

*Towards more accurate interpretation
of stellar spectra: the role of
C, N, O and α -process elements*

Gražina Tautvaišienė

*Institute of Theoretical Physics & Astronomy of
Vilnius University, Lithuania*

Standard Solar Composition

$$A_C = 8.52$$

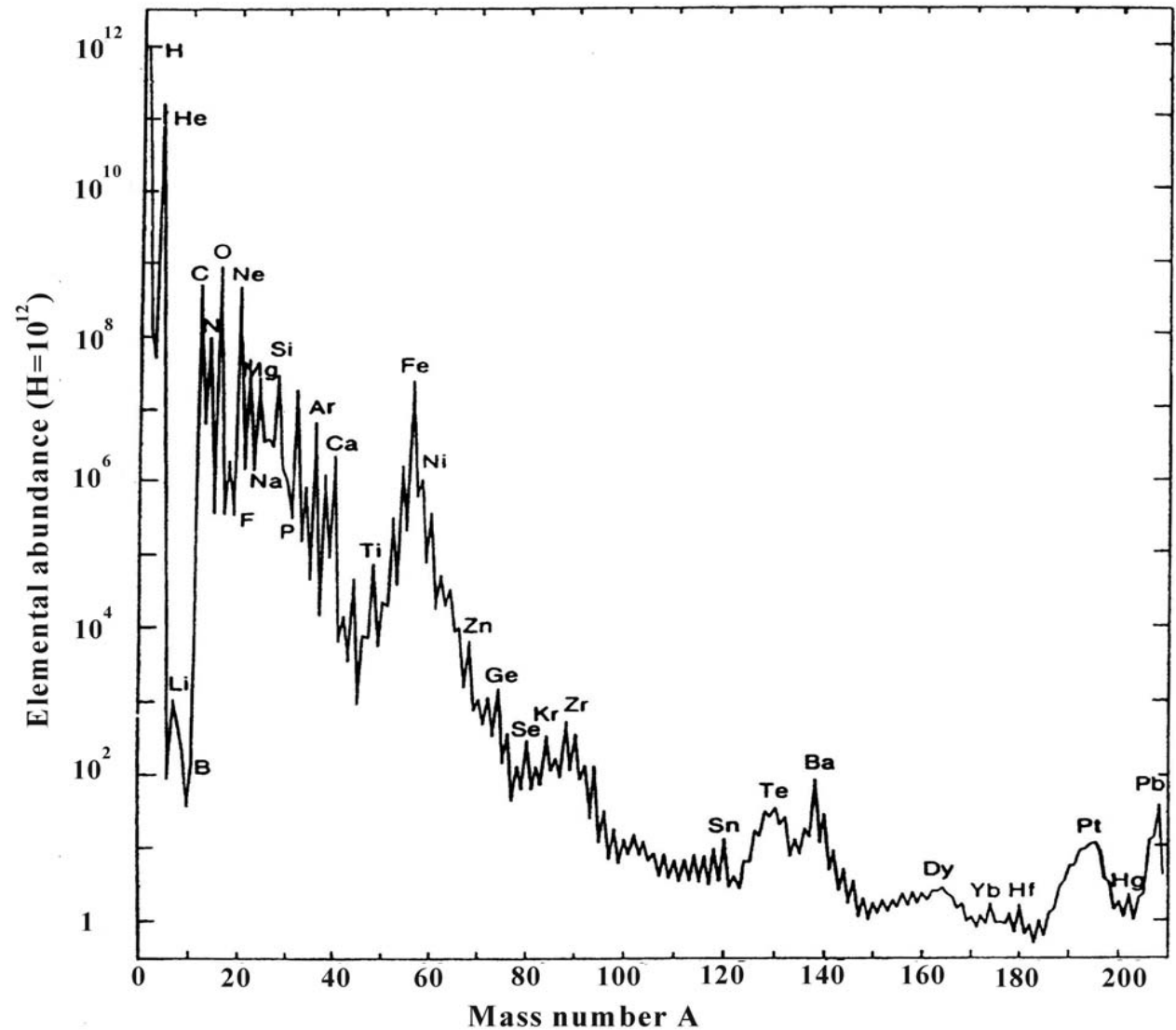
$$A_N = 7.92$$

$$A_O = 8.83$$

$$A_{Fe} = 7.50$$

$$C/N = 3.98$$

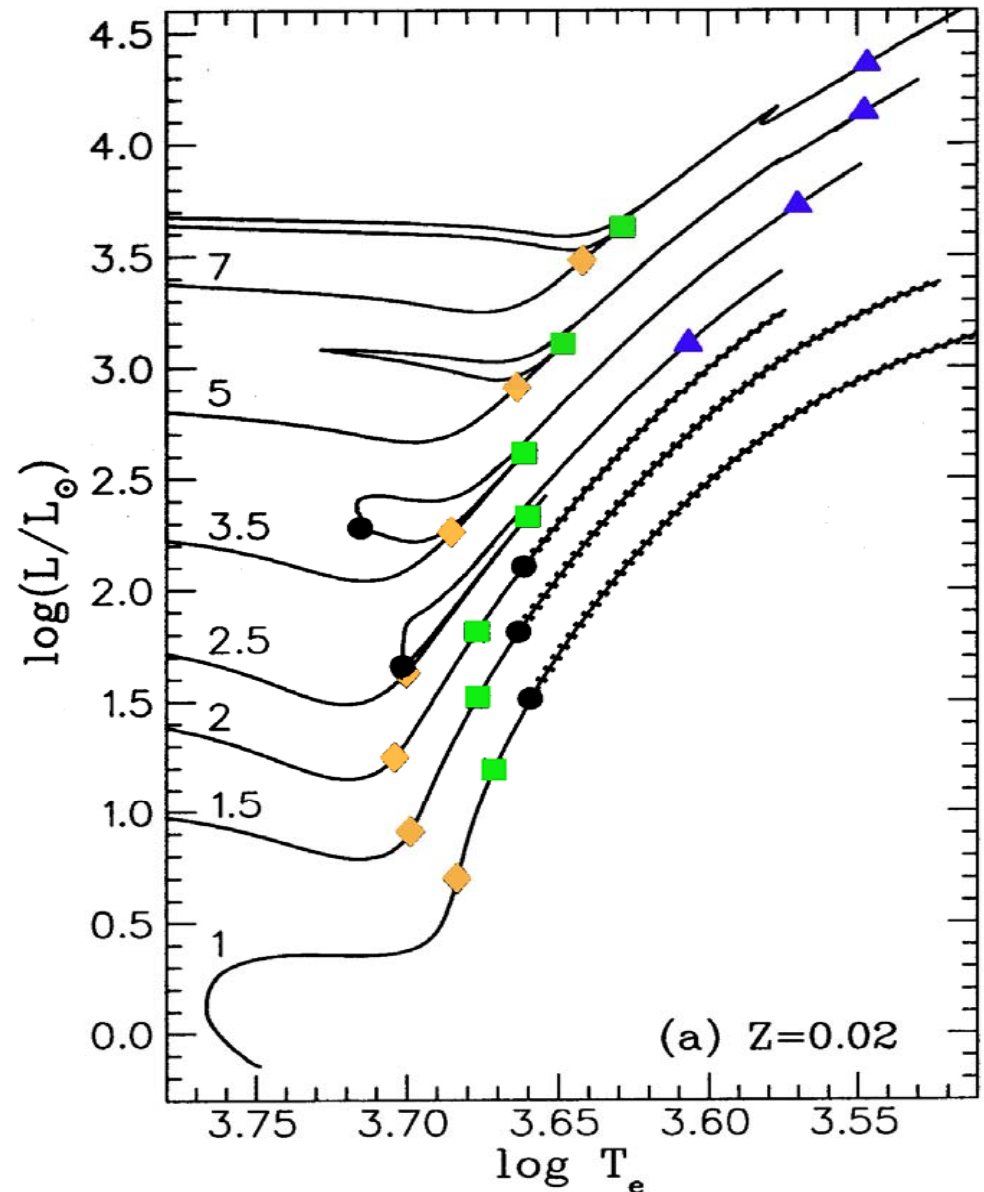
$$^{12}C/^{13}C = 90$$



$$A_{el} = \log N_{el}/N_H + 12.0$$

First discrepancies from the standard theory came when:

- Arcturus was found to have $^{12}\text{C}/^{13}\text{C} = 7.2 \pm 1.5$ (Day et al., 1973)
- The enhancement of CN bands was reported for the clump stars in M 67 (Pagel, 1974)



Photometry

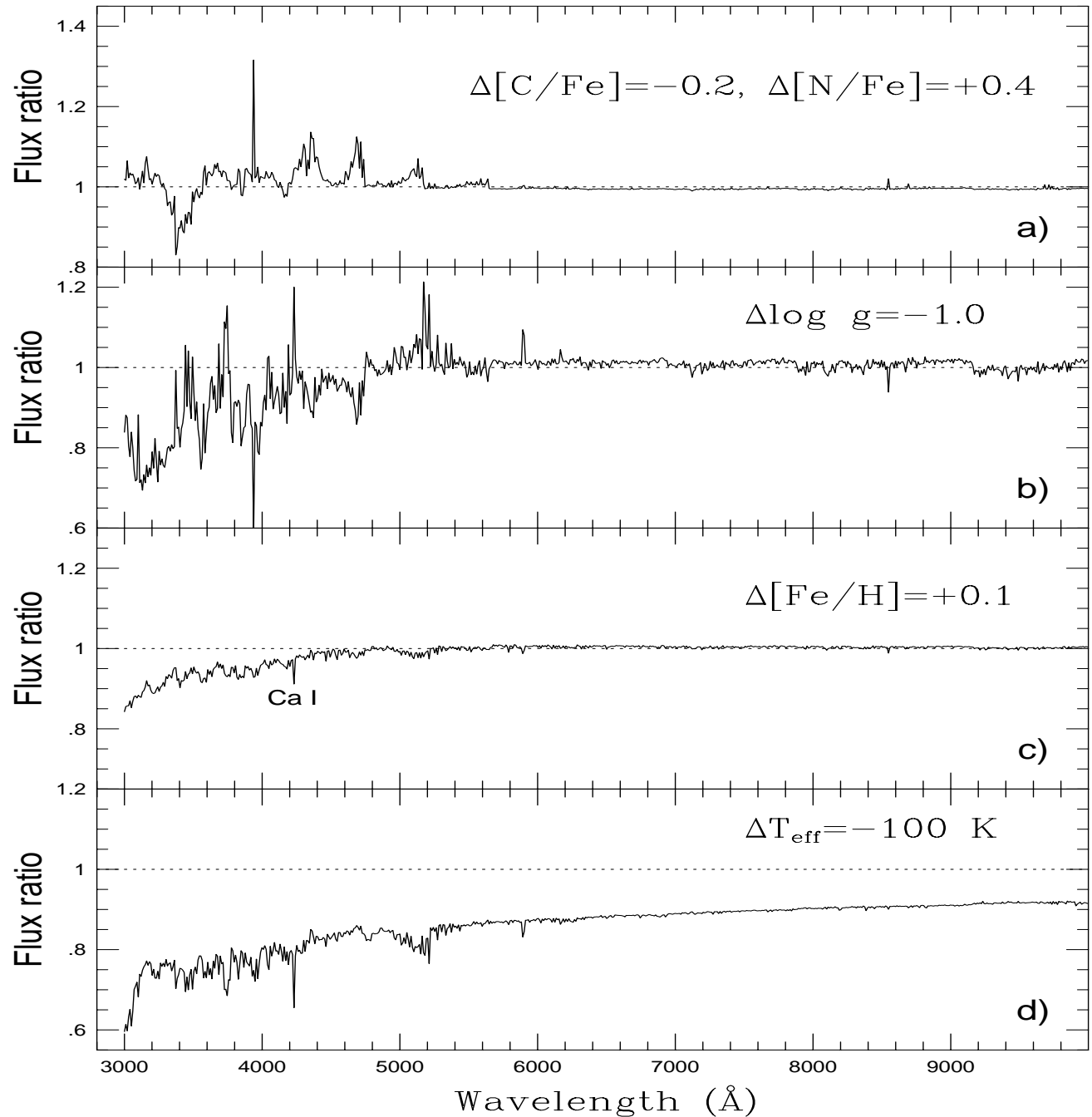
- 1912-1915
- 1951-59 *UBVRI*
- 1962 *uvby β*
- 1963 *Geneva*
- 1962-65 *UPXYZVS*
- **Updated photometric methods of analysis**

Stellar and Galaxy evolution

- 1957 **BBFH**
- 1965 1st dredge-up
- 1973 extra-mixing
- 1983 thick-disk
- 2002-3 new models of stellar atmospheres

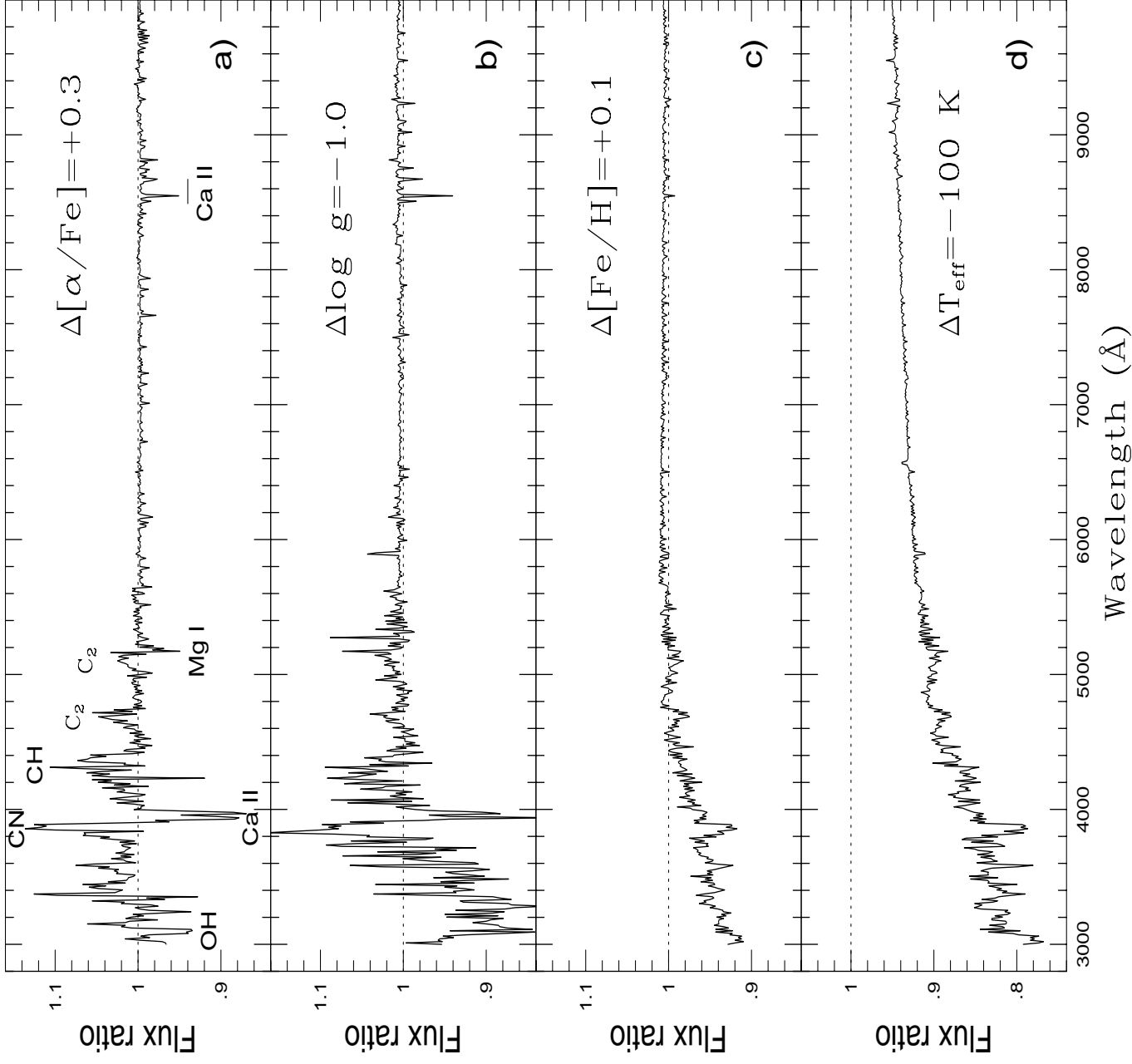
Tautvaisiene
Edvardsson,
Bartasiute,
2003, Baltic
Astron. 12, 5

$T_{\text{eff}} = 4500$
 $\log g = 3.0$
 $[\text{Fe}/\text{H}] = -$



$T_{\text{eff}} = 5500$
 $\log g = 4.0$
 $[\text{Fe}/\text{H}] = -0$

Tautvaisiene
Edvardsson
(2002)



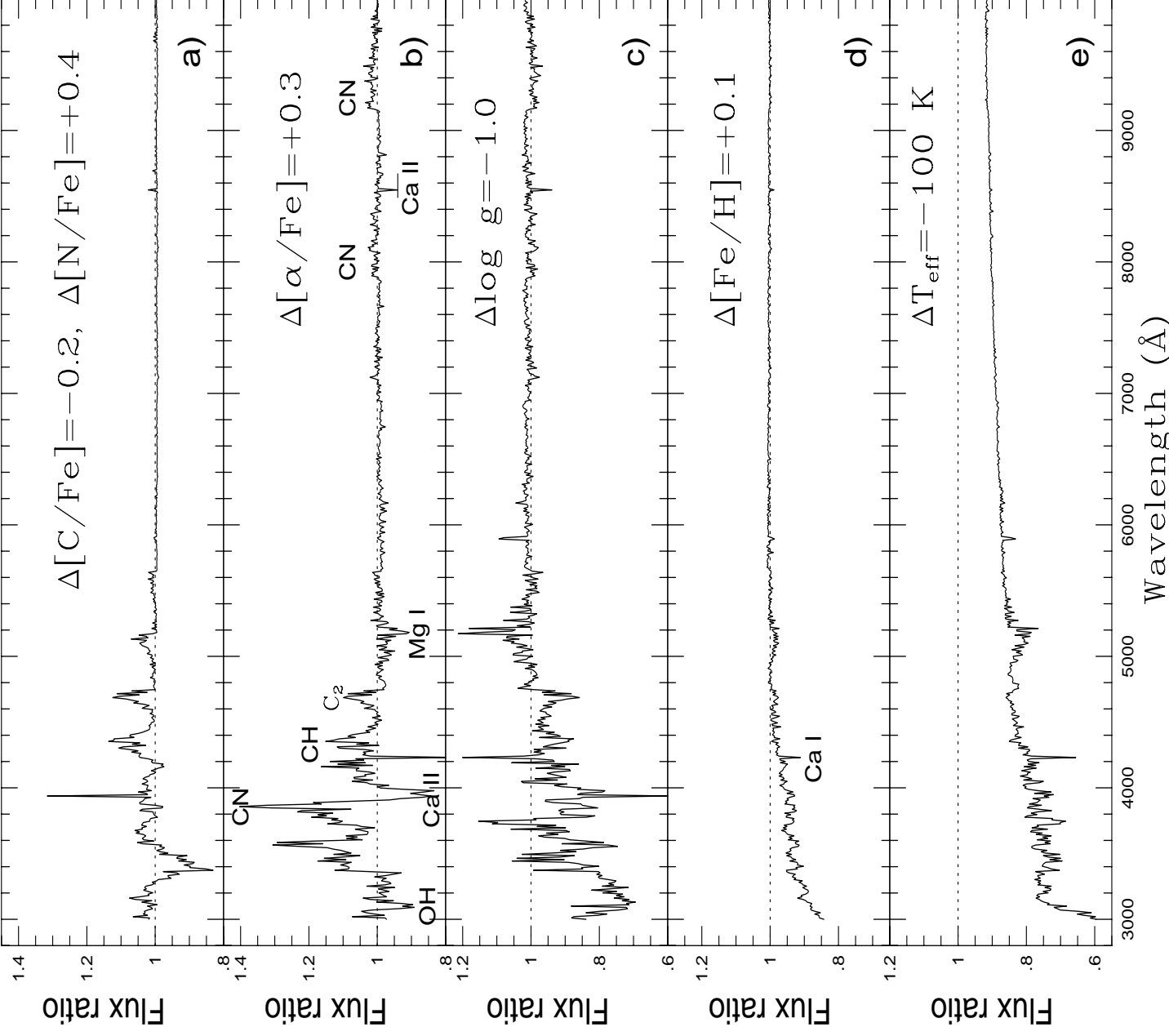
$T_{\text{eff}} = 4500$
 $\log g = 3.0$
 $[\text{Fe}/\text{H}] = -0.2$

(a)

$[\text{C}/\text{Fe}] = -0.2$
 $\text{C}/\text{N} = 1$

(b) – (e)

from Tautvaisis
Edvardsson (2004)



CONCLUSIONS

- For the accurate determination of stellar main atmospheric parameters the influence of C, N, O and alpha-process elements should be taken into account
- Carbon features are abundant in stellar spectra and are sensitive both to mixing processes in stars and to abundances of alpha-process elements
- Modern science and technology urges us to receive from photometric observations more information and of higher accuracy !