

Automated classification of IPHAS Be stars in the BCD (Barbier-Chalonge-Divan) system

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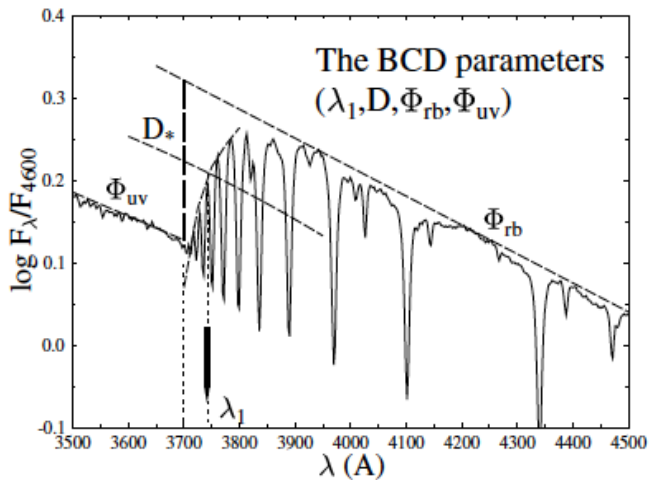
Optical and Infrared Galactic Plane Surveys, Hertfordshire, July 2011

- Most of the IPHAS $H\alpha$ emitters are Be stars
- Hundreds of follow-up spectra (fast, iac-ity, etc...)
- Be stars are tracers of the galactic structure
- Standard MK classification is difficult, due to the circumstellar continuum and line emission features and the strong interstellar bands
- Need of a reliable, automated classification procedure

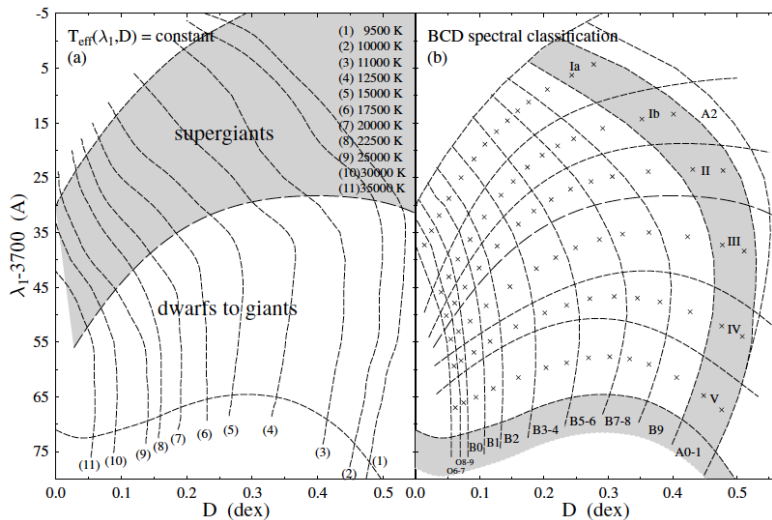
The BCD system

- Developed between 1930 and 1970 by Daniel Barbier, Daniel Chalonge and Lucienne Divan at the IAP, Paris (Barbier & Chalonge 1941, AnAp 4, 30; Chalonge & Divan 1952, AnAp 15, 201; 1973, A&A 23, 69; 1977, A&A 55, 117; Cidale et al 2001, A&A 368, 160; Zorec et al. 2009, A&A 501, 297)
- Bi-dimensional classification schema based on the measure of the Balmer discontinuity
 - D is a measure of the Balmer jump depth. T_{eff} indicator
 - λ_1 is a measure of the mean Balmer jump position. Luminosity indicator
- Currently in use by groups at the IAP and La Plata

The BCD system



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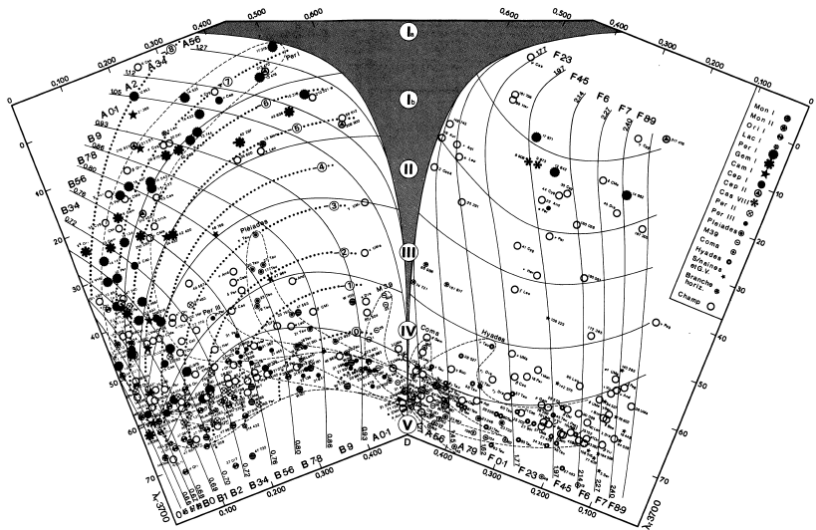
The BCD system: interstellar reddening

- Φ_{rb} is the slope of the Paschen continuum between 4000 and 5400 Å

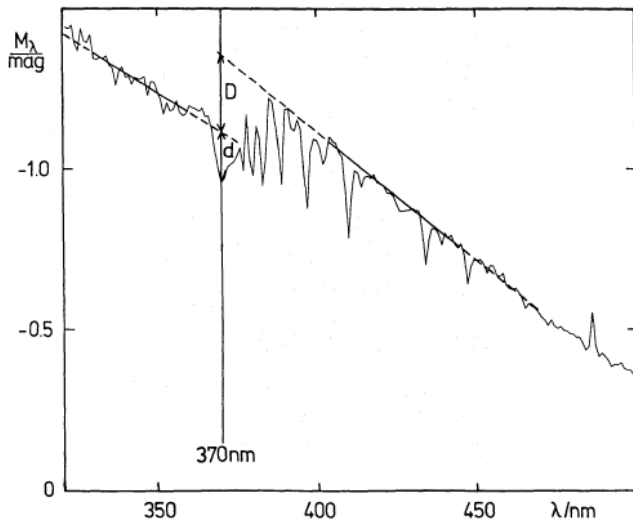
$$\log F_{\lambda} = \Phi_{\text{rb}}(1/\lambda) + b, \lambda \text{ in } \mu\text{m}$$

- The intrinsic Φ_{rb}^0 is obtained from D and λ_1
- $E(\text{B-V}) = 0.548 (\Phi_{\text{rb}} - \Phi_{\text{rb}}^0)$

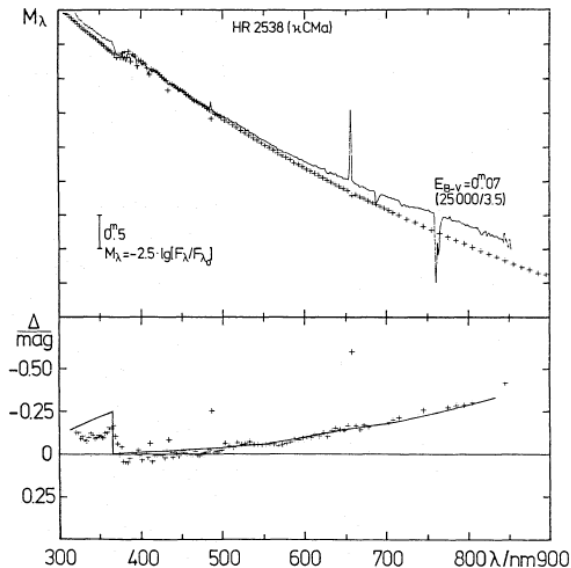
The BCD system



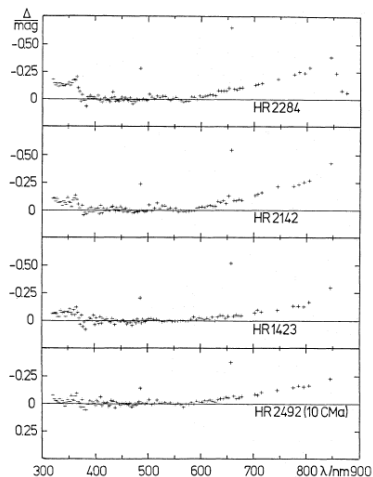
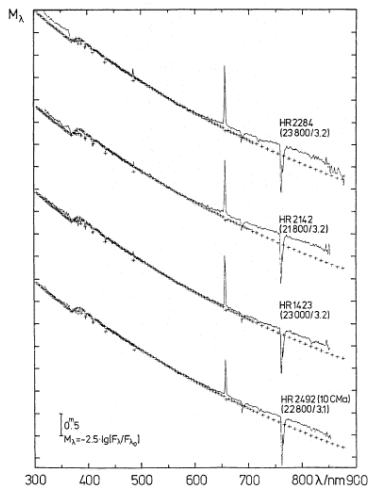
BCD and the Be stars: a second Balmer jump



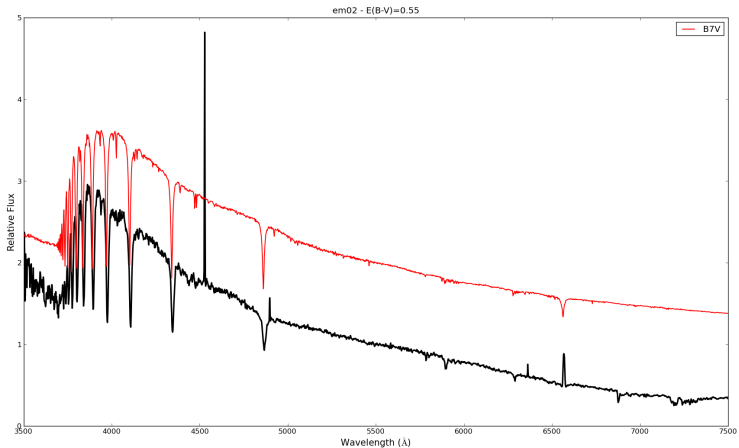
BCD and the Be stars: a second Balmer jump



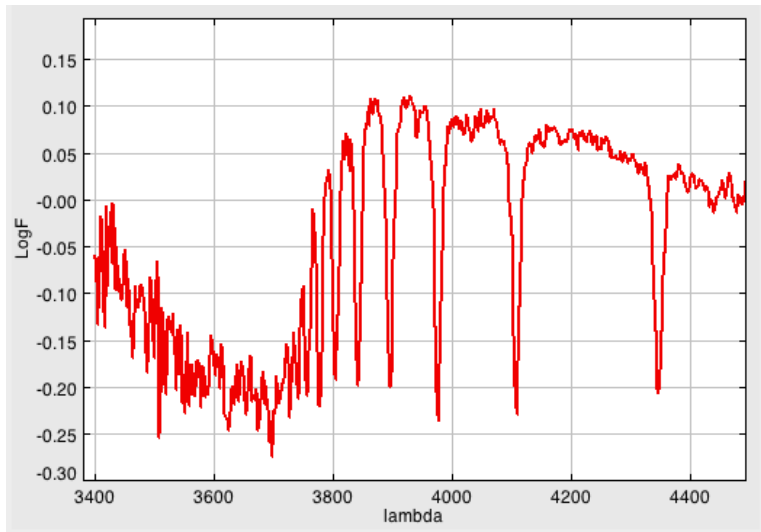
BCD and the Be stars: a second Balmer jump



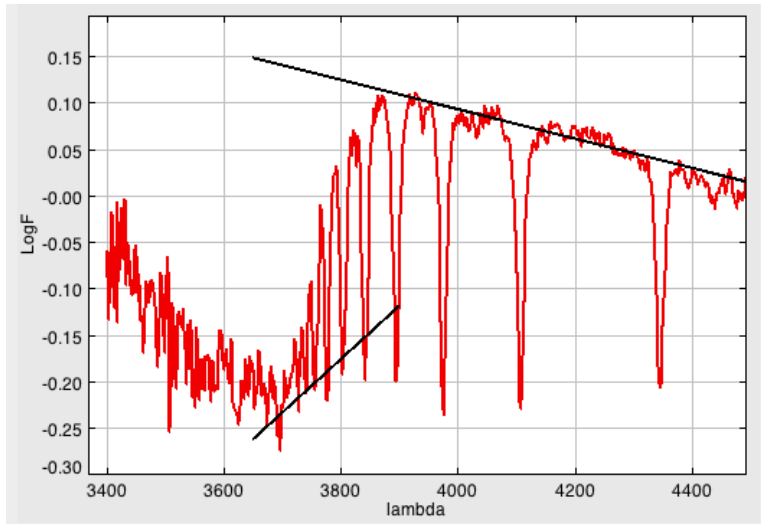
Test 1: IPHAS J002926.93+630450.2



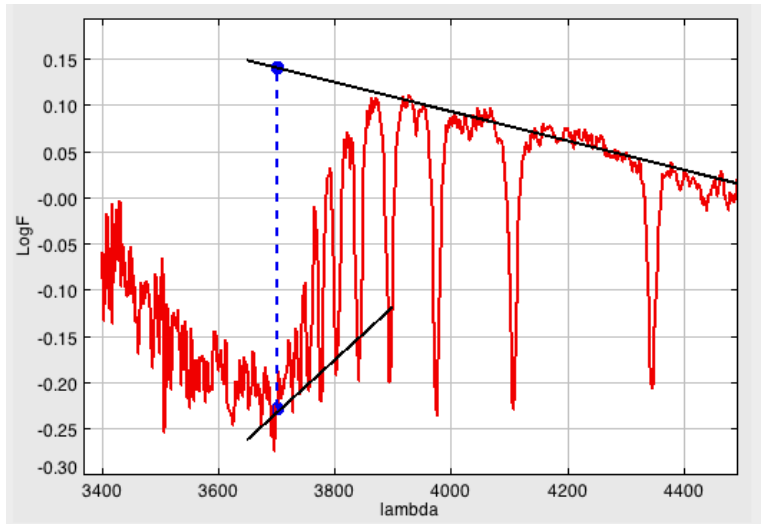
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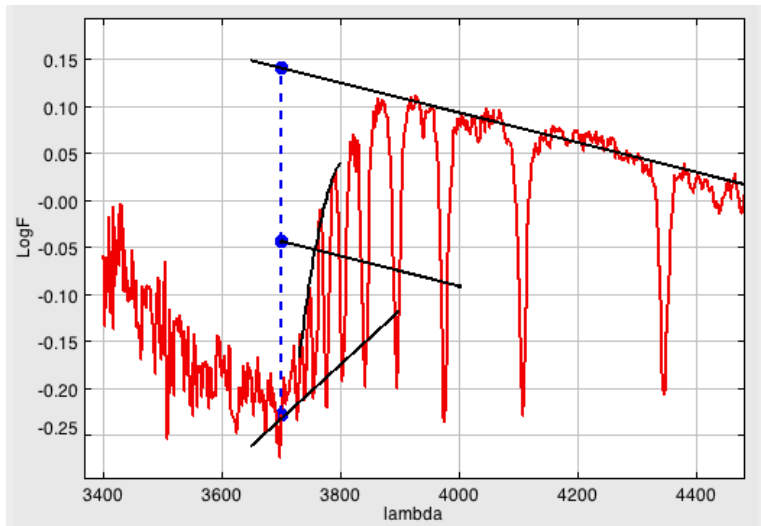
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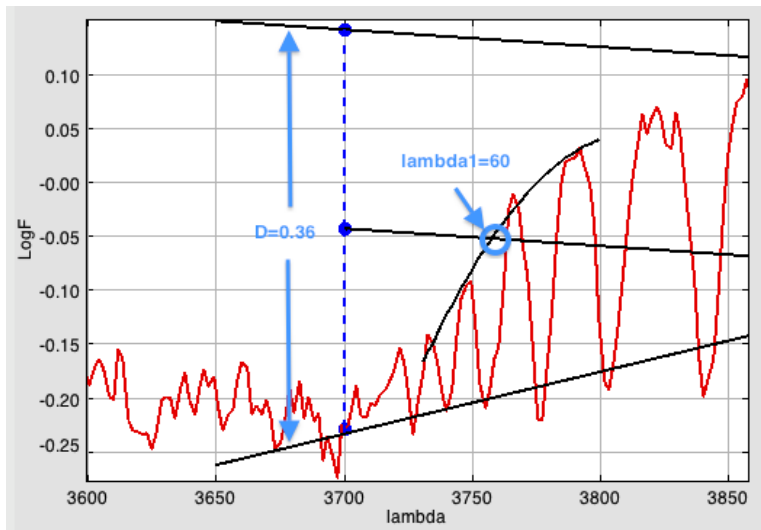
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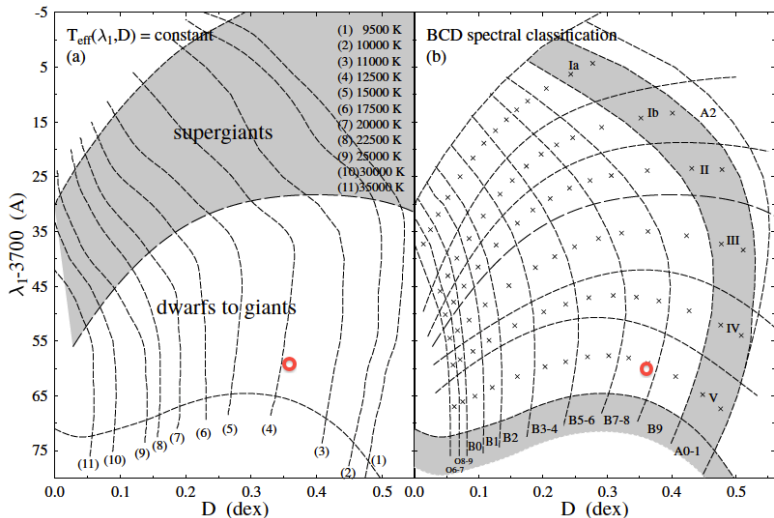


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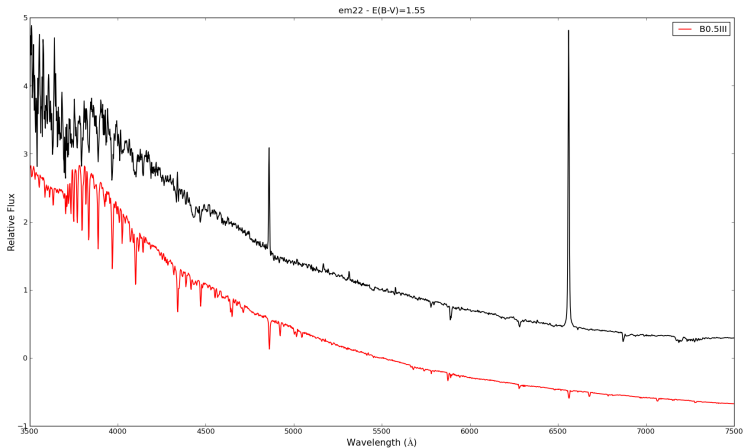


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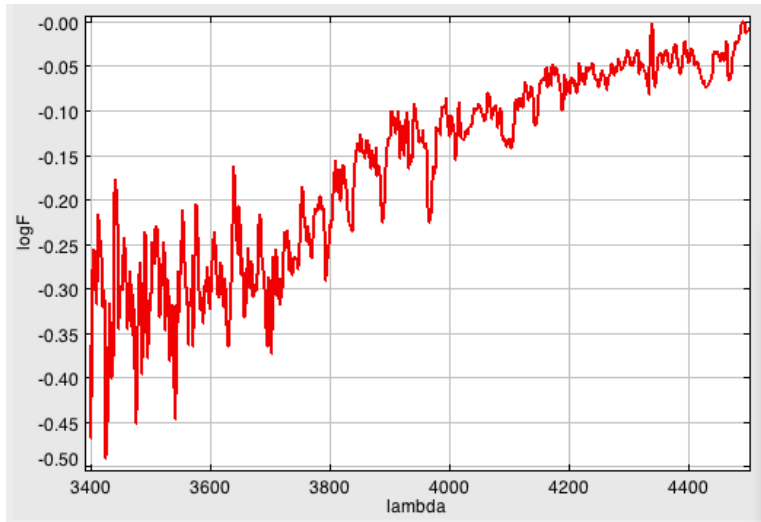
B8V (BCD); B7V (RR); B6V (JF)



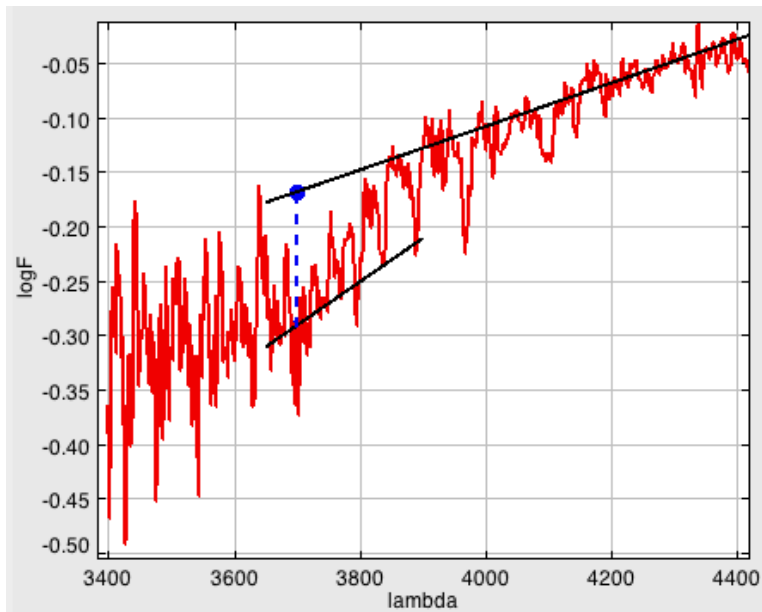
Test 2: IPHAS J011543.94+660116.1



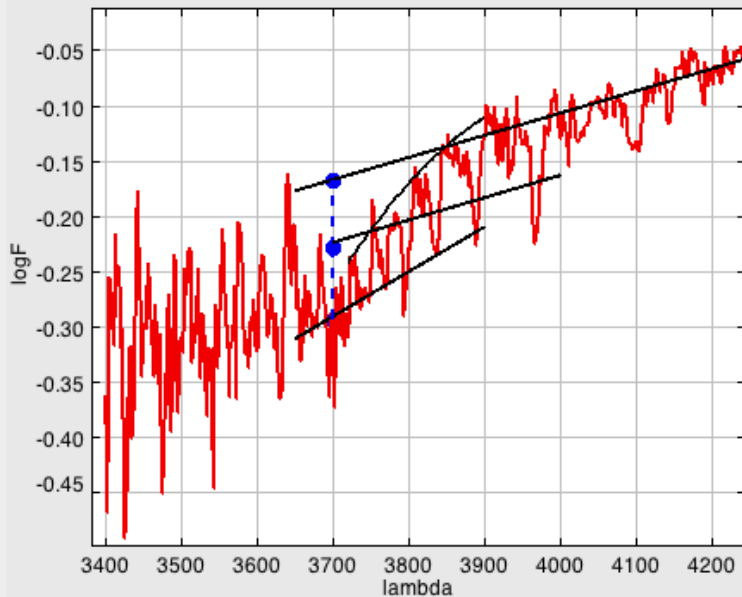
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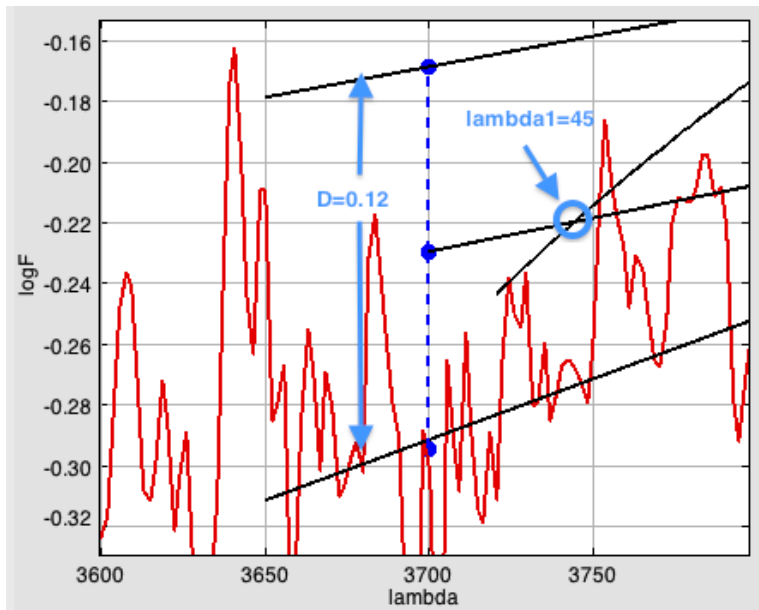
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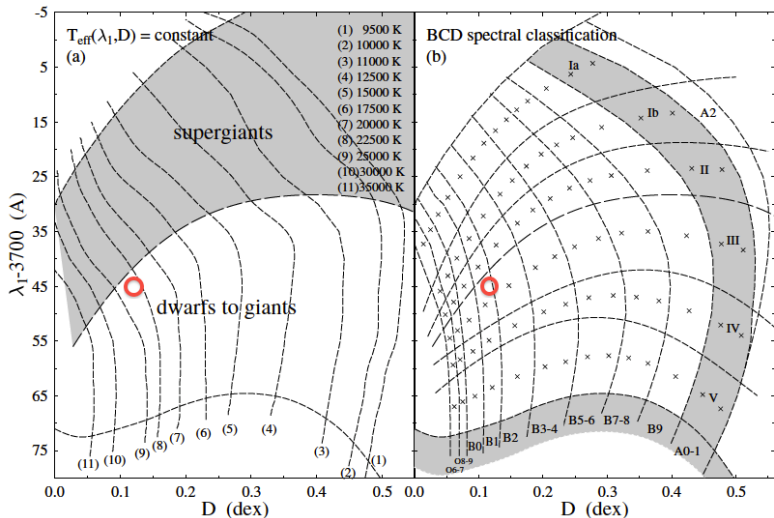


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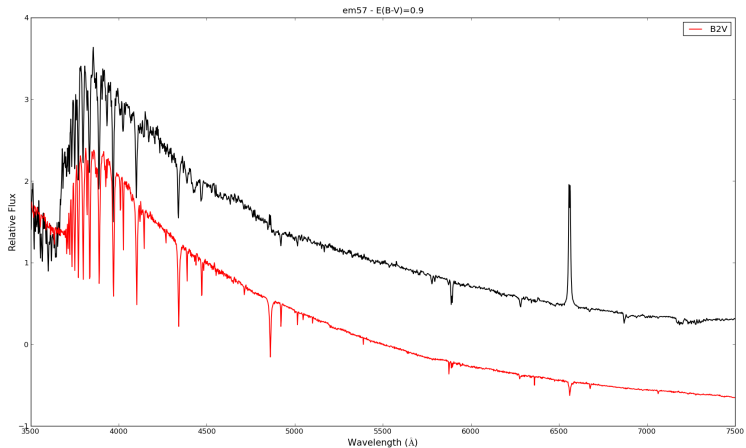


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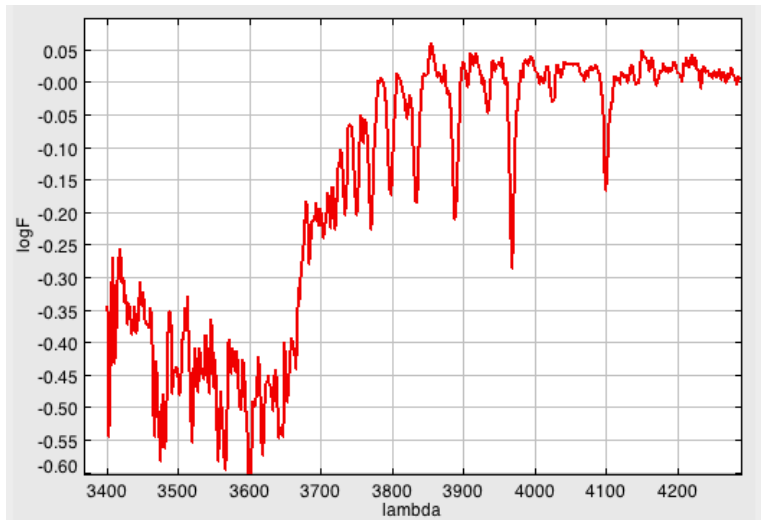
B1III (BCD); B0.5III (RR); B0.5III (JF)



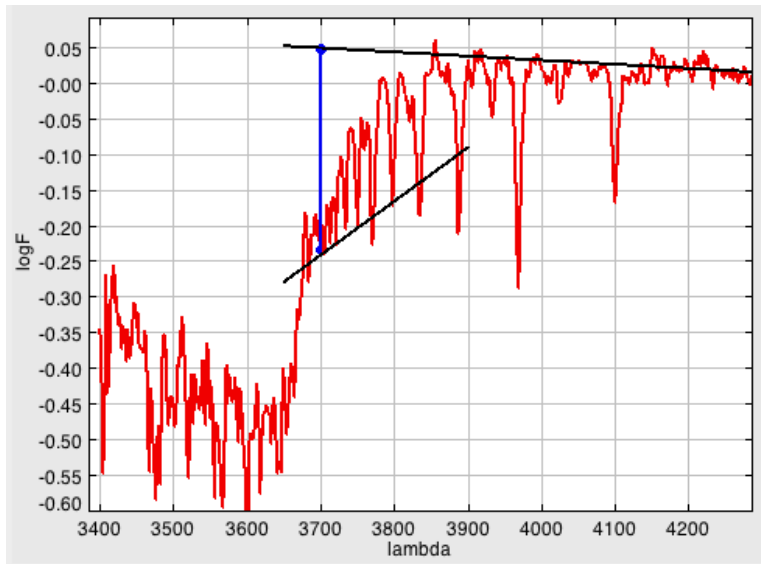
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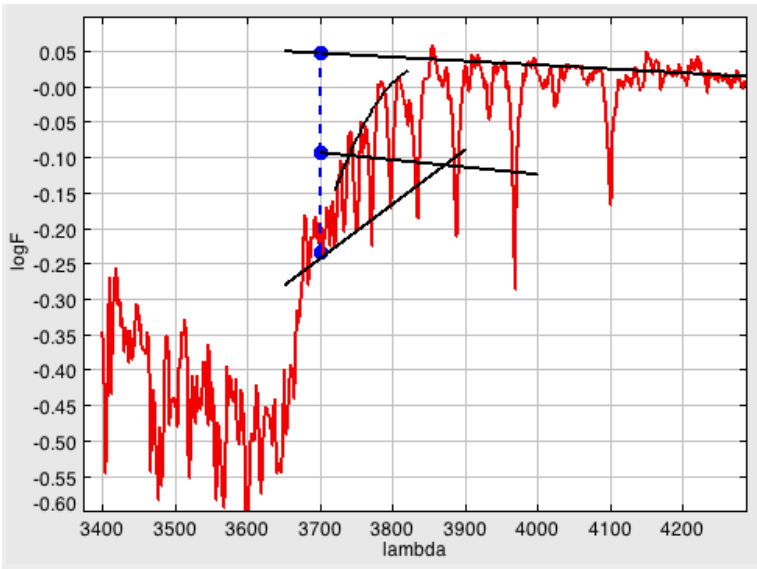
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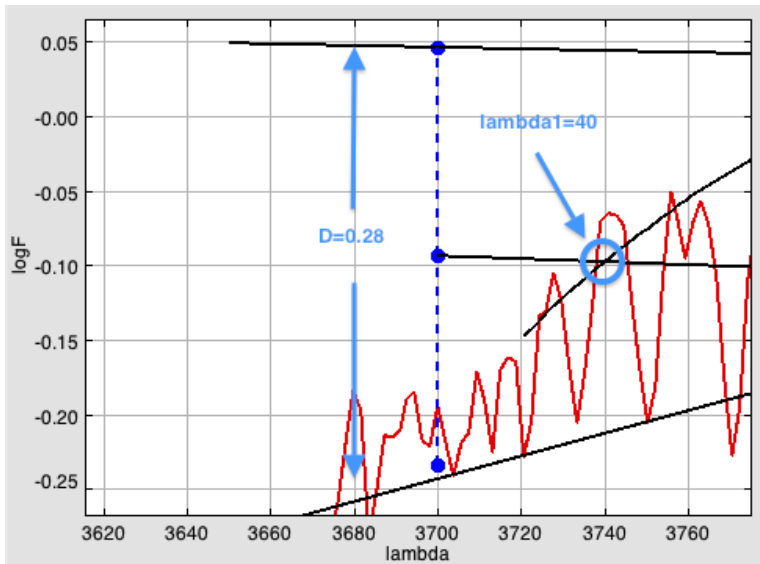
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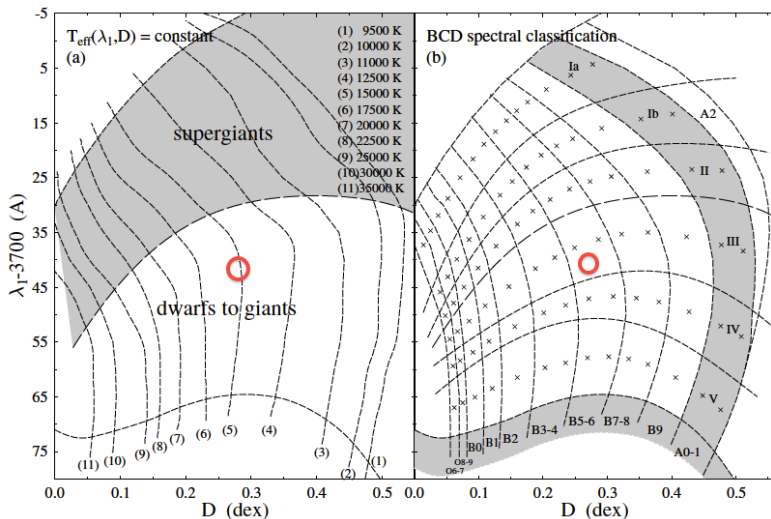


Test 3: IPHAS J015922.53+635829.3



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B5III (BCD); B2V (RR); B3III (JF)



- The BCD system provides a consistent schema for the bi-dimensional spectral classification and the determination of stellar temperatures and luminosities, in the O-F spectral range
- The BCD parameters are independent of the interstellar reddening and the circumstellar continuum emission
- It is specially well suited for emission-line stars, and in particular for classical Be stars
- The classification procedures can be automatized

- Test the system with a statistically significant sample of IPHAS spectra
- Full understanding of the BCD techniques and subtleties
- Development of an automatic pipeline for the spectral classification and determination of the physical parameters
- Classification and analysis of all IPHAS spectra of Be stars