Simultaneous Optical to Infrared Photometry and Spectroscopy of the classical Be Stars with Large Near-Inrfrared Excess: the Case of CD-49 3441

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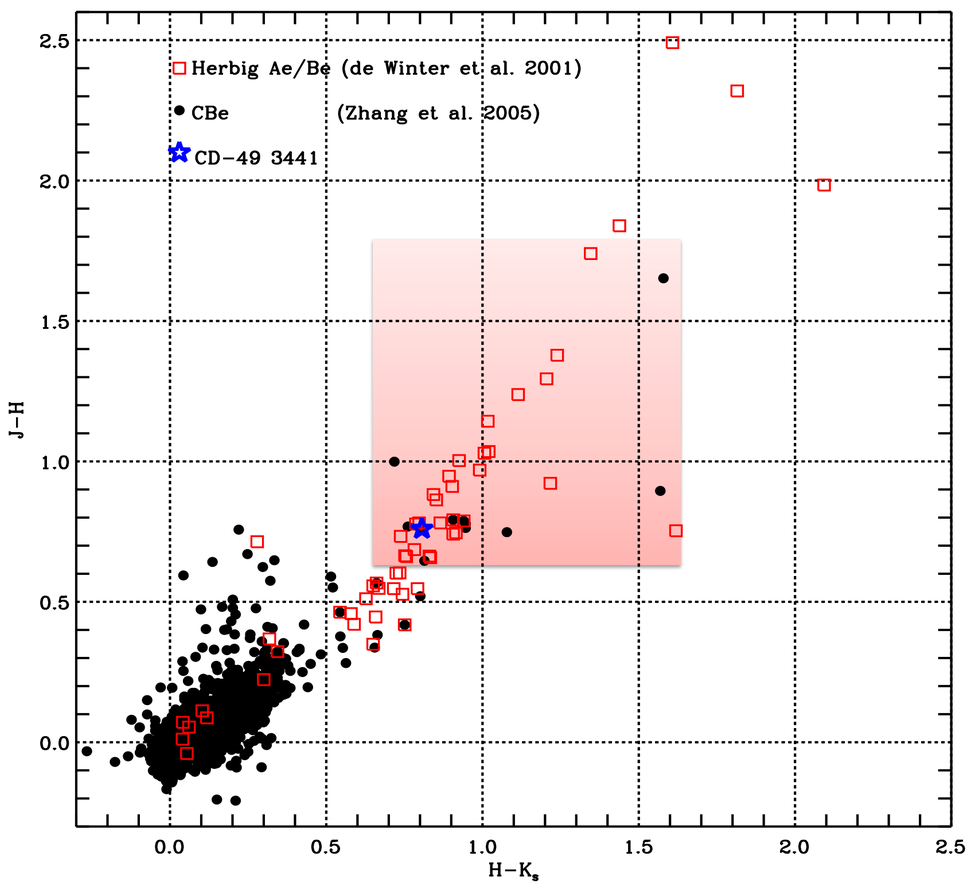
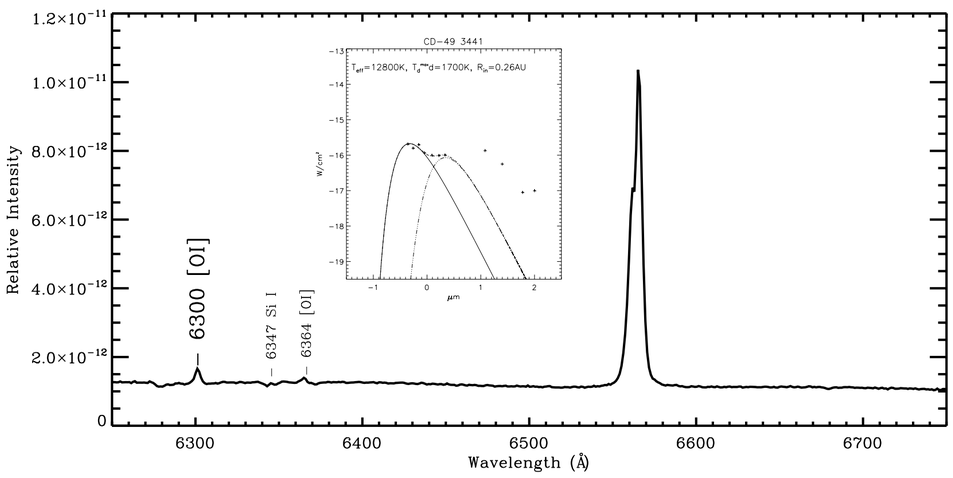
Classical Be Stars with Large IR Excess

- Classical Be (CBe) stars and Herbig Ae/Be stars show different extent of near infrared (IR) excess.
- A few CBe stars such as CD-49 3441, have very large near-IR excess.
- Prominent IR excess cannot be explained by free-free emission alone (Lee & Chen 2009). The excess emission often extends to far-IR and beyond, suggestive of thermalized circumstellar dust.
- Most of CBe stars are too bright (V < 10 mag) for photometry observation even by one meter telescopes. CD-49 3441 is a margined case (V = 10.3 mag) which is a proper case to investigate.



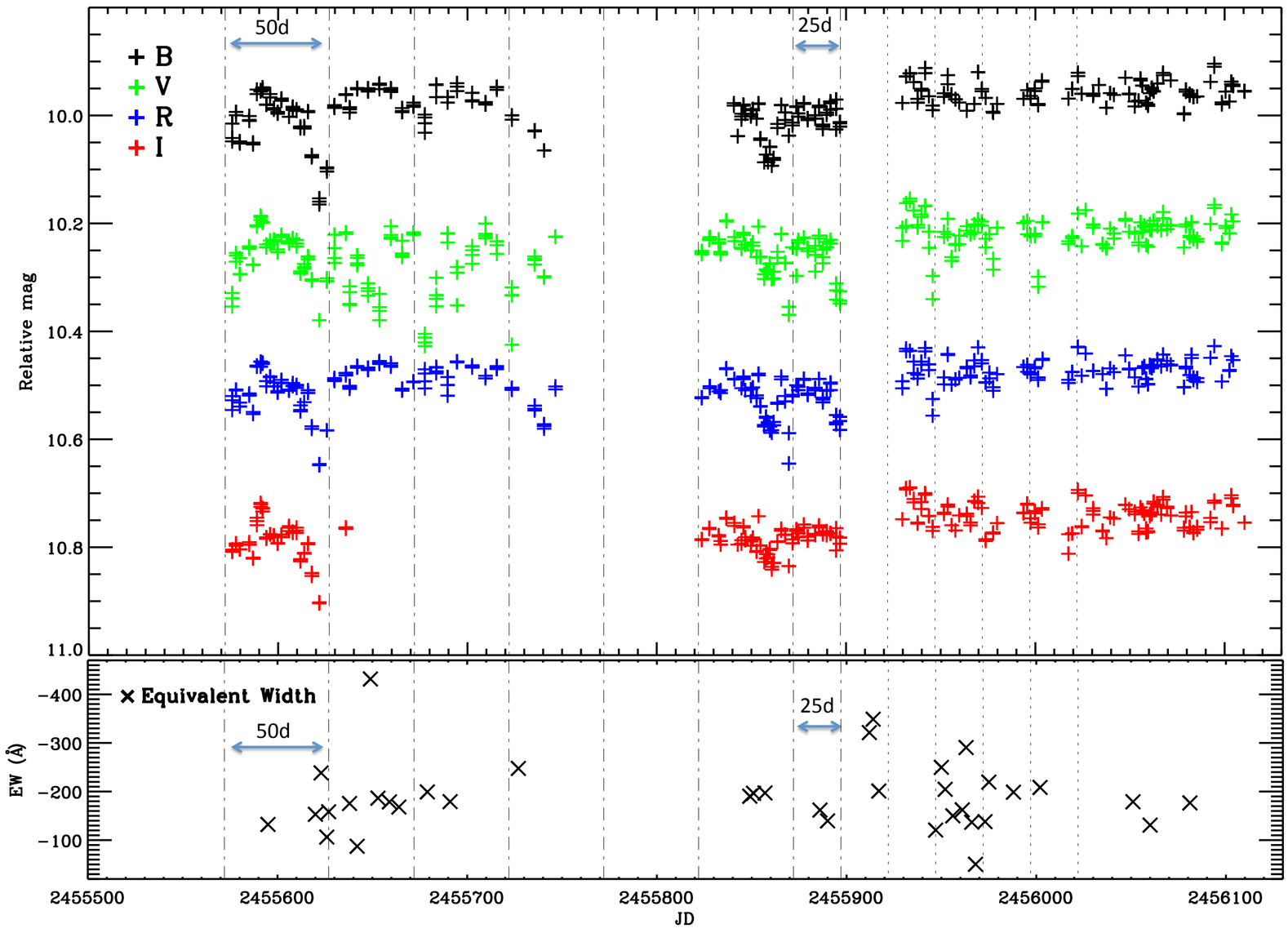
CD-49 3441

- CD-49 3441 is a late B type star at distance of 1400 pc (Miroshnichenko et al 2001) .
- It shows the forbidden line [OI] and very strong Hα in emission (SMARTS 1.5m).
- There are clouds and a star cluster projected near CD-49 3441, but they are at a distance of about 400 pc, form which the star could not have have escaped.
- Therefore the IR excess is not from surplus star-forming material.



Variations of CBe Star: CD-49 3441

- CBe are known to vary both in brightness and spectral lines (intensity and shape), with time scales from years, weeks, days to minutes, usually nonperiodically (Patel et al. 2006)
- Spectroscopic and multi-band photometric observations were carried out by SMARTS 1.5 m and 1.3 m telescope from early 2011 to mid 2012, typically one measurement in a few days.

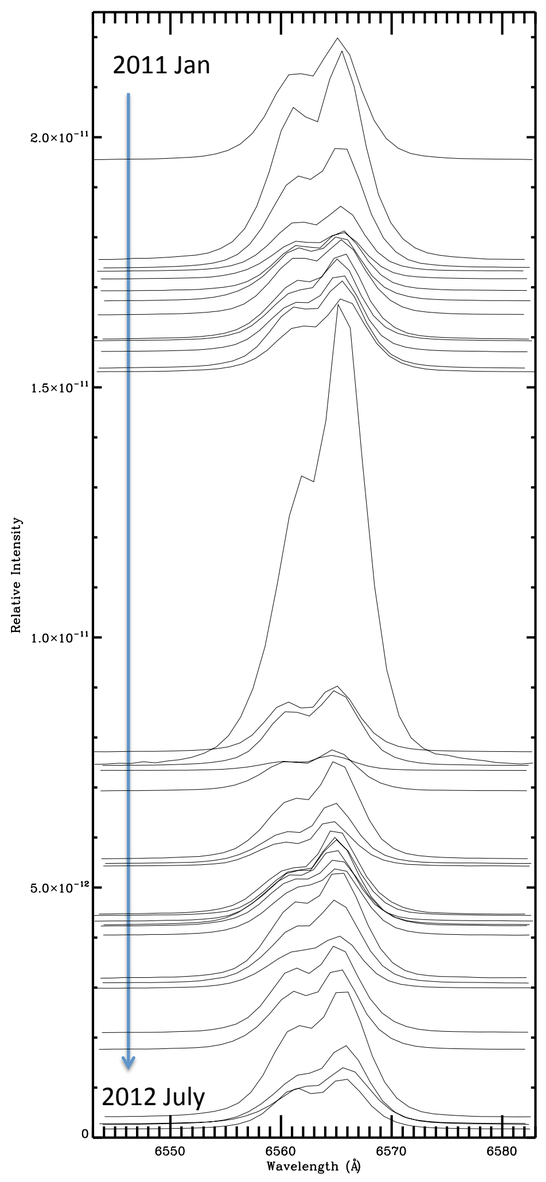


BVRI Photometry Variation

- The multi-band light curves show eclipsing behavior.
- However, the light curve ceased to show periodicity at a later end.

Hα Variation

- During one and half year, 40 spectra were measured at different epochs. The equivalent width and Hα profiles are presented at ther upper figure and right figure.
- The equivalent widths show extreme variations but no periodicity.
- Double-peaked emission of Hα emission was revealed in all observation epochs with slight V/R (violet-to-red) variation.
- Asymmetric V < R profiles were accounted for by circumstellar gas expansion like P Cyg stars.



Conclusion

Our preliminary results show that CD-49 3441 is a classical Be star with peculiar photometric and spectroscopic variations. More detailed analysis and interpretations are necessarily.

References :

Allen, C.W., 1963, Astrophysical Quantities (London: Athlone).

de Winter, D., et al. 2001, A&A, 380, 609s

R.D., et al. 1974 ApJ, 191, 675.

Kogre, T. & Leung, K. –C. 2007 The Astrophsics of Emission-Line Stars (Berlin: Springer)

Lee, C. D., & Chen, W. P. 2009, in APS Conf. Ser., 404,302

Malfait, K., et al. 1998, A&A, 331,221

Miroshnichenko et al 2001, A&A 371, 600

Patel, M. et al 2006, MNRAS, 373,1641

Zhang, P., et al. 2005, NewA 10, 325Z1