Observational constraints of interstellar dust models

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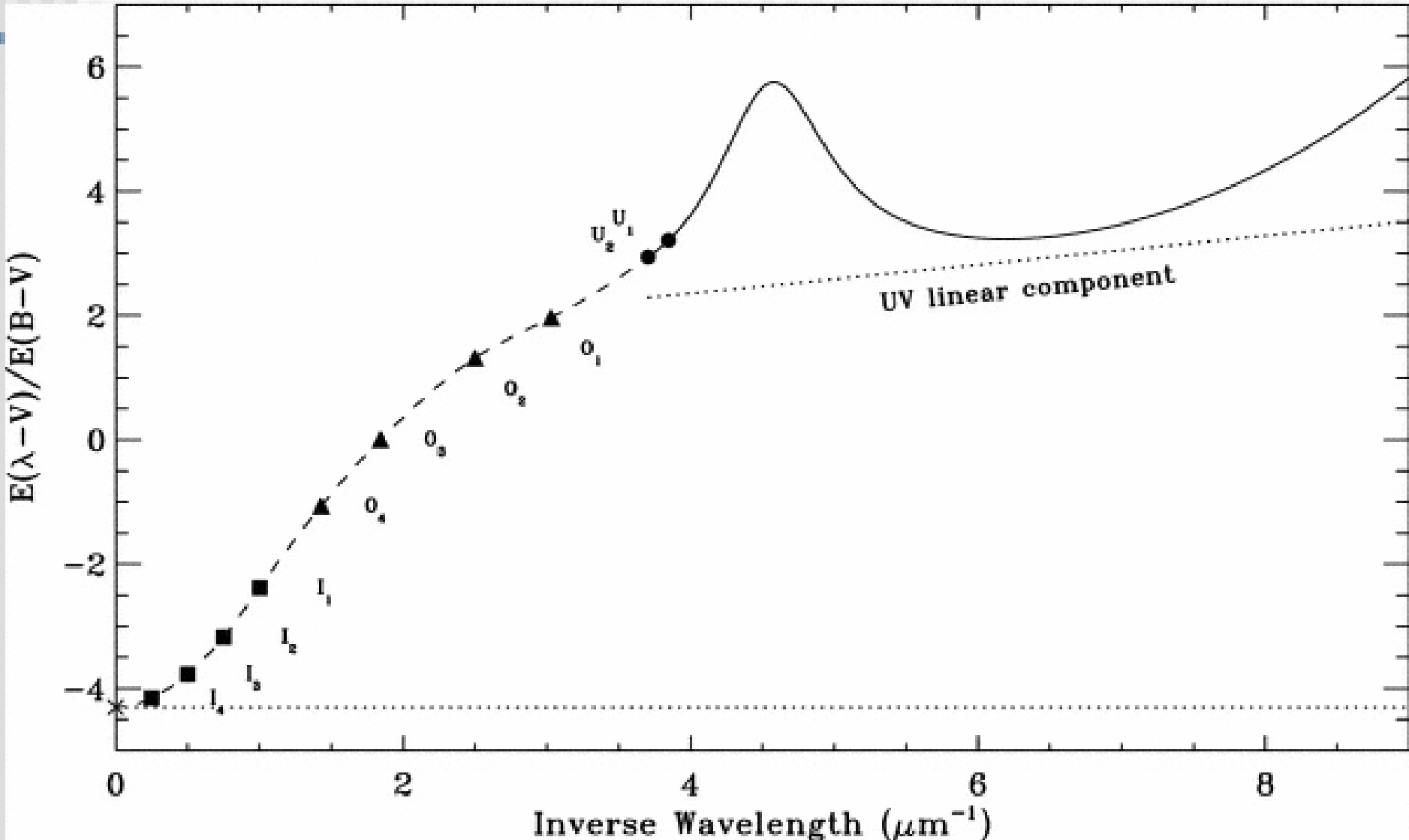
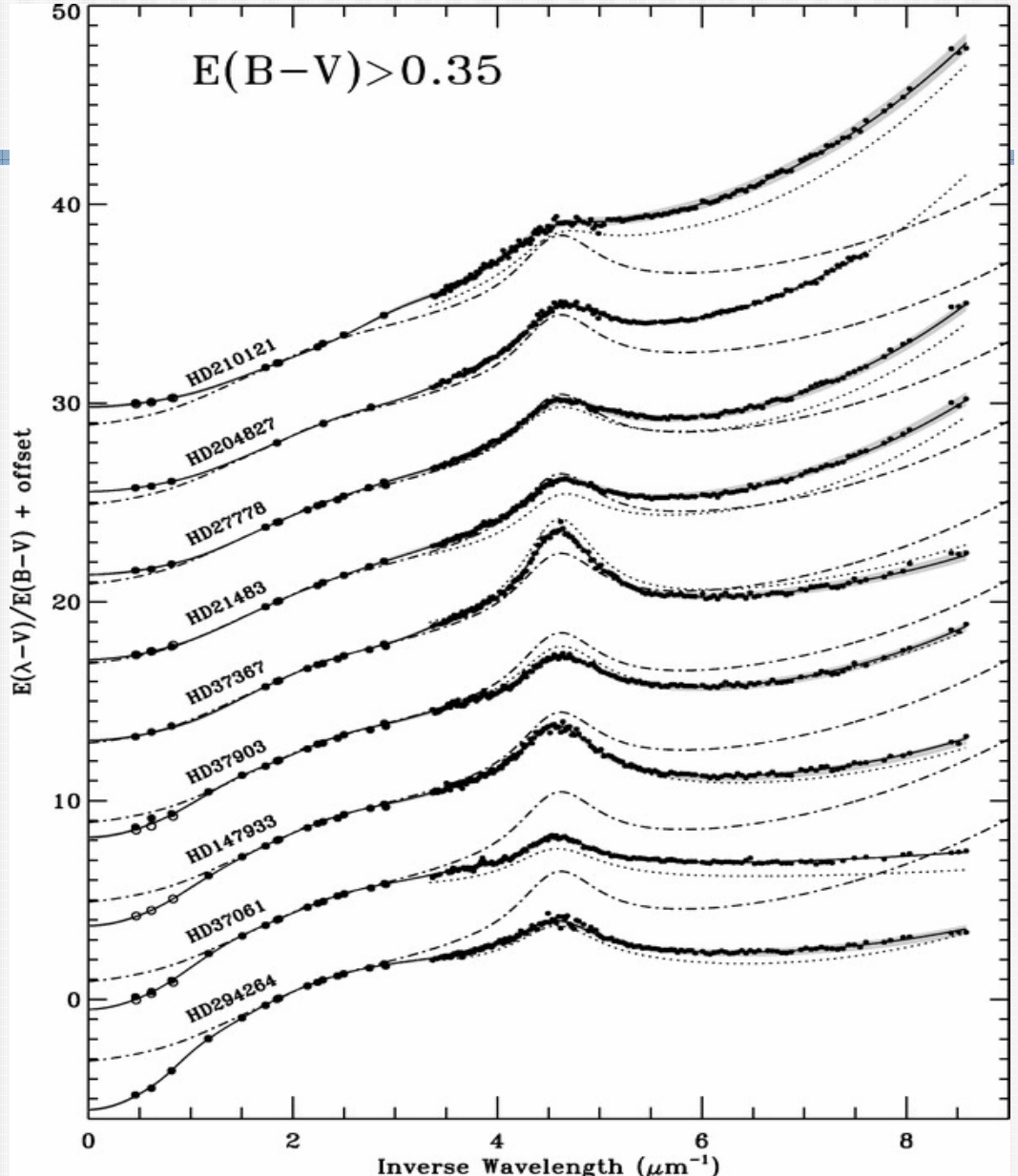
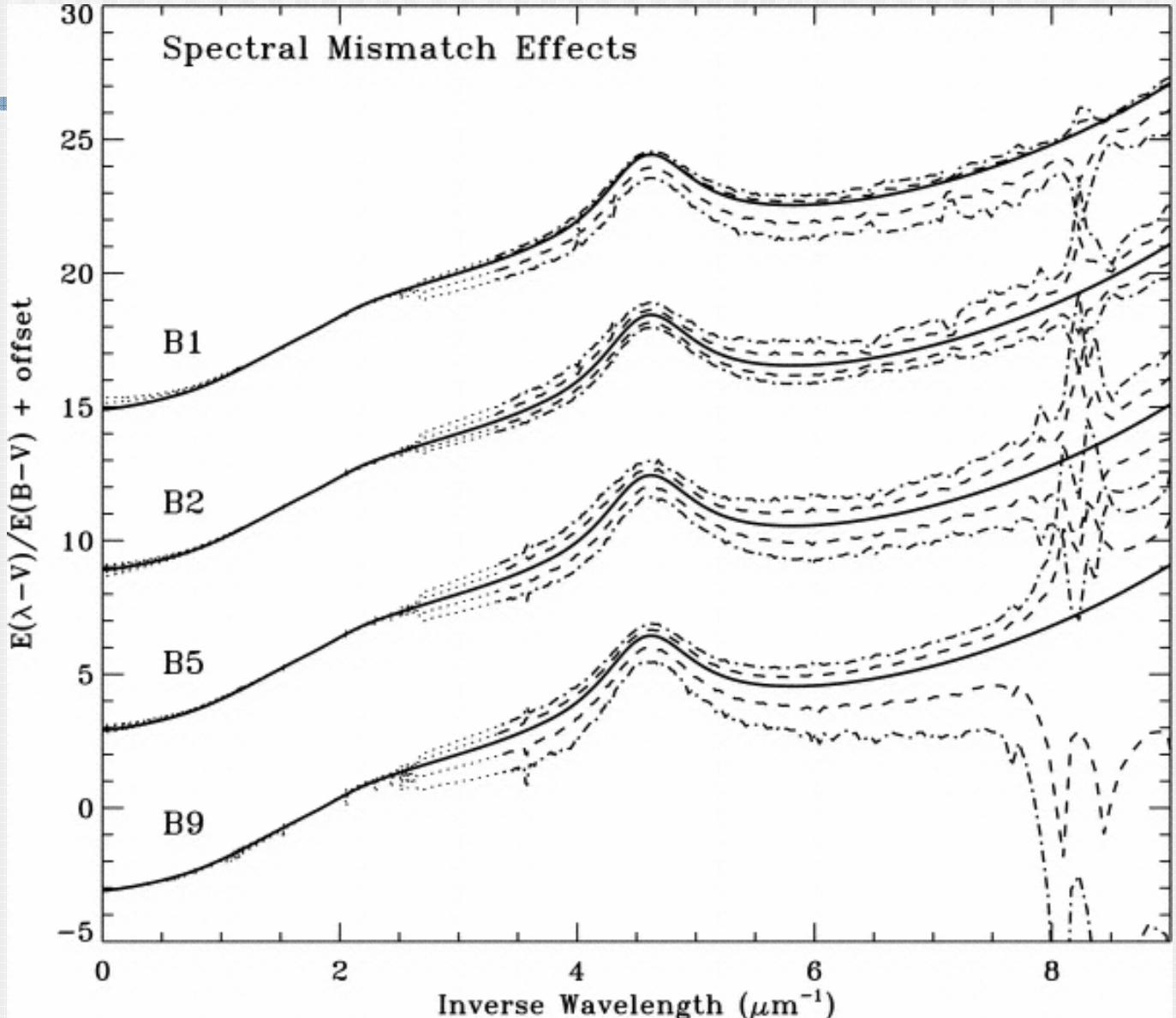
Schematic extinction curve (FLM AJ 130, 1127)



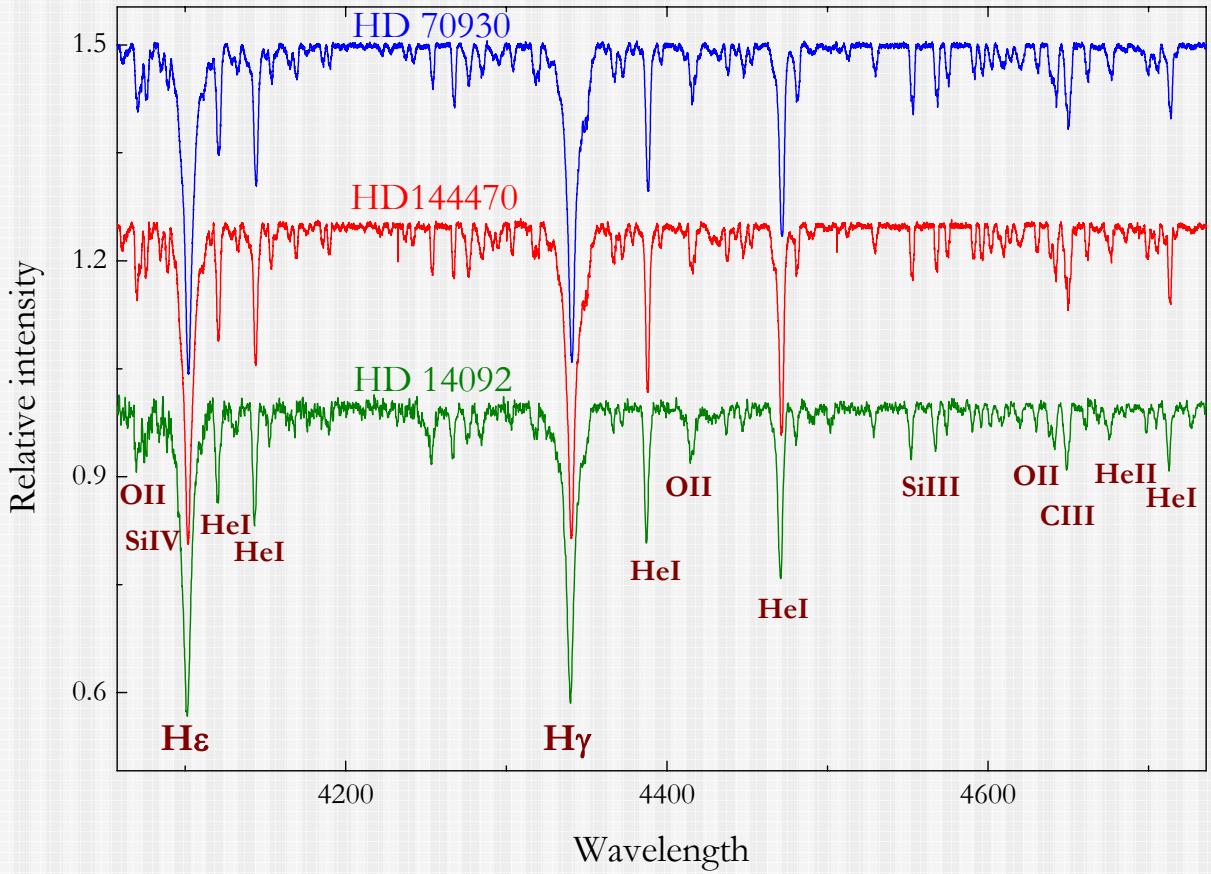
Observed variety of extinction curves (F&LM AJ 130, 1127)



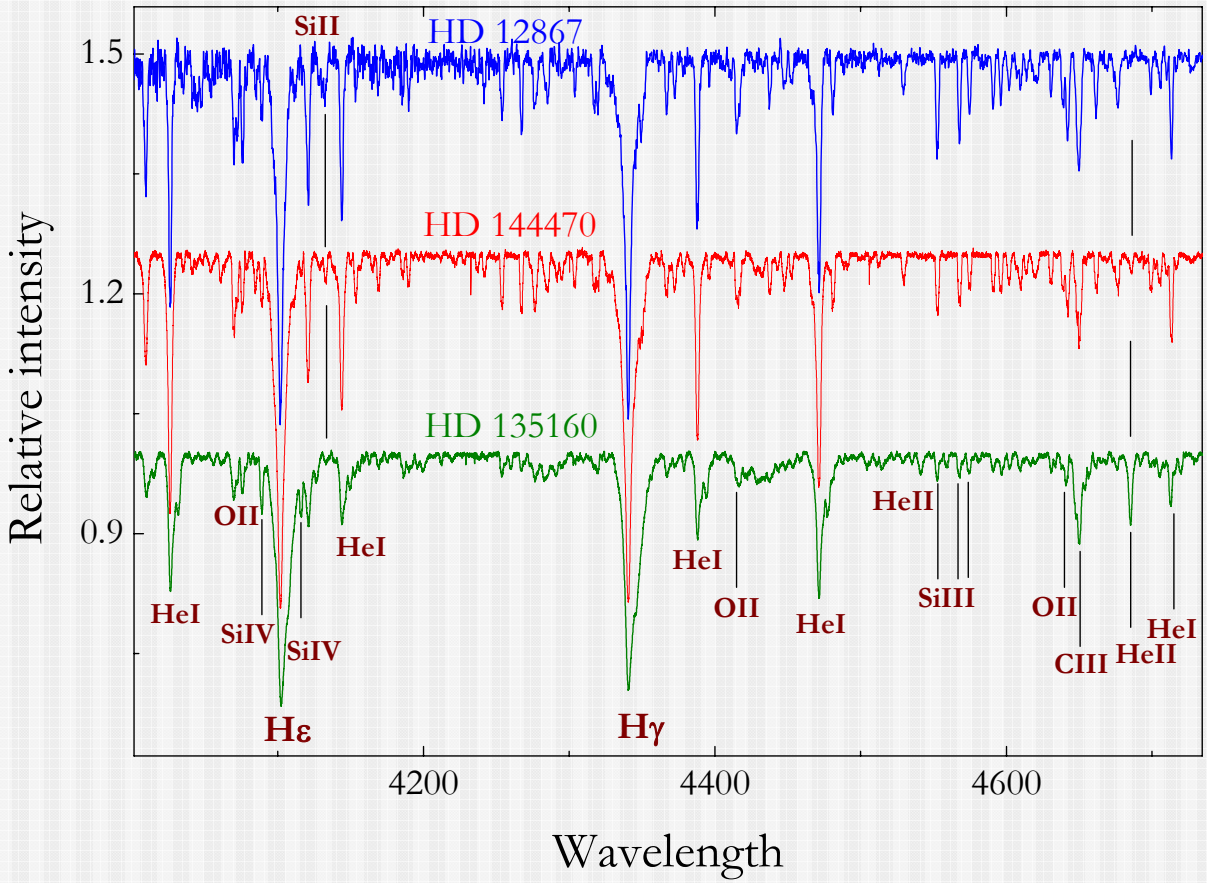
Errors caused by +/- ½ spectral subtype (F&LM AJ 130, 1127)



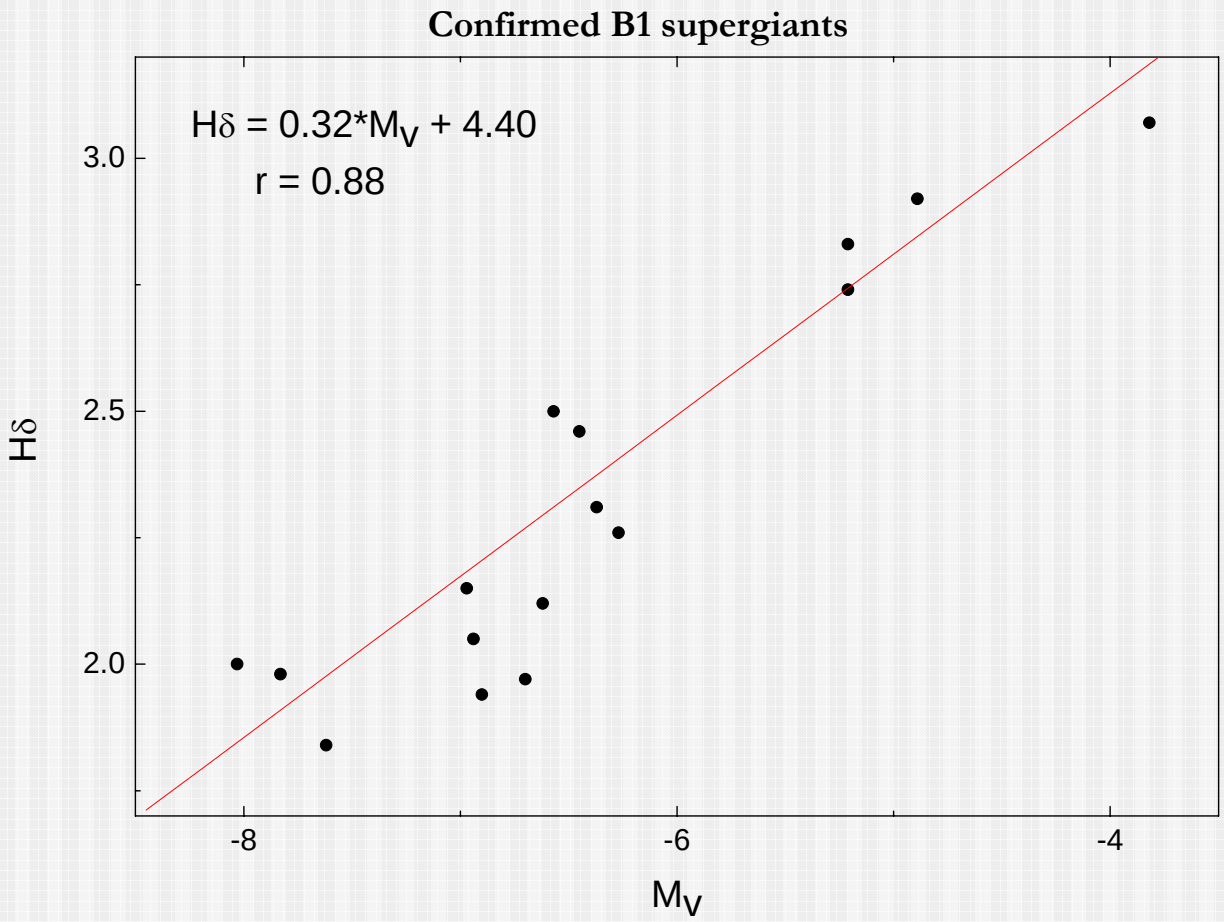
Three stars of evidently identical Sp/L



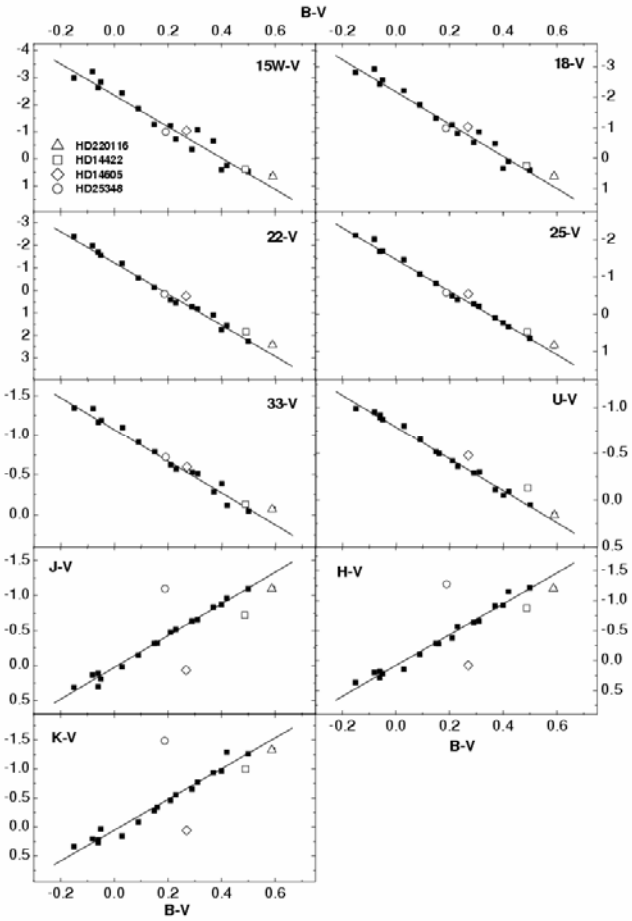
Three stars classified as B1V, but of evidently different T_{eff}



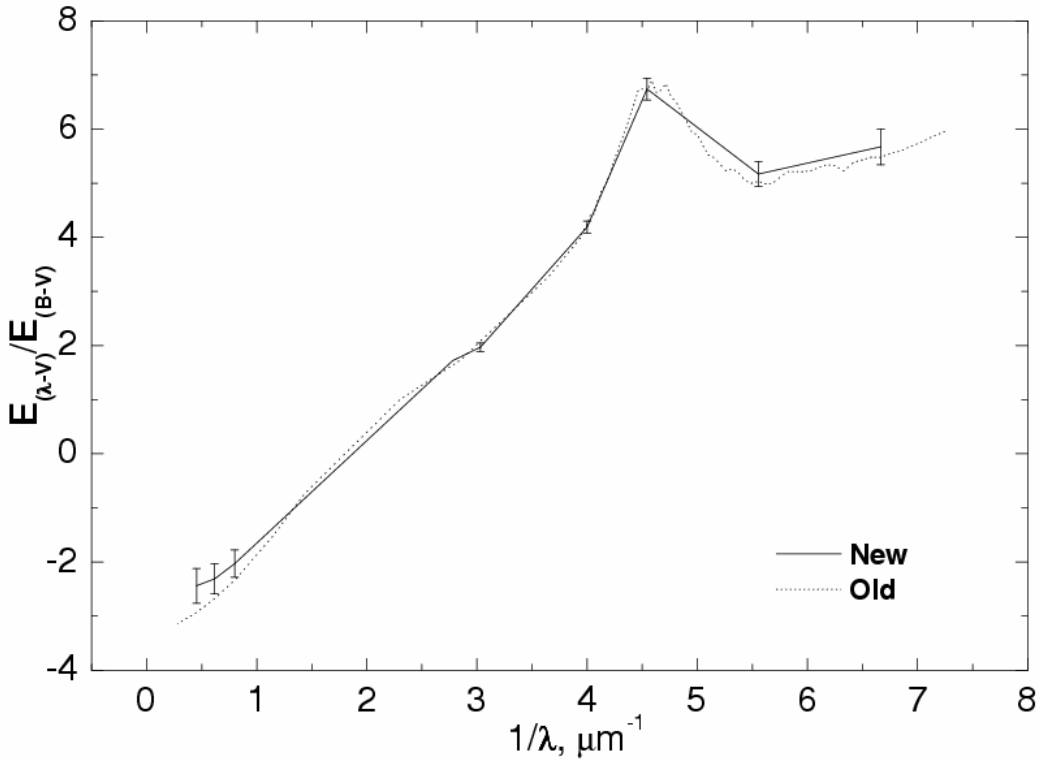
*FWHM of H_δ as an indicator of luminosity in ** B1I*



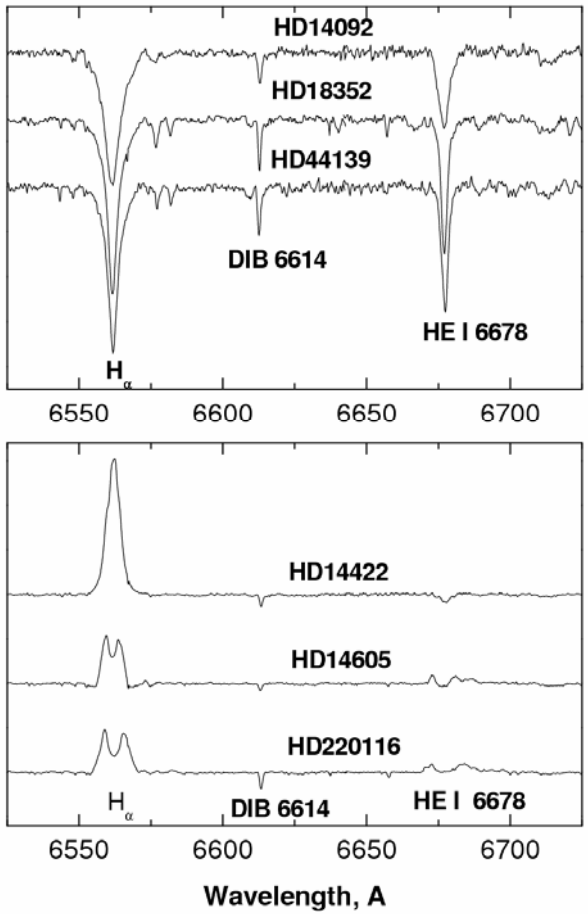
*Extiction law may be the same everywhere in the Galaxy – here a set of **B1V (Bondar et al.. 2006, JKAS, 39, 73)*



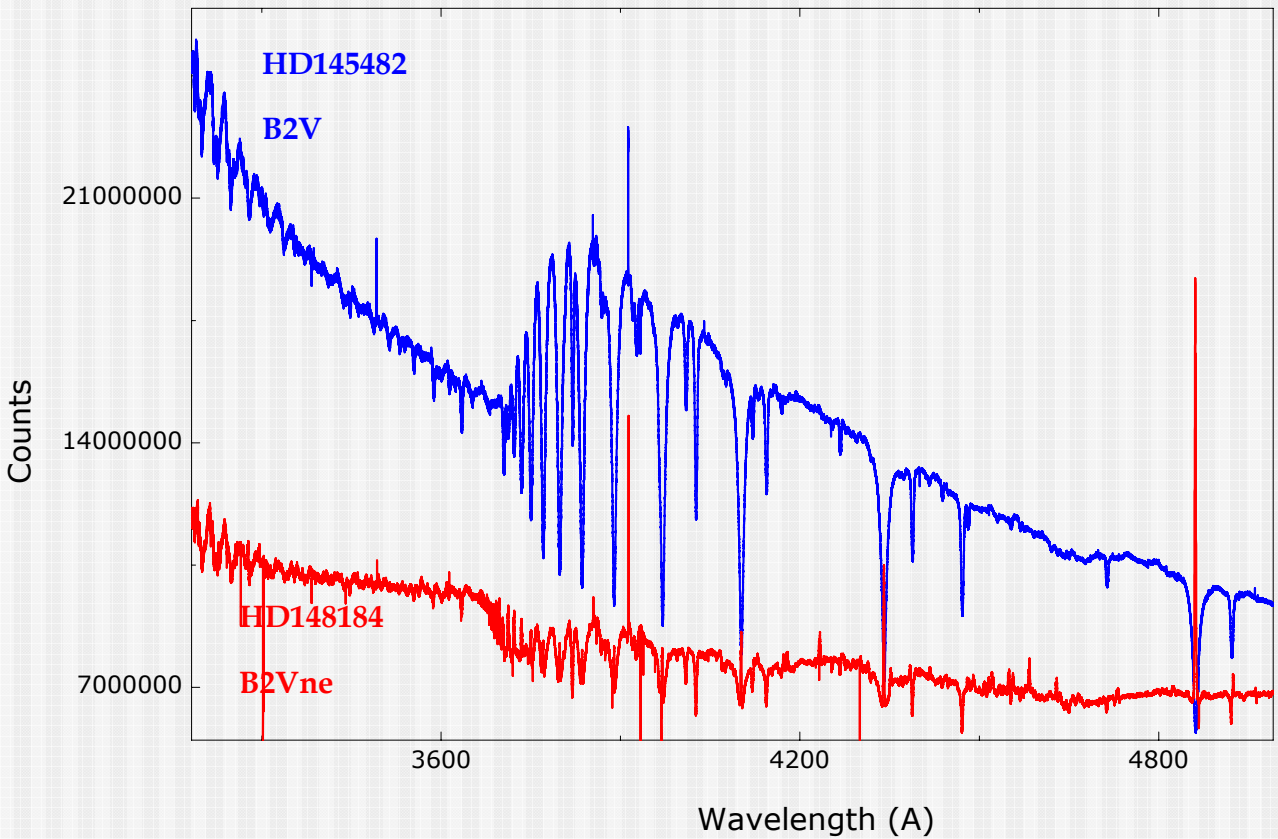
*Average extinction curve based on two-color diagrams for **B1V*



Normal and emission line stars



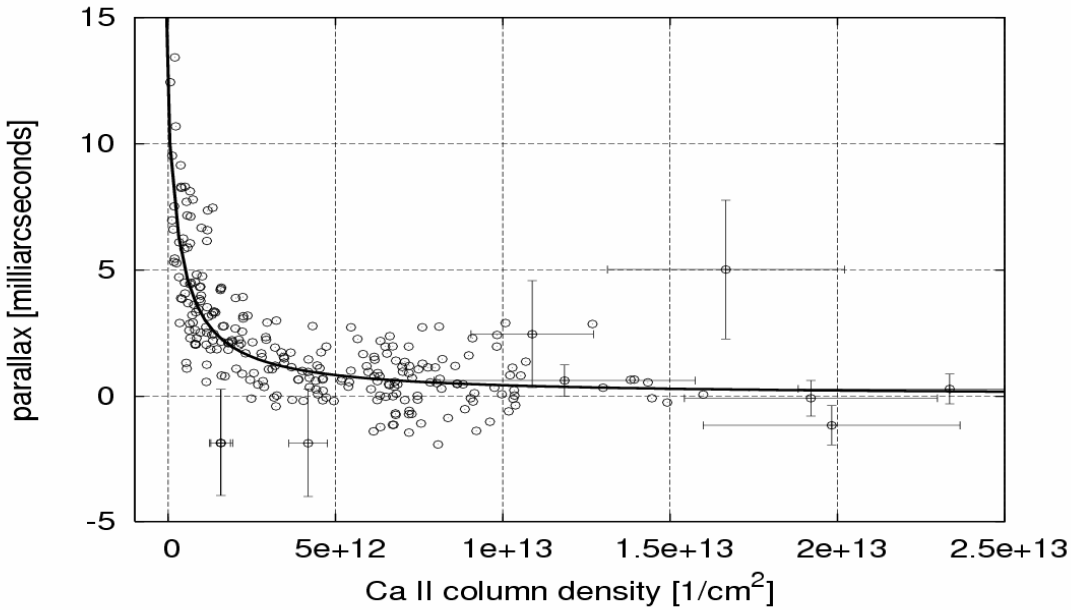
Emission Balmer continuum



Extinction curves

- Depend on precise match of the investigated stars' Sp/L and the assumed standards
- In all cases extinction curves for Be stars are very uncertain due to possible dust emissions in IR and hydrogen emissions in UV
- Every OB. star may pass a Be period (example: HD143275)

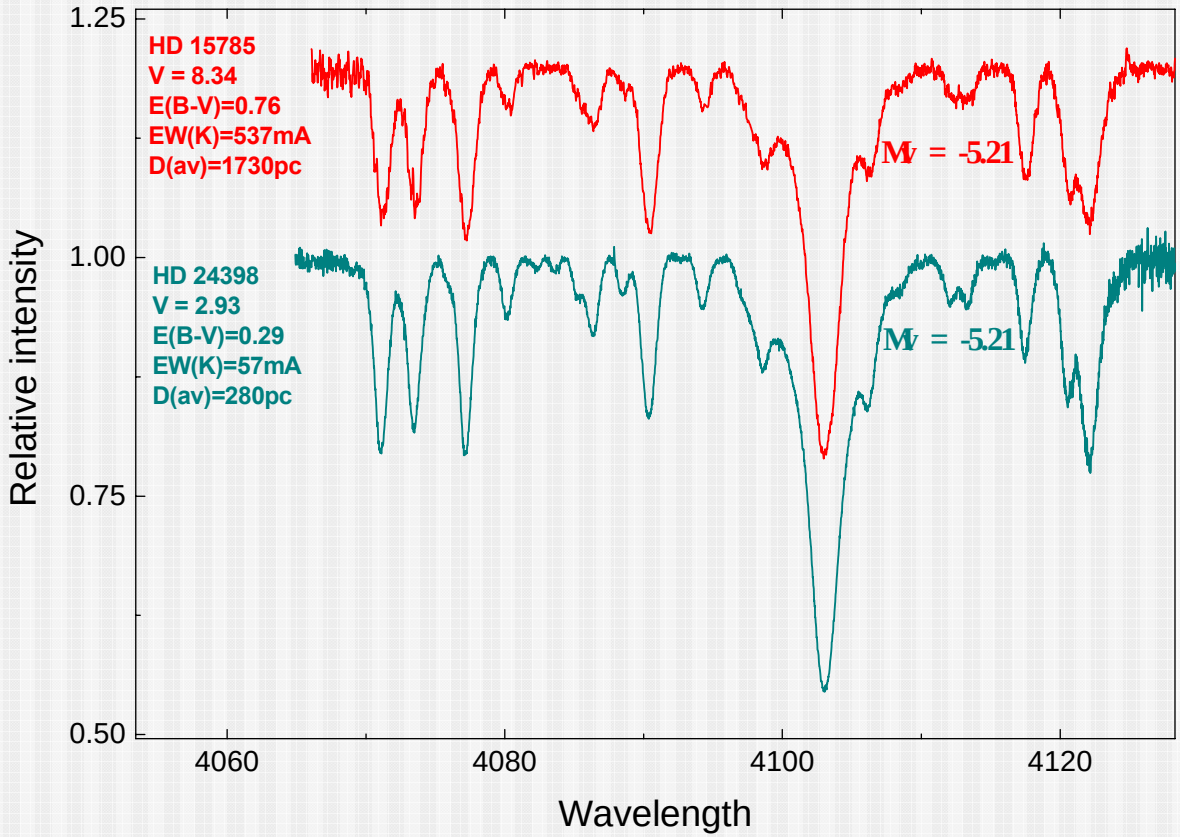
CaII column density as a distance measure



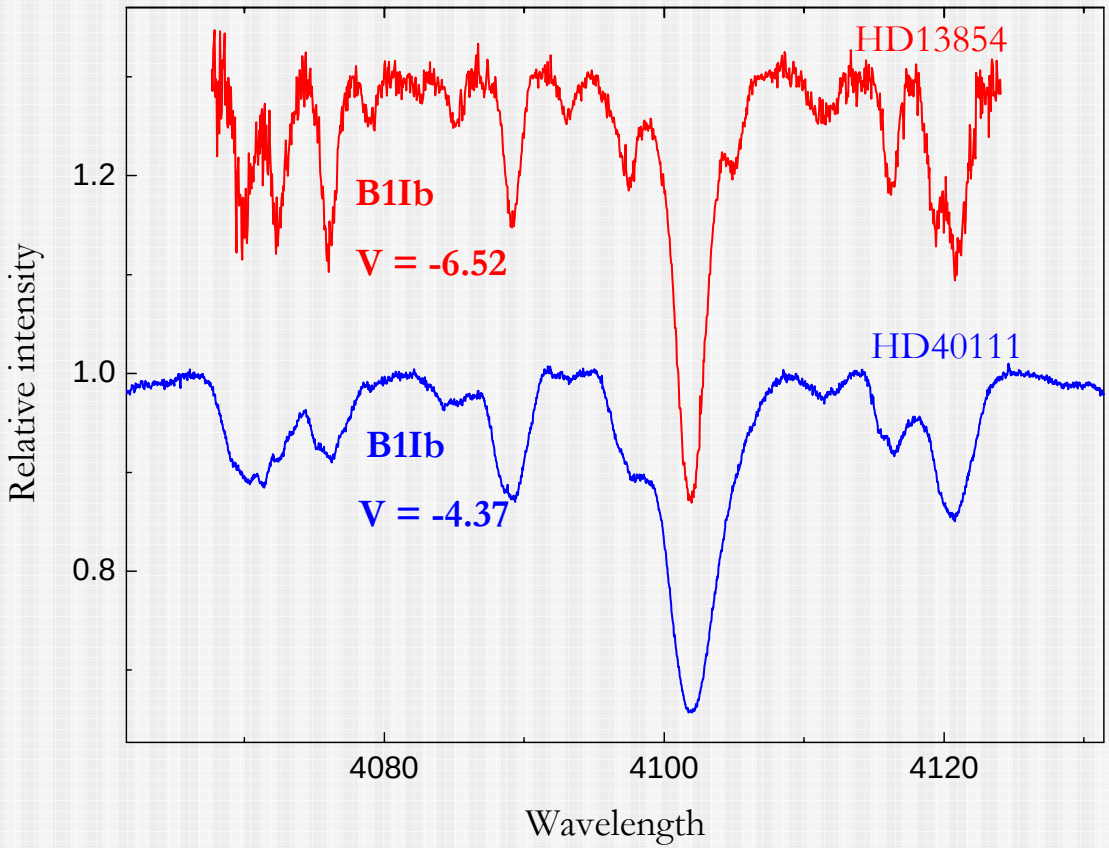
$$\pi = \frac{1}{2.21 \cdot 10^{-13} \cdot N_{\mathrm{CaII}} + 0.089}$$

gdzie π w milisekundach łuku, N_{CaII} w $1/\mathrm{cm}^2$.

Identical spectra and calculated absolute magnitudes



Obvious error of classification



Total extinction

- Assumption: dereddened stars of the same Sp/L are of the same M_v when distance is estimated using the CaII column density
- Many objects are misclassified and both the shape of extinction curve and total extinction may be incorrect
- Statistically meaningful samples of the same Sp/L are necessary

Elemental depletions discovered in Copernicus spectra

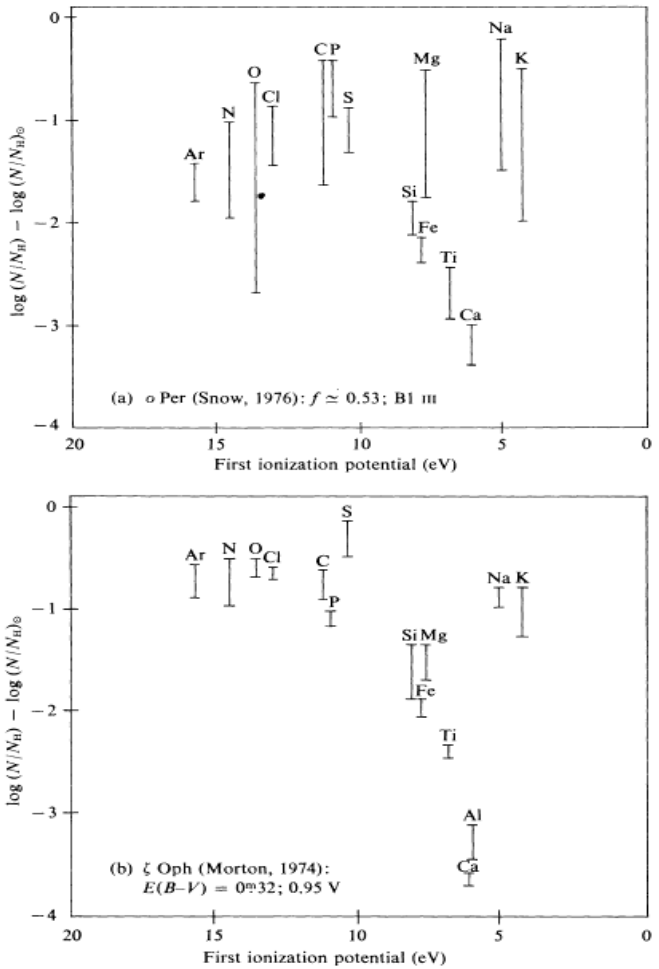
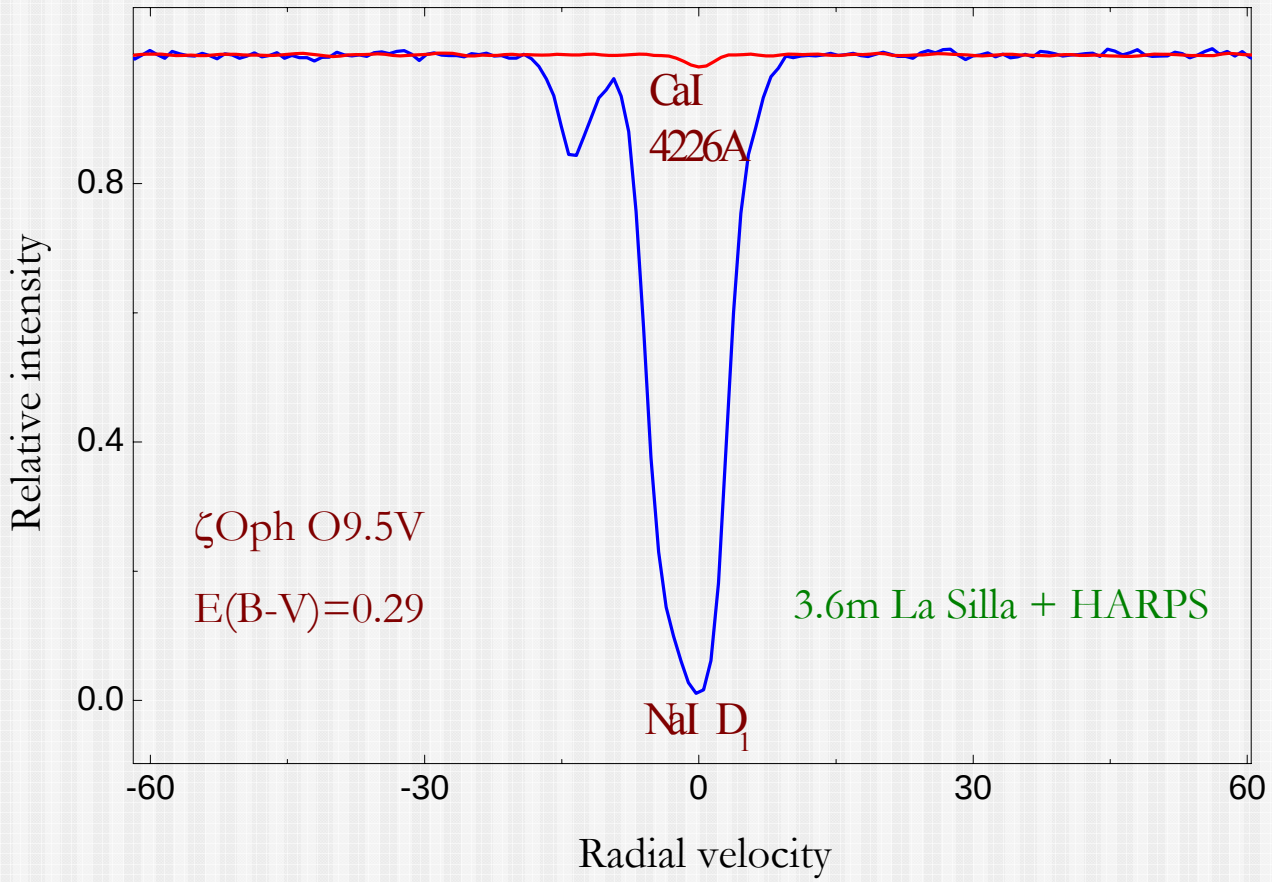
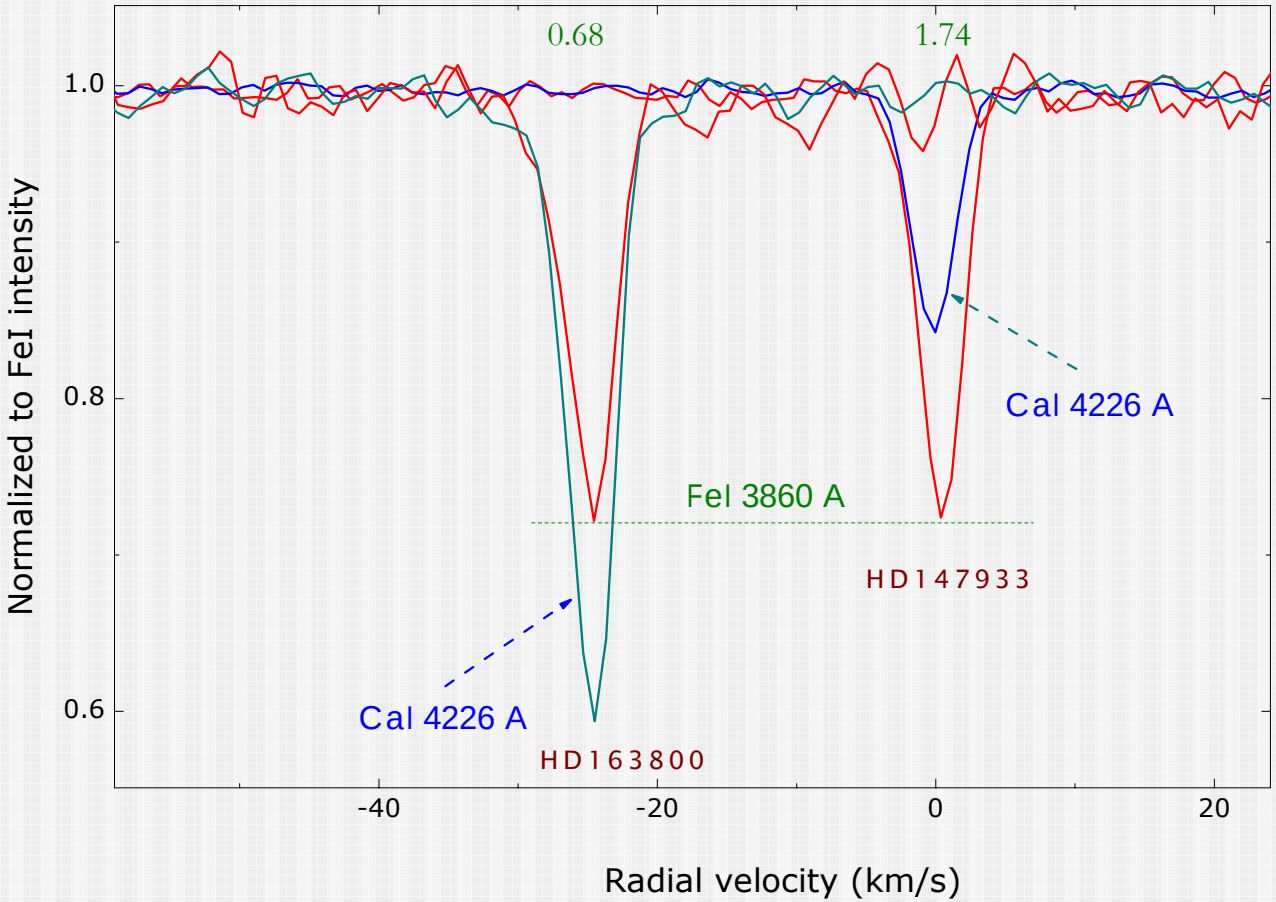


Fig. 1. Depletions of elements from the gas phase versus the first ionization potentials of these elements: (a) is the graph for *o* Per, while (b) corresponds to the line of sight toward ζ Oph. There is a good correlation for the refractory elements and very little correlation from sulfur to argon. This is what we would expect if the condensation temperatures of the elements were of primary importance in explaining depletions, since Ca, Ti, Fe and Si are 'refractories' while most of the others are not. The principal problem is the positions of Na and K. Seen by itself, this figure does *not* demonstrate a strong correlation between depletions and electrostatic effects.

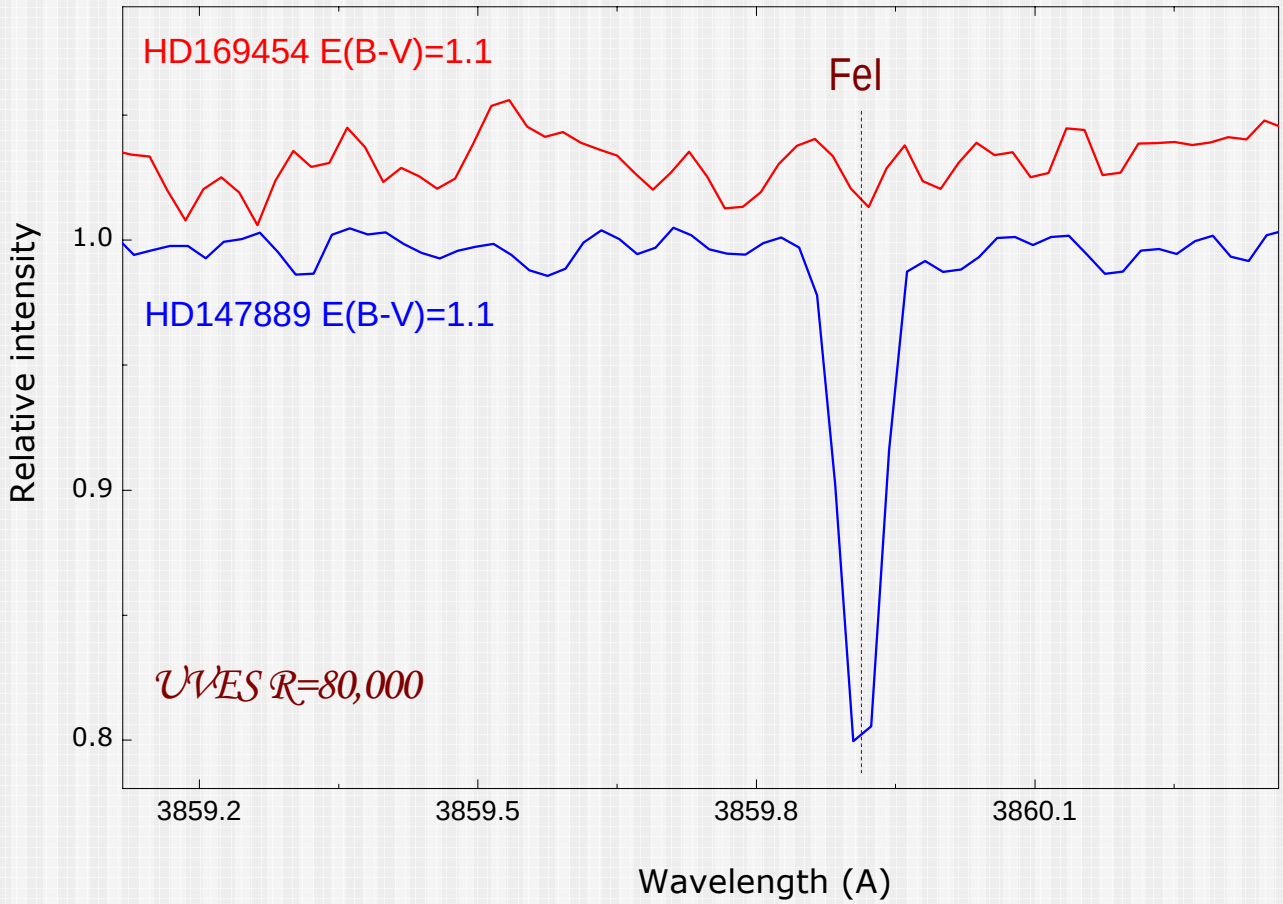
The result of CaI depletion toward HD149757



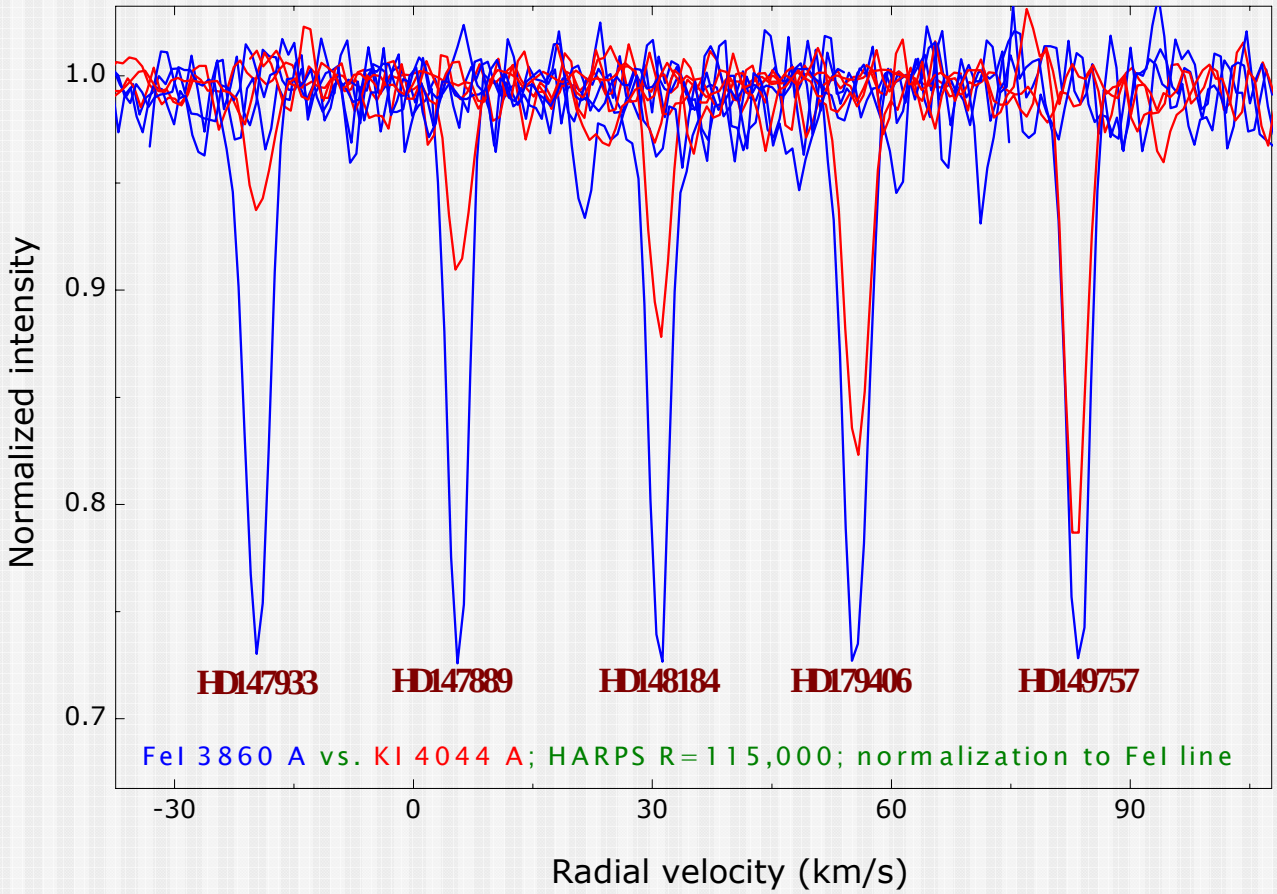
Various relative abundances of CaI and FeI seen in HARPS spectra (R=115,000)



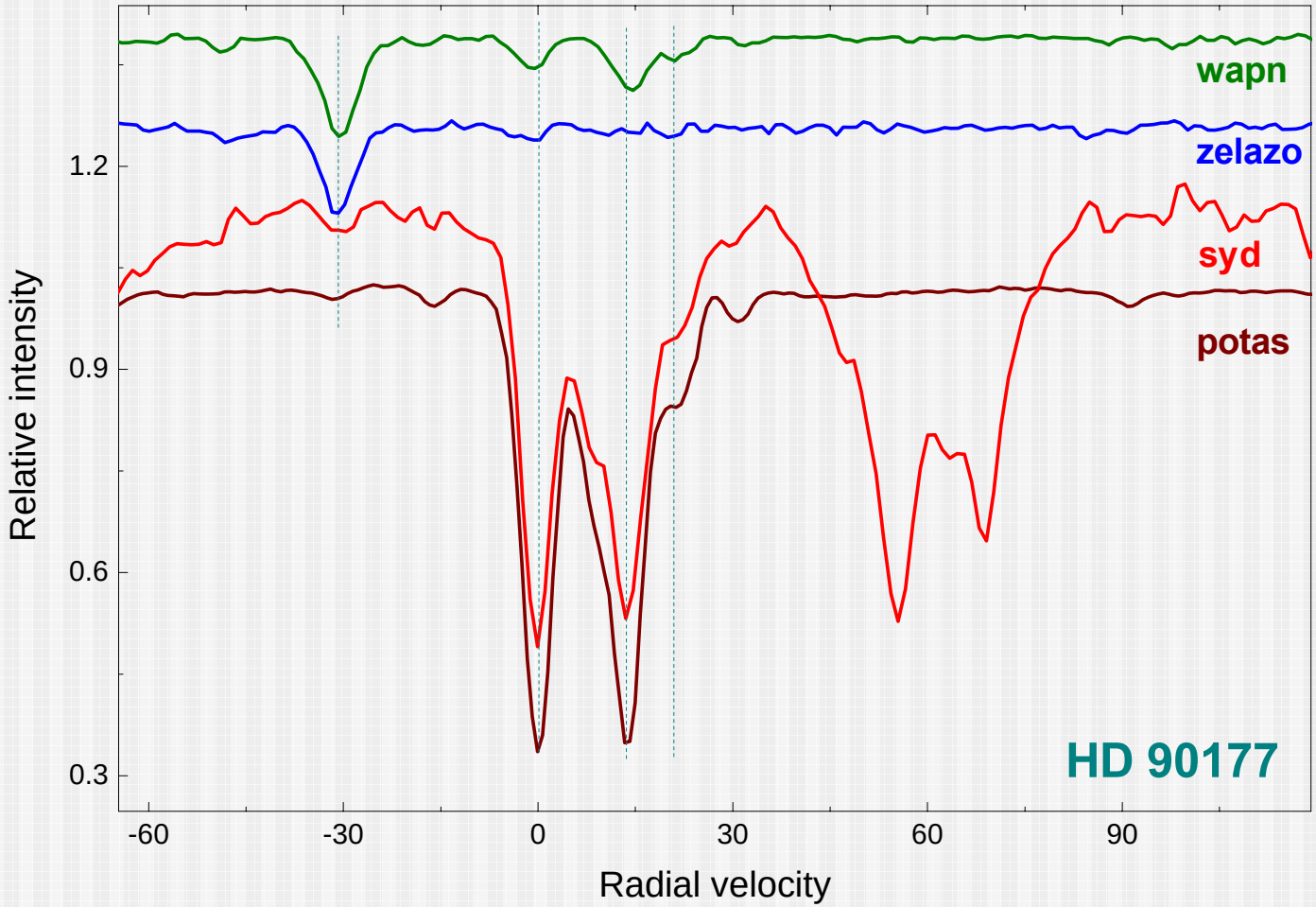
Gas-phase abundance of iron is not related to E_{B-V}



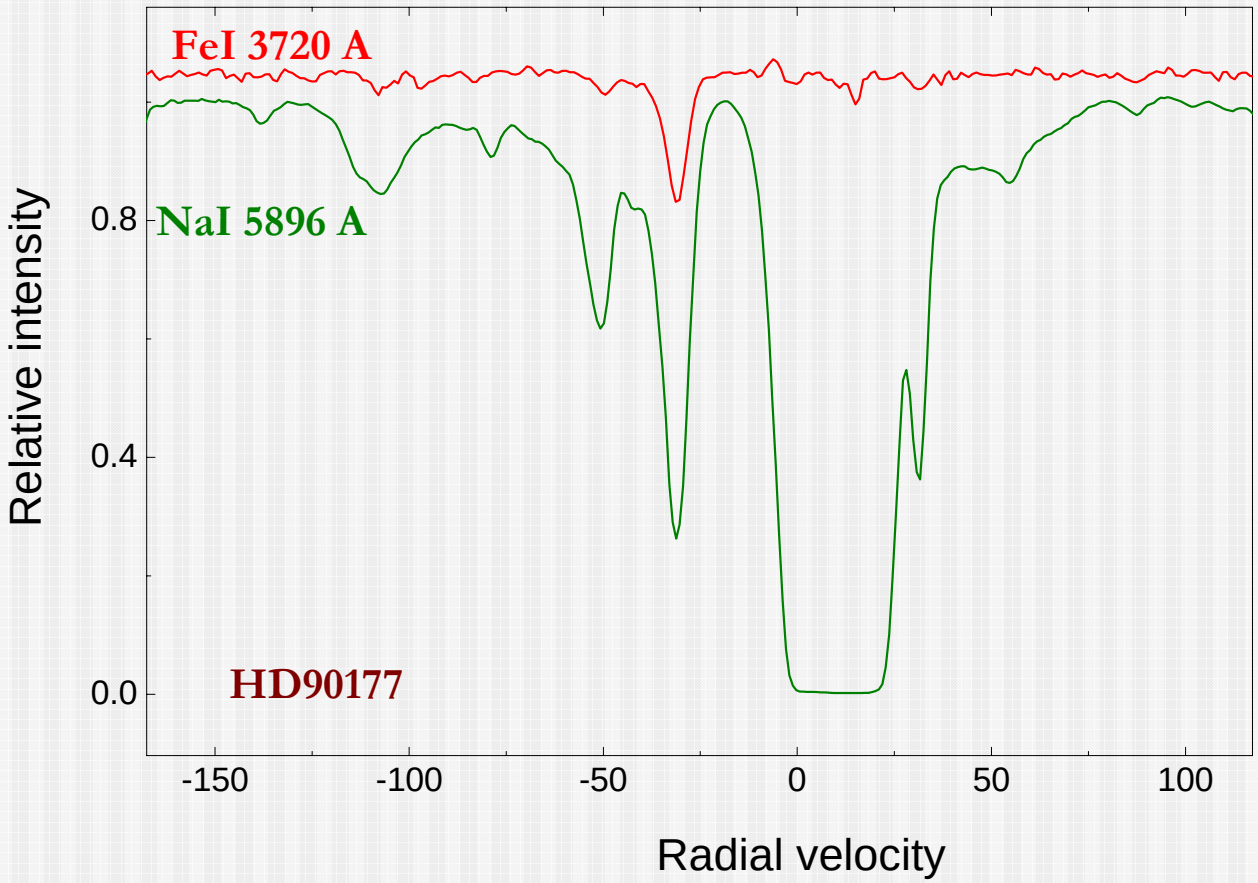
Variable strength ratio (by a factor of 3.4) of unsaturated lines of iron and potassium



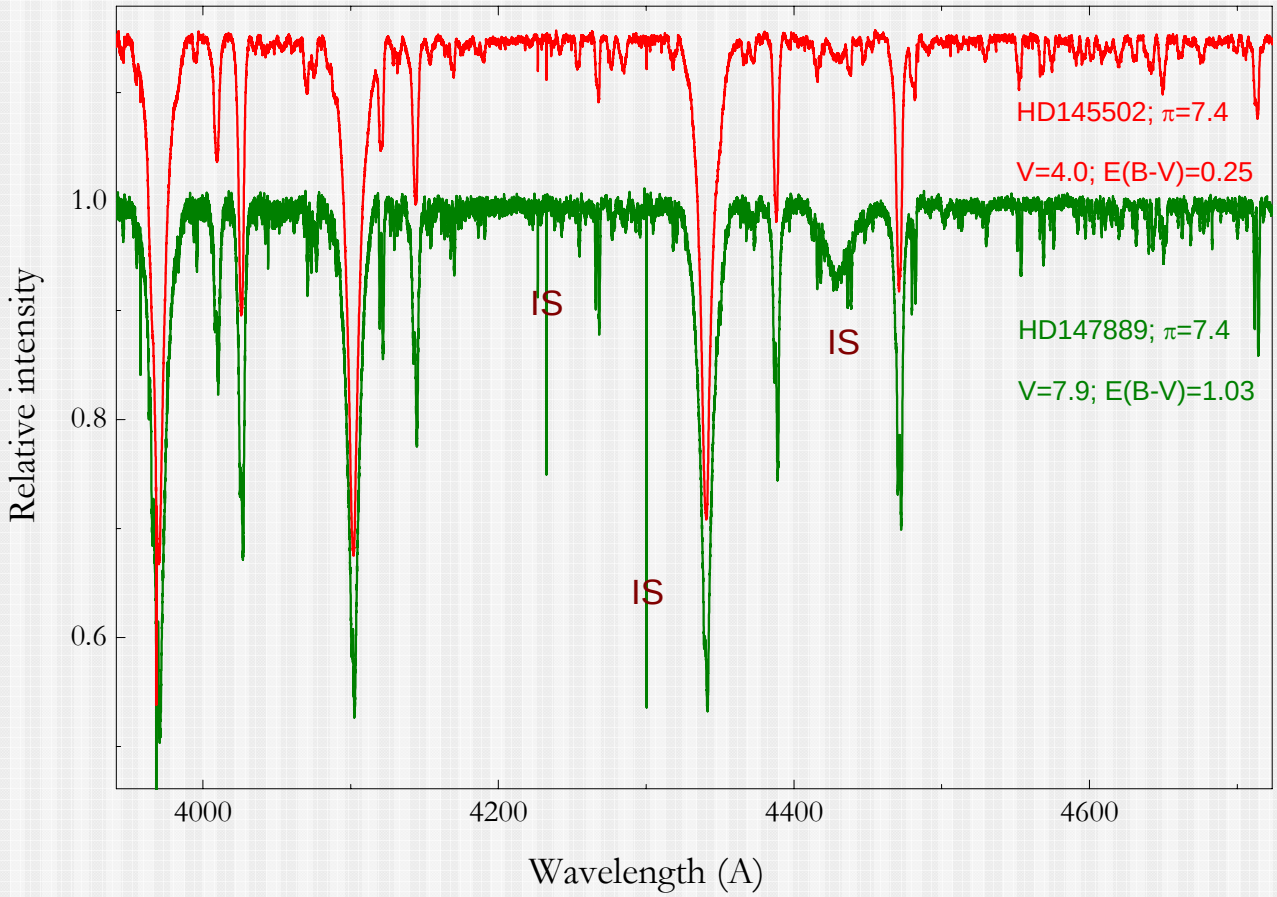
CaFe clouds – another depletion pattern (Bondar et al. 2007, MNRAS, 378, 893)



NaI gas-phase abundance in a CaFe cloud is very low



Two stars of identical Hipparcos parallaxes and spectra; for HD145502 R=3.1 seems OK,; for HD147889 either R~5.2 or a part of extinction is grey



Problems

- Distribution of dust particles along any sightline is uncertain
- Possible relation between elemental depletions and shape(s) of extinction curve(s) needs to be investigated
- It is not certain whether any neutral (grey) extinction exists at all – the answer depends on distance estimate (*uncertain*) and extinction estimate (*uncertain*)