CM Dra spectrum analysis

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Orbit and components

- P = 1.268 day
- a=3.76 R_{sun}
- e = 0.00051 !!!
- high proper motion

- M(1)=0.23M_{sun} ; M(2)=0.21M_{sun}
- R (1)=0.25 R_{sun}; R(2) = 0.23 R_{sun}
- log g (1)=5.00; log g(2)=5.00
- Spectral type: M4.5
- Age 4.1 Gyear (Main Sequence)
- Metal poor -1<[M/H]<-0.6
- Chromospherically active (spots)

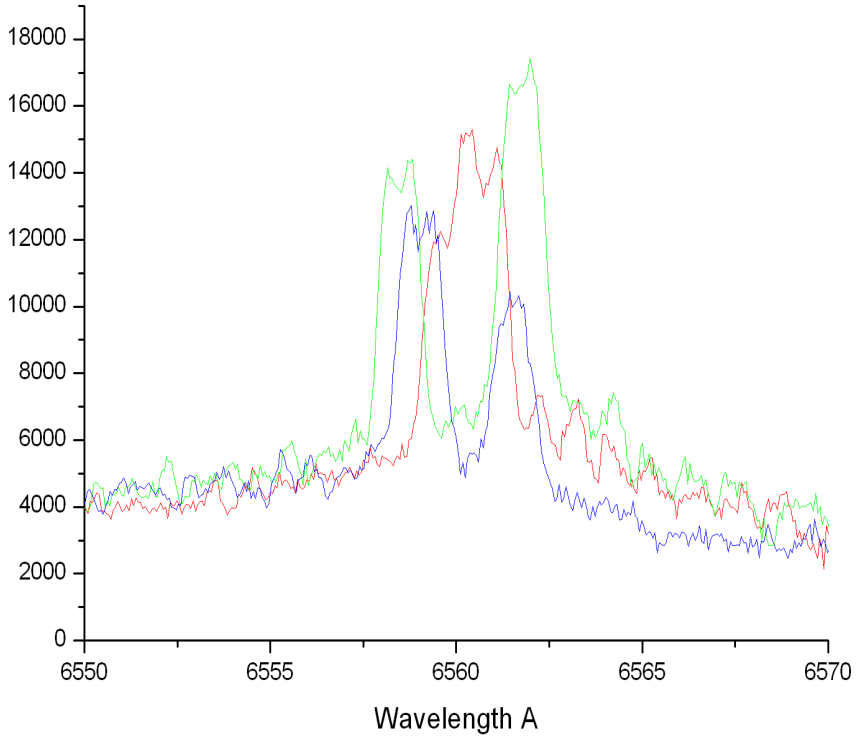
- 2009ApJ...691.1400M - Astrophys. J., 691, 1400-1411 MORALES J.C. et.al.

Features

- $P_{orb}=P_{spin}$ - syncronisation of components rotation
- Overheated atmosphere by the second component?
- Apsidal motion, e .ne. 0 - third body? (or tidal interaction)

Observations

- the 4.2-m William Herschel Telescope using the Echelle high-resolution spectrograph (UES)
- 20-23 May 1997 - 63 echelle spectra of CM Dra
- R = 45000
- 4500-10000 Å



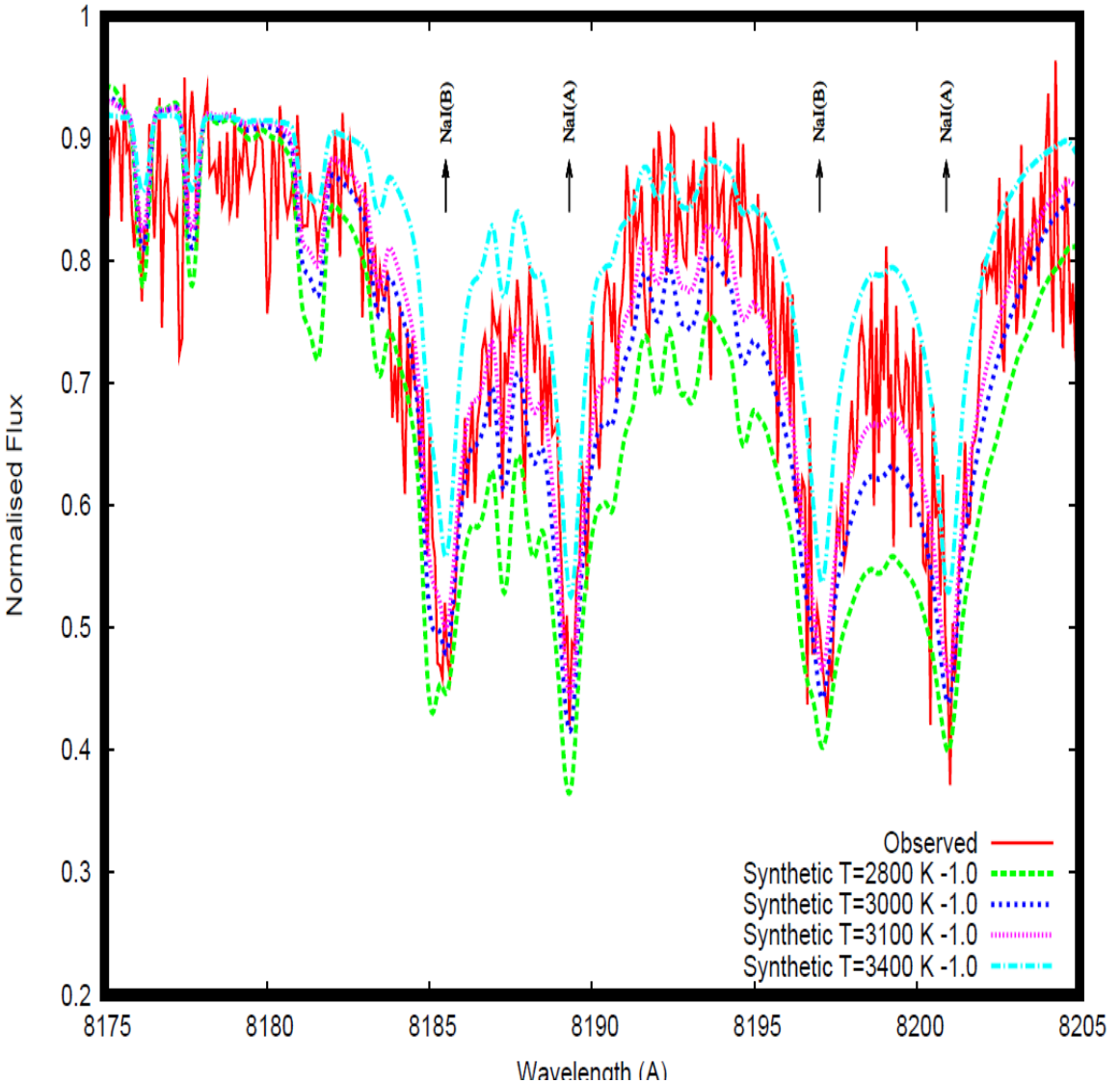
Data	time (UT) midExp	phase	Vr (km/s)
20.05	22:53	0.16	121.79
20.05	1:08	0.23	135.73
20.05	3:08	0.30	143.80

H_a of CM Dra for different phase. Red Phasa – 0.19 Blue – 0.31 Green - 70

Atmosphere models of components

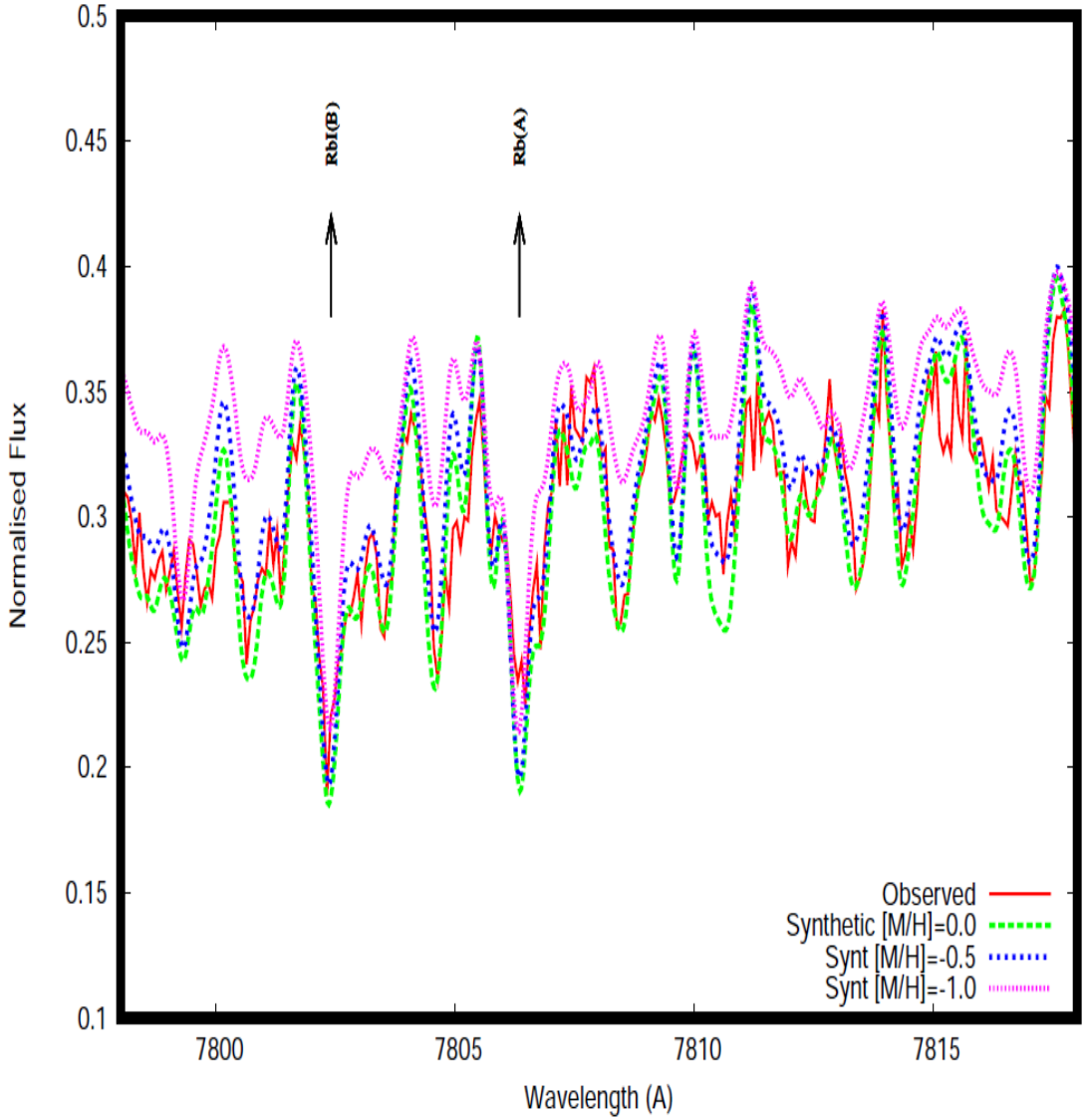
Model atmospheres:
NextGen models
(Hauschildt et al. 1999)
Line lists:
VALD (Kupka et at al. 1999),
TiO (Plez et al. 1998)

T_{eff}= 2800 K
T_{eff} = 3000 K
T_{eff} = 3100 K !
T_{eff} = 3400 K
err ~ 100 K
V_{sini} = 10 km/s
V_{turb} = 3.0 km/s



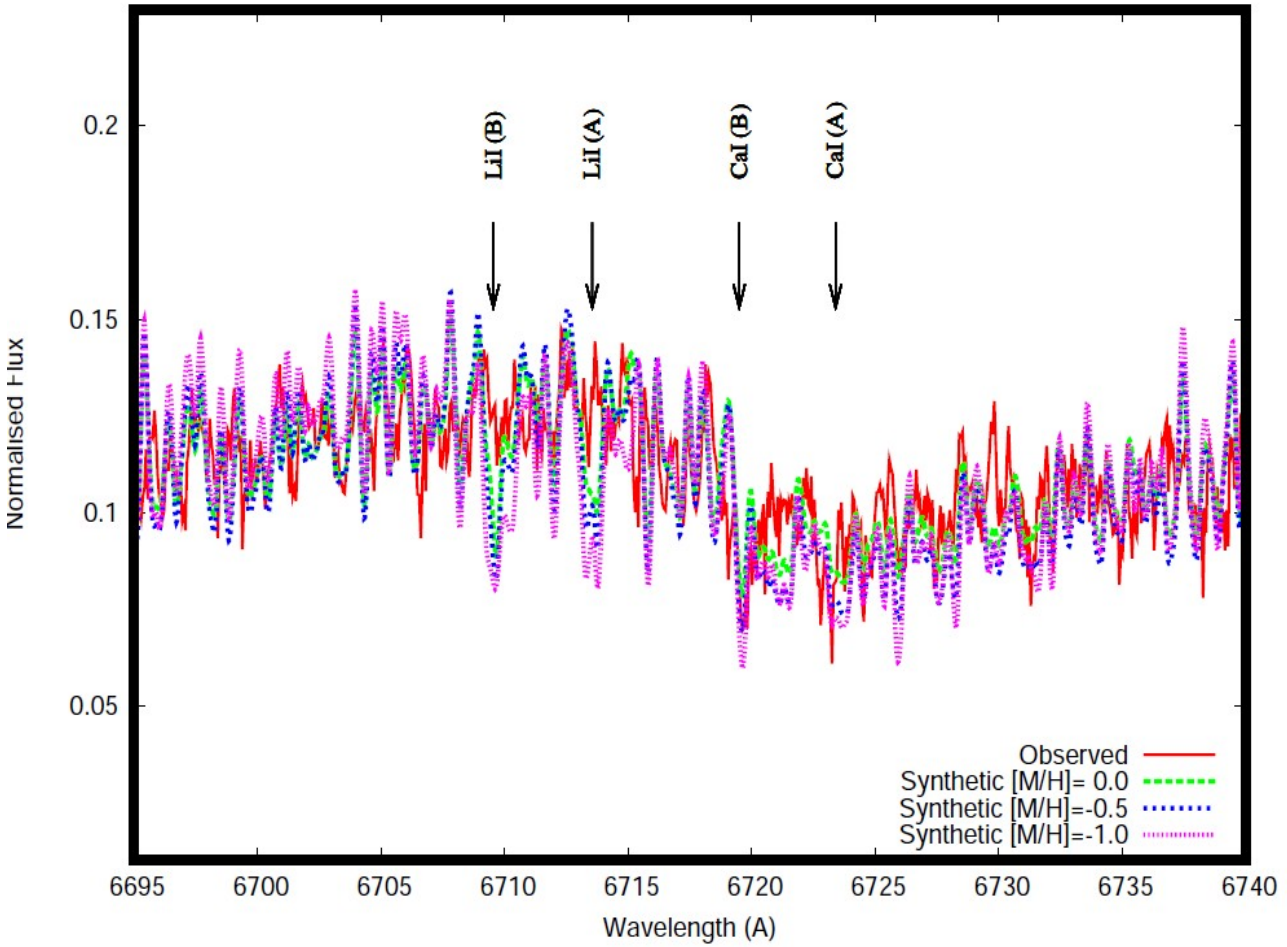
[M/H] from fits to Rb lines

- [M/H] = 0.0 dex
- [M/H] = -0.5 dex ! ← our best fit
- [M/H] = -1.0 dex
- Err ~0.25 dex

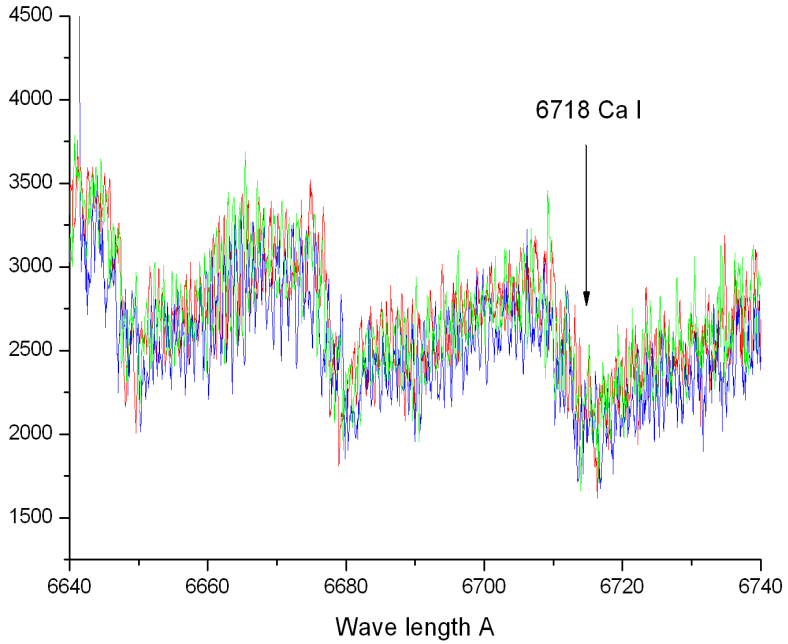


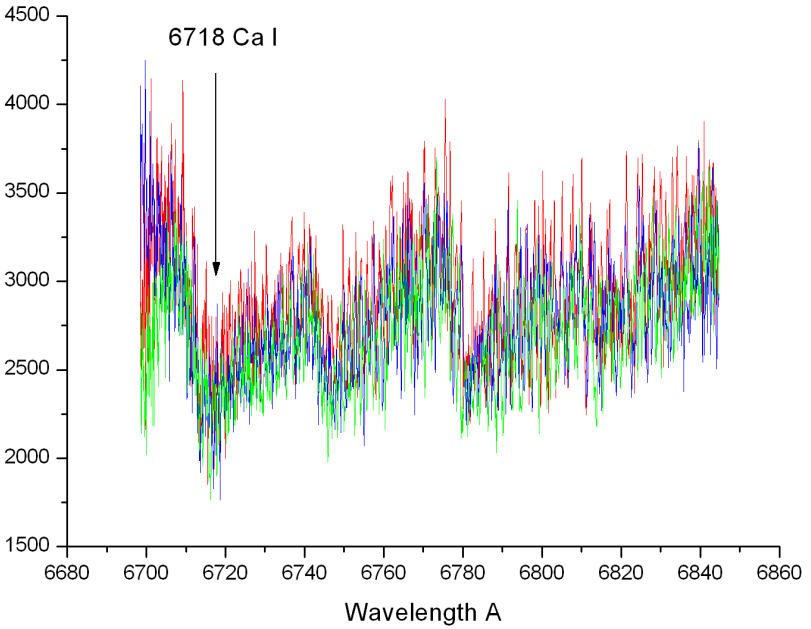
Li I; Ca I

- No Li I
- Ca I
  [M/H] ~ -0.5 dex



TiO and Ca I for diferent phase





Spectrum	phase
Red	0.14
Blue	0.31
Green	0.70

Spectrum	phase
Red	0.02
Blue	0.35
Green	0.50

Conclusions

- T ~ 3100 K
- [M/H] ~ -0.5 dex
- method for making the continuum for echelle spectrum of cool stars
- Overheating atmosphere by the second component???

Thanks!