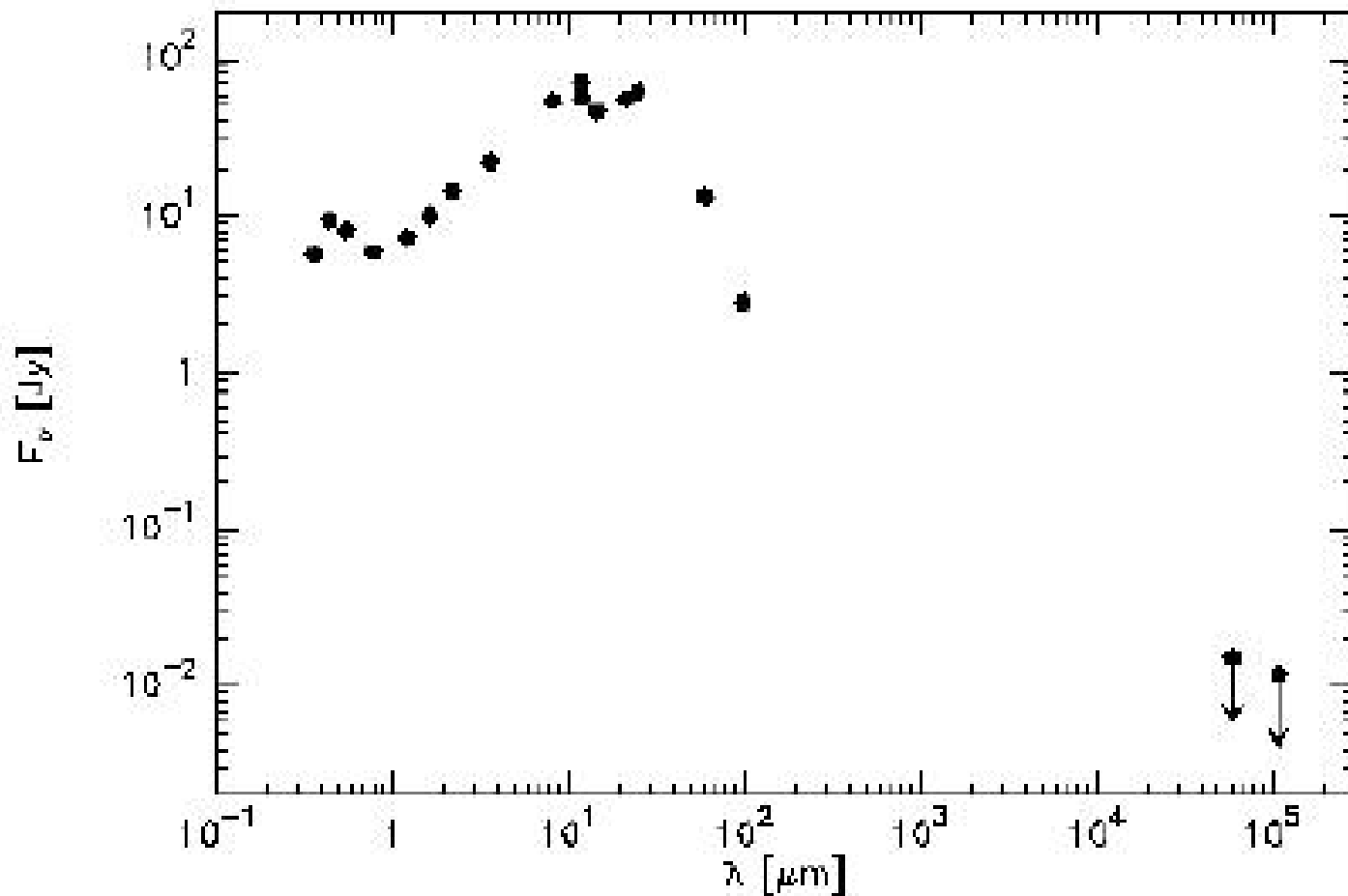
4.5 or 5.5 M evolving on or just off the main sequence

From the position in the HRD alone, it is not possible to distinguish between a pre-main sequence and a more evolved nature



4-4.5 or 6.5 M pre-main sequence star

Pre-main sequence nature:



How
tha
have “photospheric” lines)

higher
ce we



Transition object between Be and B[e] stars ?

The work is far from the end, so the next steps are:

- Observational campaign to have a better description of the spectral variations;
- The complete SED modeling: gas + dust, outflowing disk X flared disk (Michaela's codes, SIMECA, MC3D);
- Analysis of new interferometric data from VLT/MIDI and VLT/AMBER and images from VLT/VISIR, allowing us hopefully to get more information about the circumstellar geometry and the inclination of this curious star.

More details soon, in the paper: “On the possible new shell-phase and the slow-down of the galactic unclassified B[e] star HD50138” already submitted to A&A.

Thank you for your attention

Děkuju!