IRAF simulation of standard stars, continuated

F.Crifo, D. Katz,

GEPI, Observatoire de Paris

AIM:

- Simulate the 100 transits of a standard star during the whole mission;
- Obtain a wavelength calibration with IRAF;
- Estimate the accuracy on wavelength scale from one single star, look for possible systematic deviations or distortions.

Many thanks to....

Asiago Monografie

vol. 1

An introduction to analysis of single dispersion spectra with IRAF[1]

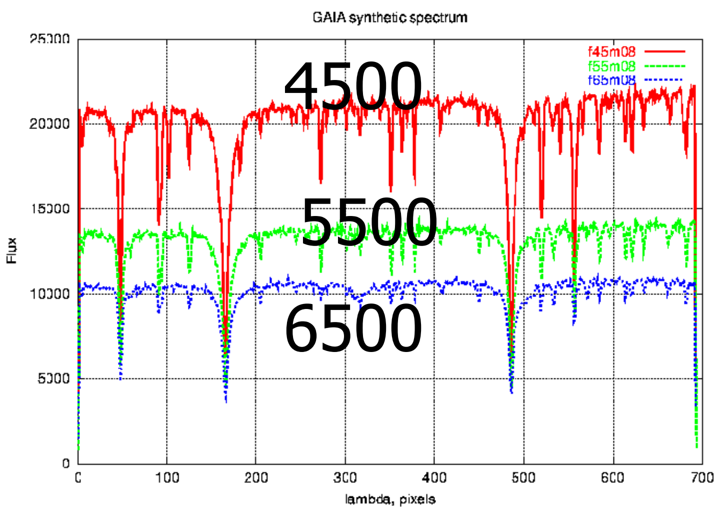
Tomaž Zwitter
Department of Physics, University of Ljubljana, Slovenia

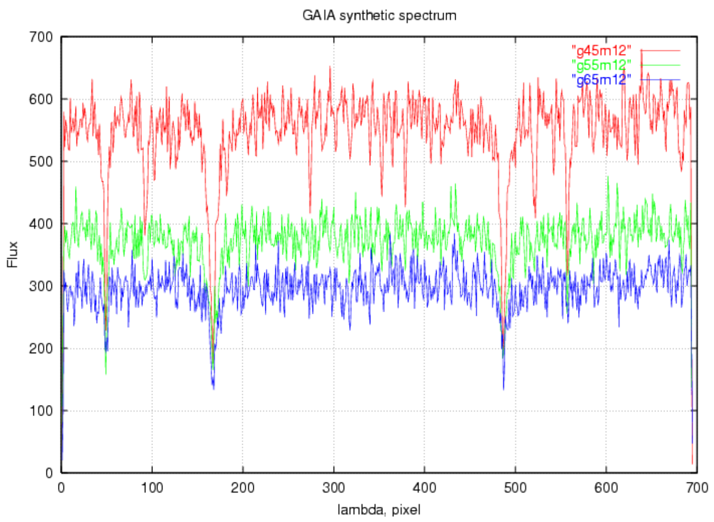
Ulisse Munari
Padova and Asiago Astronomical Observatories, Italy

INITIAL DATA

- **Synthetic spectra (Kurucz model), for:**
  3 Teff : 4500 K (K4); 5500 K (G5); 6500 K (F5);
  3 magnitudes: 8; 10; 12 (mag 14 is too bad):
- **Total of 9 « stars »**
- **« Observed »100 times with the RVS according to the 1st version of simulator rvs_simu1.0:**
- **Noise: sky background + photon noise**
  + read-out noise, 100 different realizations
- *=> total of 900 individual spectra studied*

Examples of spectra:





Teff = 4500, 5500, 6500K

mag = 8 mag = 12

IRAF tasks from the package noao.onedspec

- Task « Identify »:
- Requires a list of lines to be searched in the spectra: list of 27 lines (wavelengths), no blends.
- Fitting function: Chebychev polynomials, order 3.
- The 3 CaII lines are recognized on each spectrum, the other are then found automatically.
- Output: new wavelength for each line according to the fitting function,
  + coefficients for the fitting function

Task « Dispcor »

- Resampling of each spectrum: New wavelength according to the fitting function:

λ_{calc} for each pixel

Final comparison:

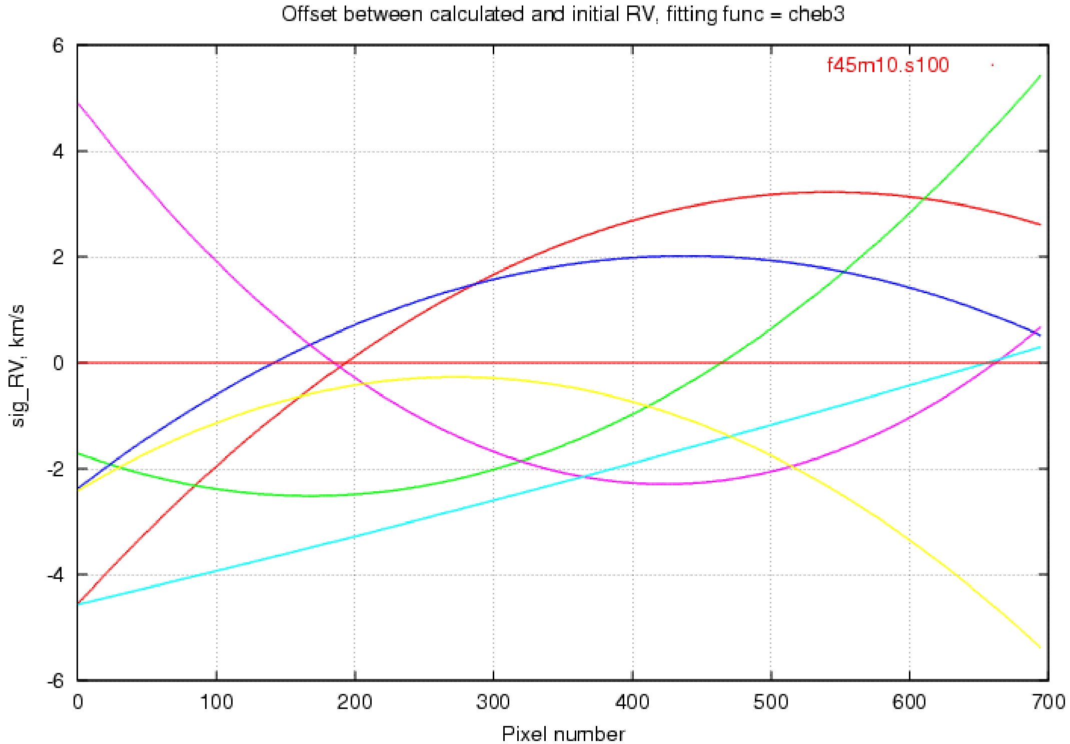
- Comparison between initial and new wavelength:

  $\Delta\lambda = (\lambda_{calc} - \lambda_{ini})$ for each pixel

- plots of $\Delta\lambda$ and ΔRV, with $RV_{ini} = 0$

RESULTS vs mag and Teff:

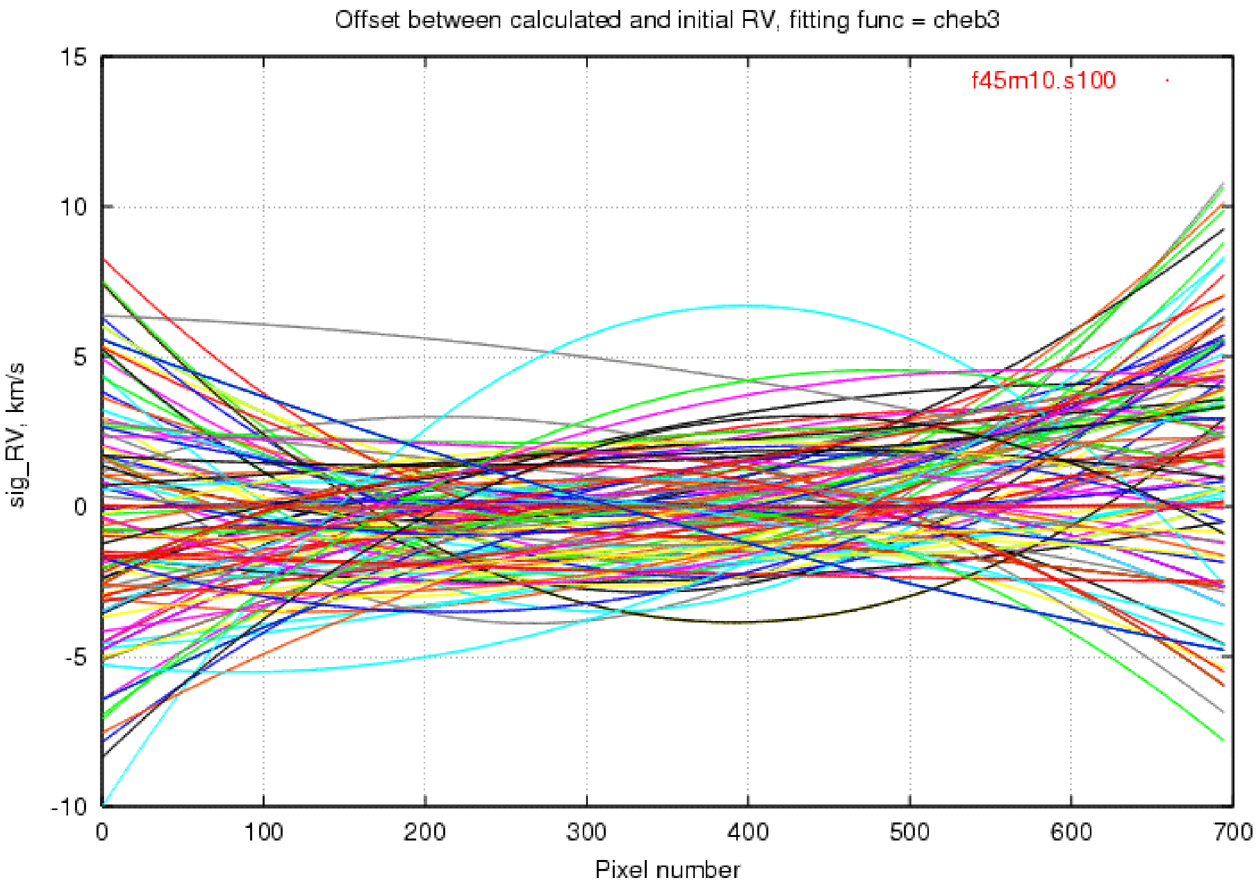
Example:Teff = 4500 K (K4), mag= 10:
For each realization, RV= f(pixel): effect of noise and reduction



RESULTS: 1 star, 100 transits

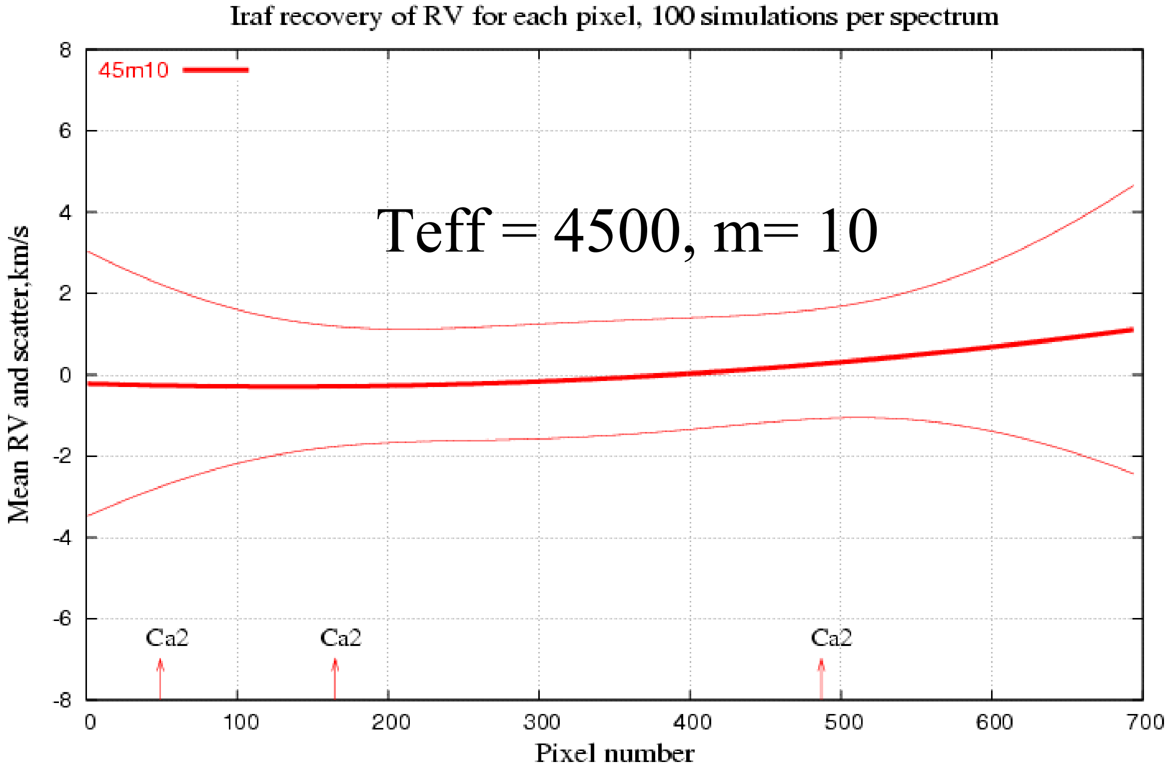
Teff = 45OO K
(K4)

mag 10

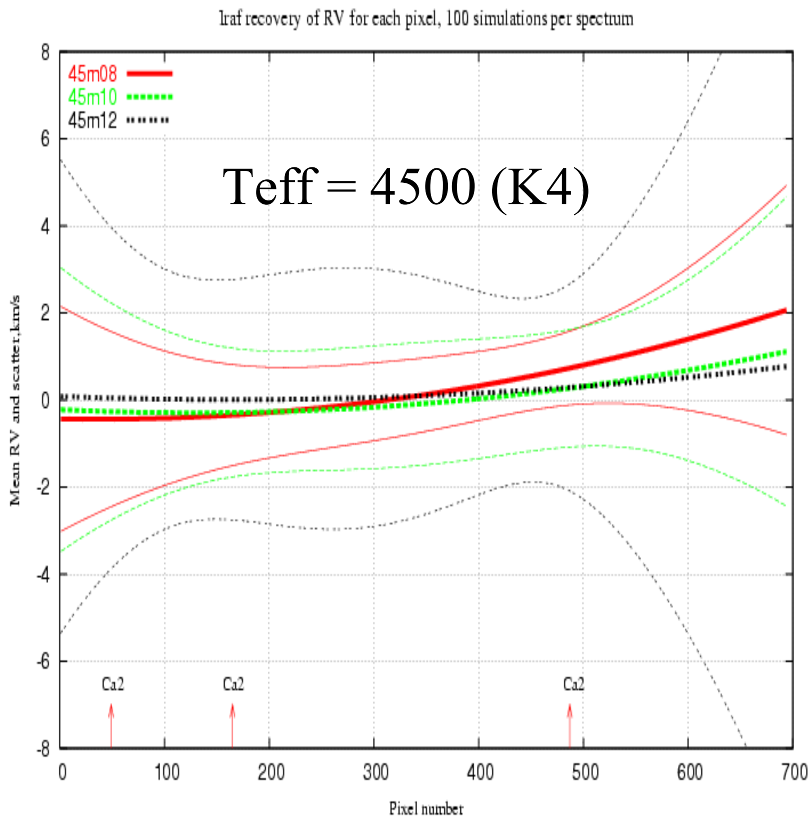


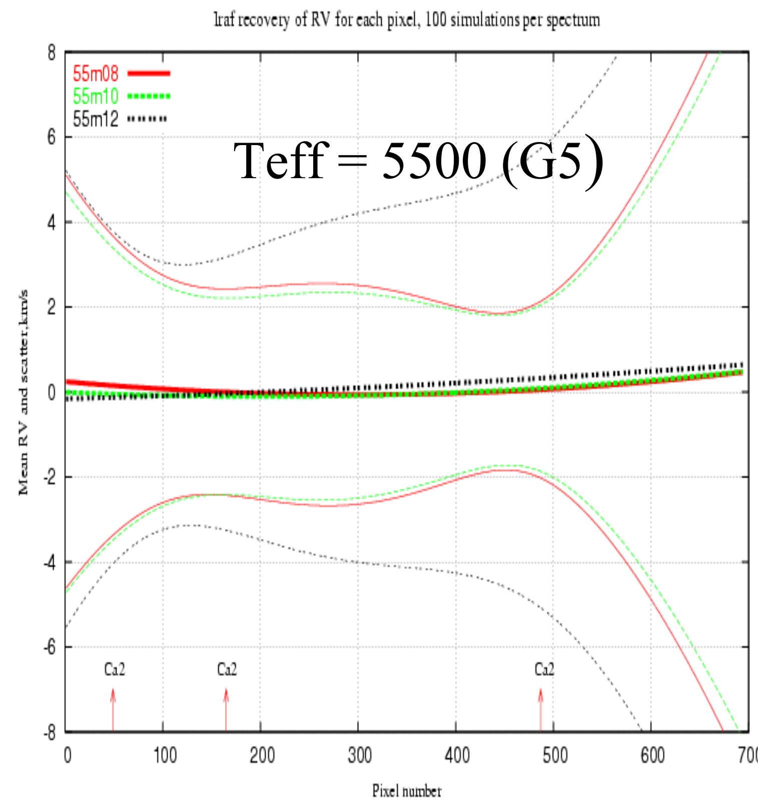
RESULTS: 1 star, 100 transits

=>For each pixel, 100 values of RV. Mean value, scatter:



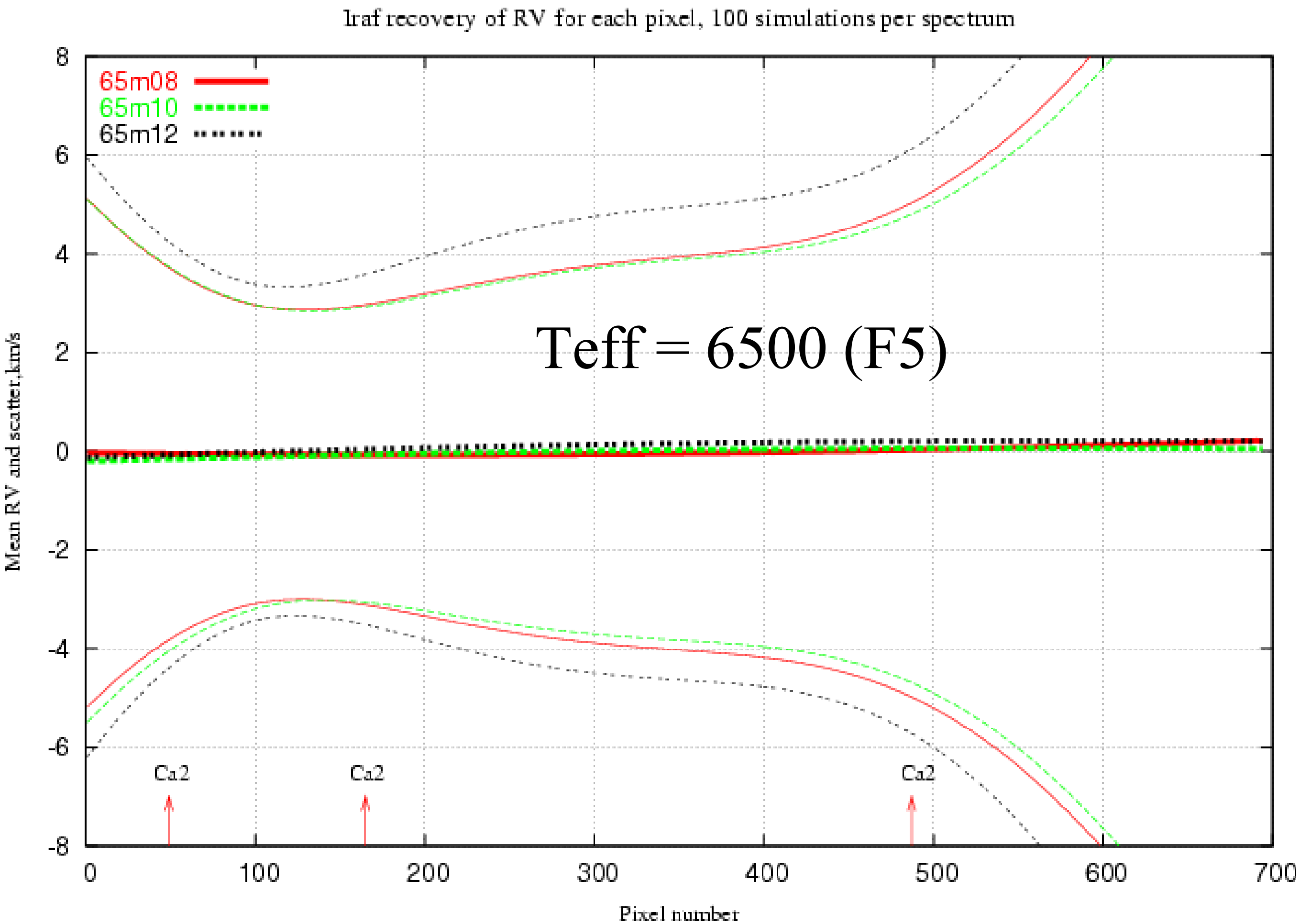
RESULTS:effect of magnitude



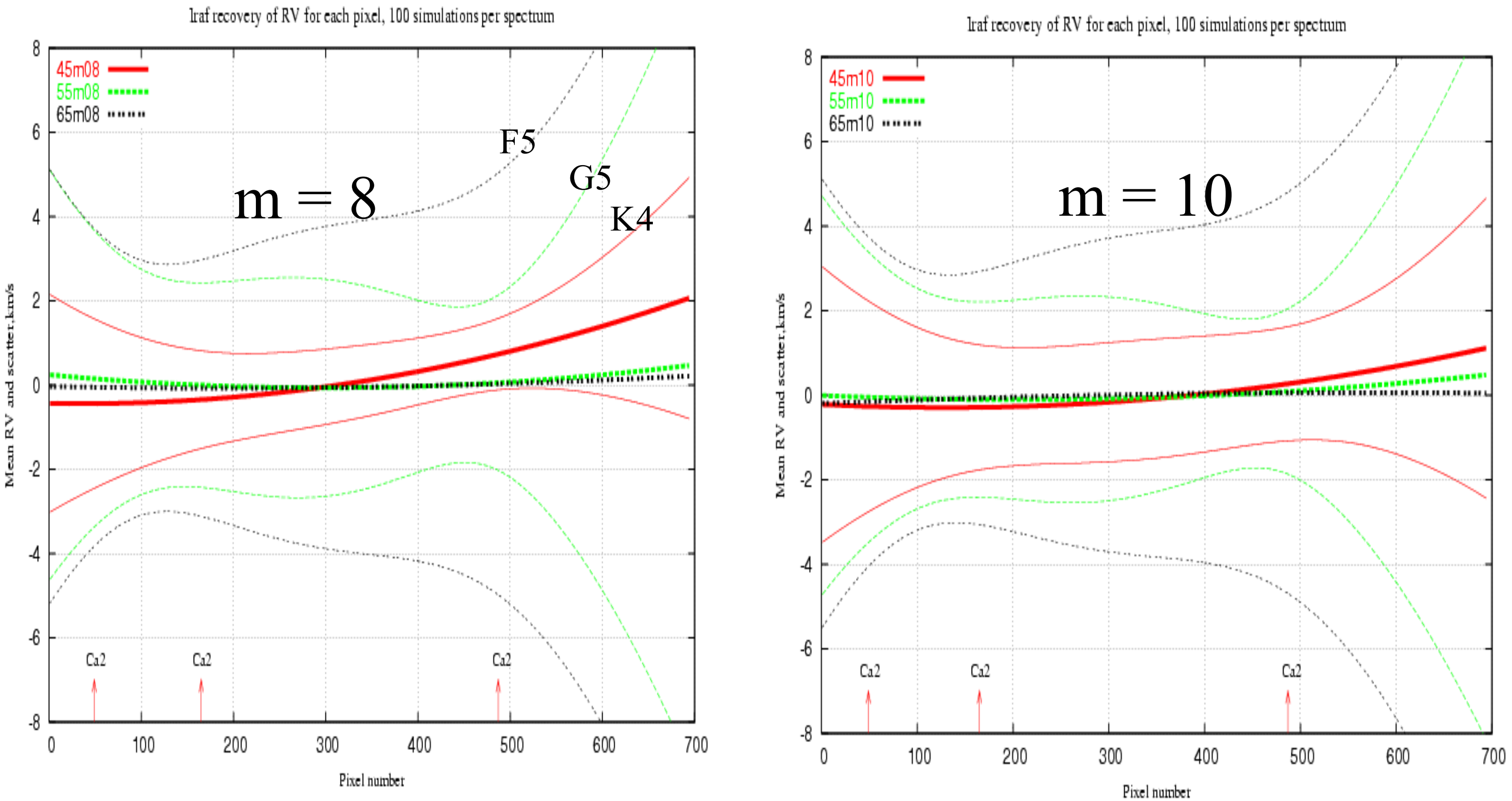


Mag 8 and 10 are close; mag 12 is BAD

Results: effect of magnitude

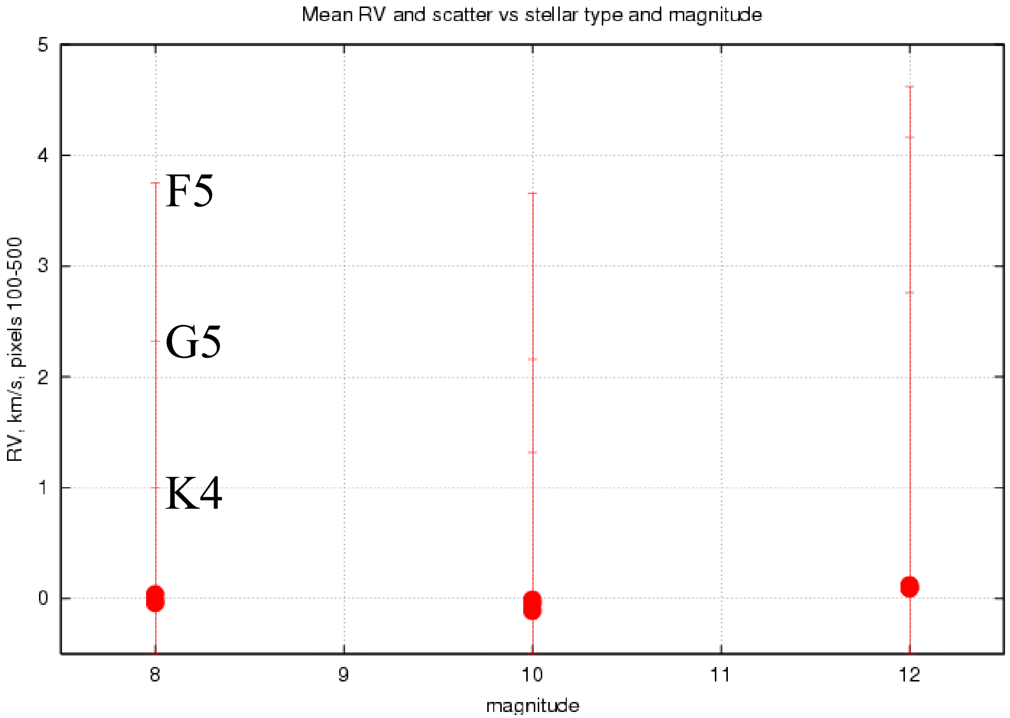


Effect of temperature:



Conclusion: mean values

Mean values for RV and scatter, for pixels 100 to 500:



Conclusion

- Conclusion of last december:
- m<=12 for Standard stars

- Today's conclusion: m<=10!
- Only small difference between mag 8 and 10
- K-stars OK; G-stars less good; F-stars bad
- Constraints come mainly from the CaII lines

CONTINUATION