Understanding host stars: spectroscopic modelling

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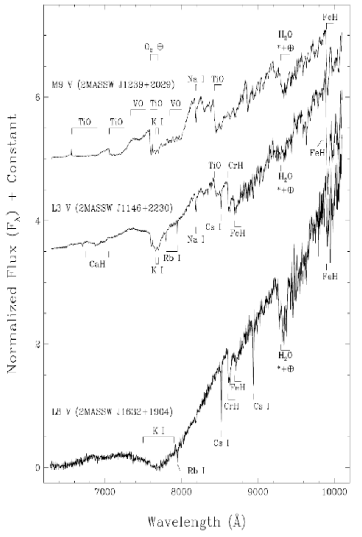
Importance of spectroscopic studying of planet host stars

- Spectrum carries information about T,R,M, composition
- the system age
- information about the planets themselves, their environments, and the physics behind planet formation

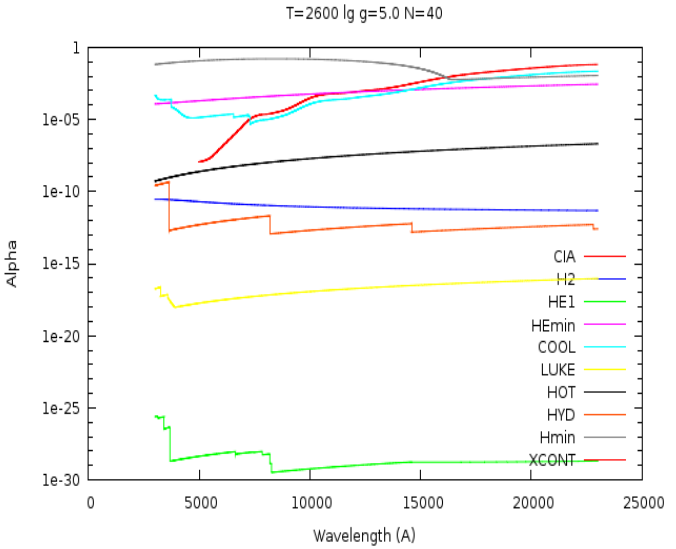
There are significant differences between the spectra of solar-type stars and cool stars T < 3000K

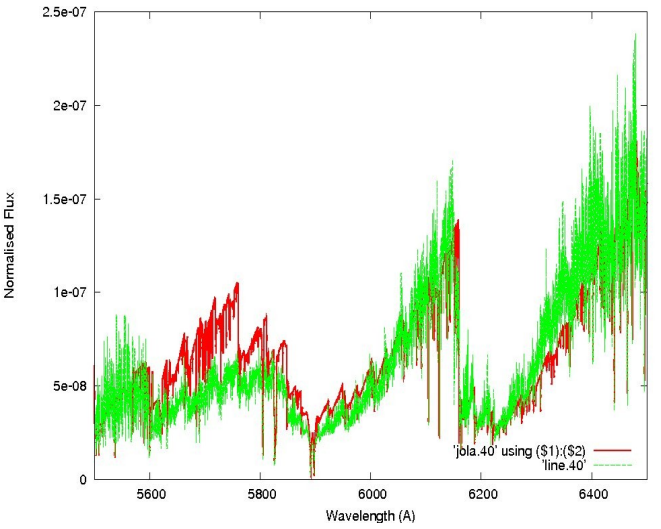
- molecule
- convection
- dust



Study of methods of modeling the atmospheres of cool dwarfs

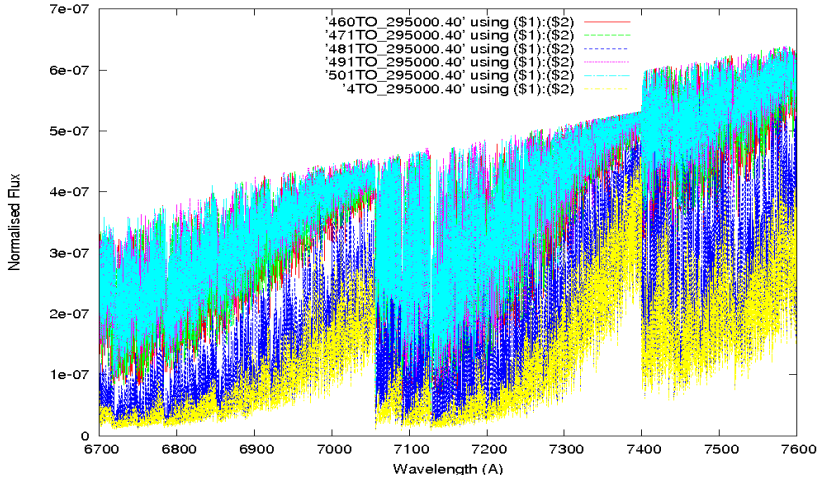
- Wita – our main instrument
- Study of sources in continuous absorption contribution in the atmospheres of solar-type stars, and cool dwarfs. H^- and collision-induced absorption (CIA) pairs H_2-H_2
- Modeling of energy distribution in the spectra of late M dwarfs using techniques JOLA and line-by line.

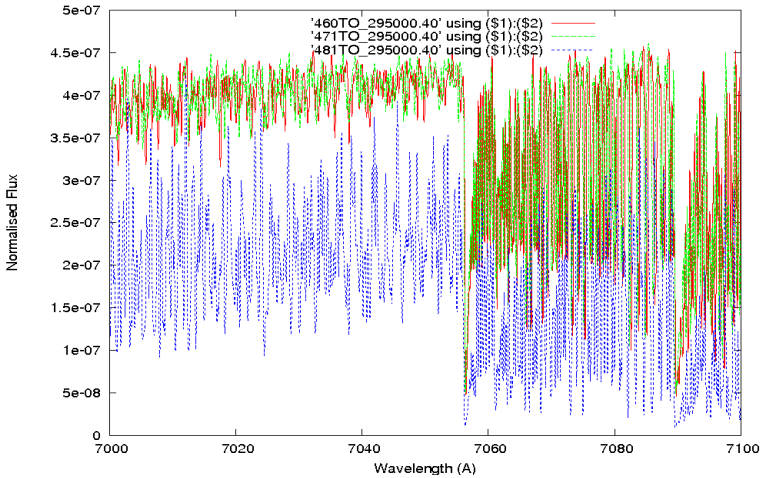




Synthetic spectra of the TiO molecule for different isotopes of Ti (Ti46, Ti47, Ti48, Ti49, Ti50)

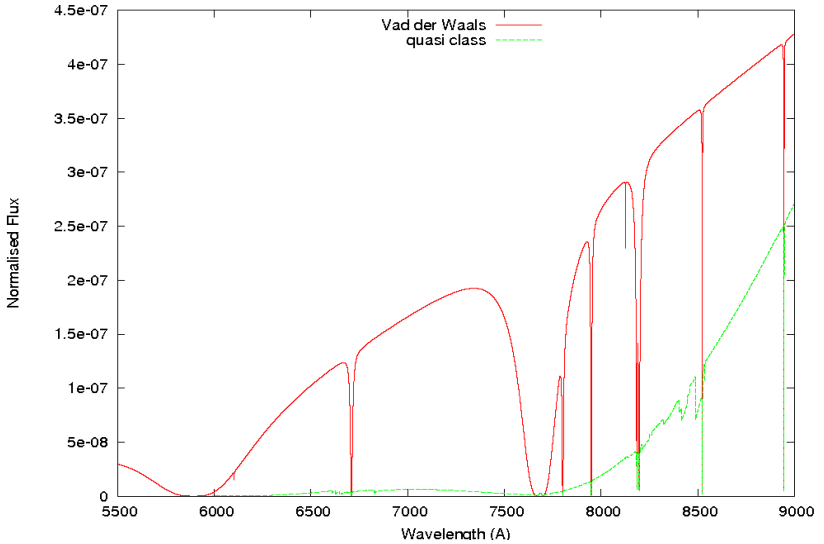
M dwarf T_{eff} = 2900 lg(g)=5.0



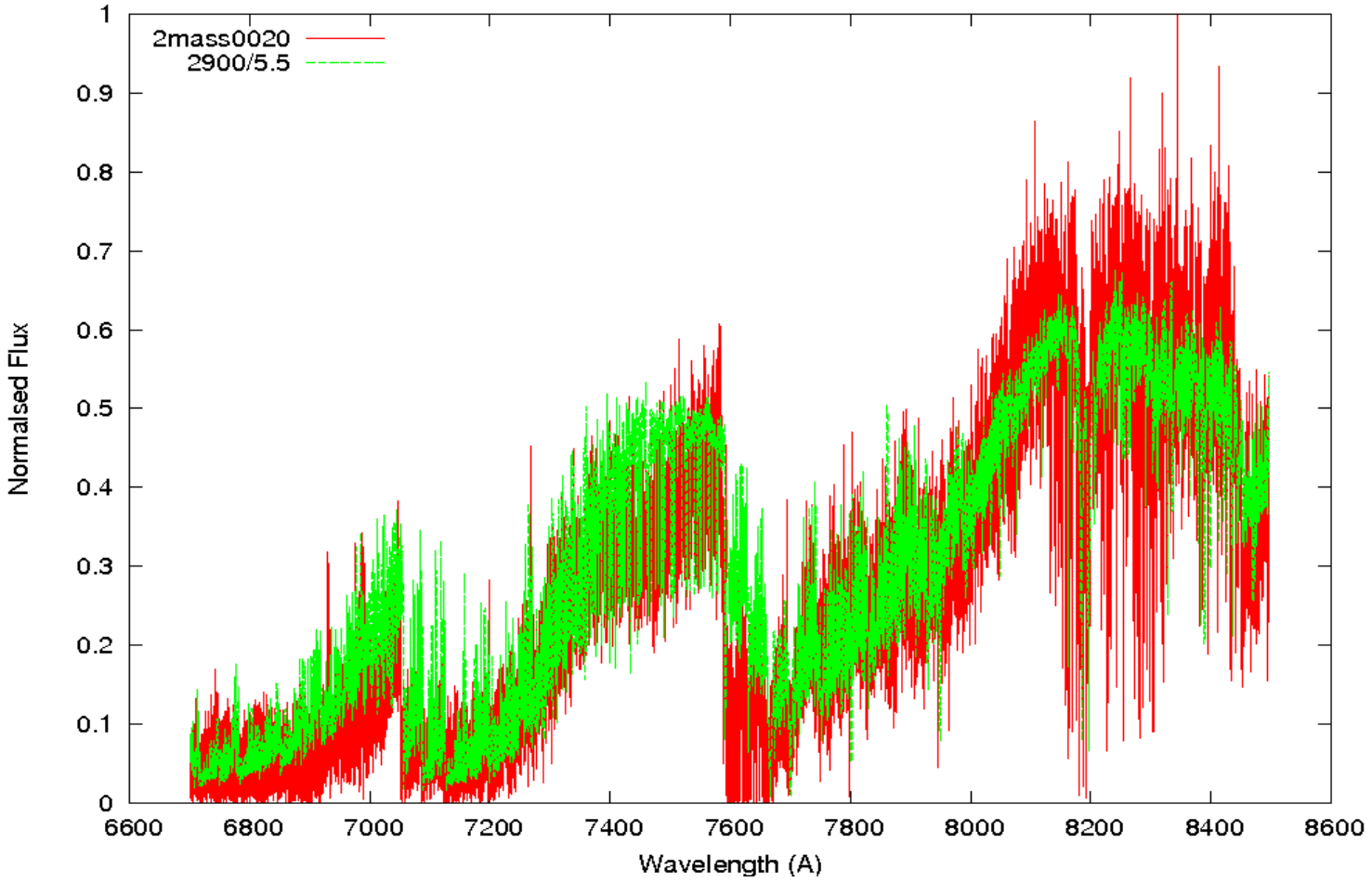


Synthetic spectra spectra of L dwarfs for different mechanisms of line broadening

T_{eff} = 2500 K lg(g)=5.0



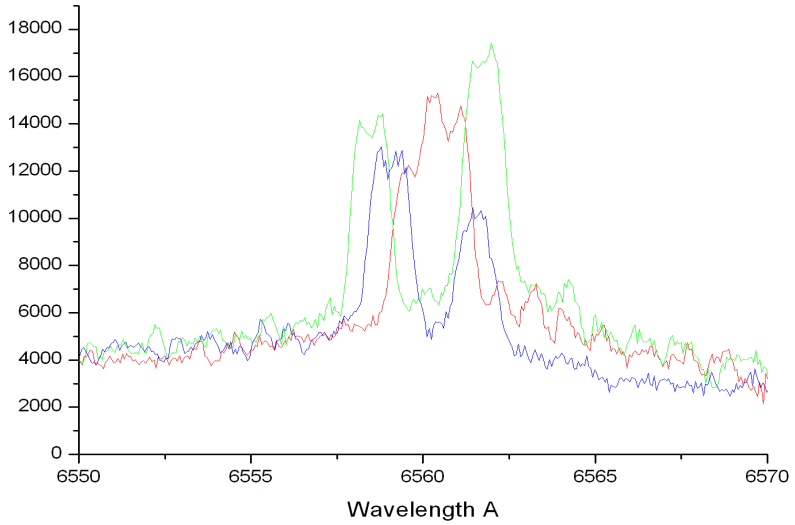
Search algorithm of fiting observed and synthetic spectra. Spectra from James Clarke VLT



CM Dra – tests object for theoretical models

- 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)



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

CM Dra parameters

- the 4.2-m William Herschel Telescope using the Echelle high-resolution spectrograph (UES)

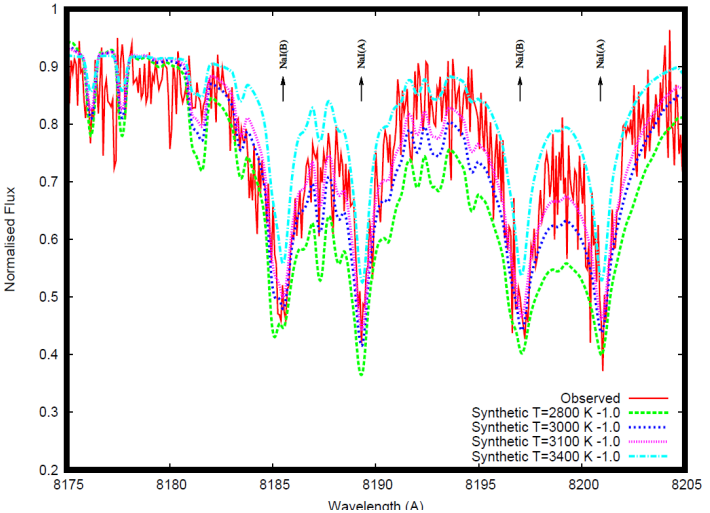
T_{eff} = 3100 K

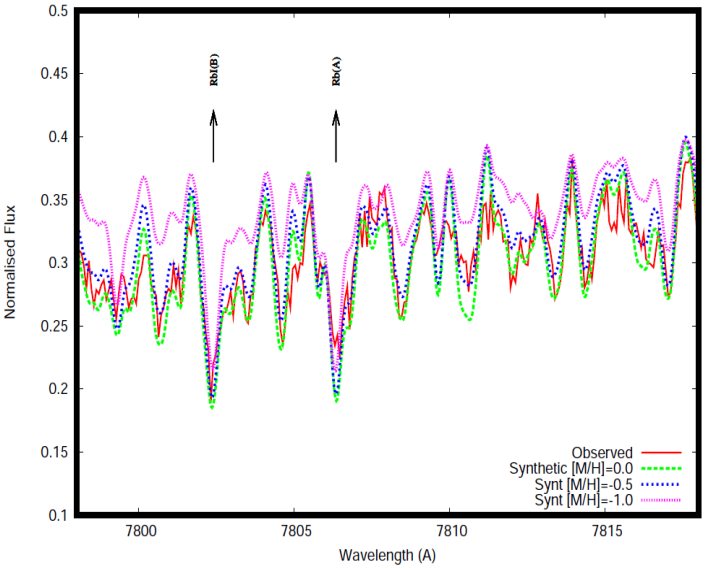
[M/H] = -0.5 dex

err ~ 100 K; ~0.2 dex

V_{sini} = 10 km/s

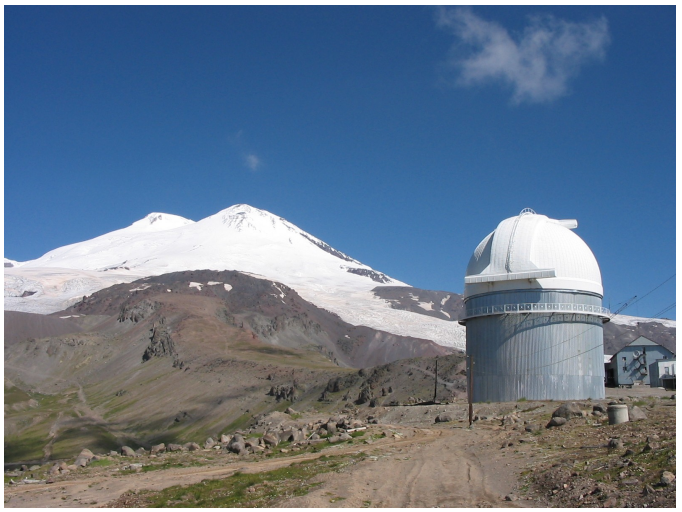
V_{turb} = 3.0 km/s





Observations

- Terskol 2m
- photometric observations of extrasolar planets transits (WTS candidates)
- 26 May – 04 June 2010



- Observer training 14-24 August IAC
- IAC80 (CAMELOT)
- TCS (FastCam)

Current plans

- M dwarfs fundamental parameters estimation (CAP)
- Chemical composition of solar like stars (UH)
- Computations of spectra of earth-like planets
- Molecular spectra of NH_3 CH_4

Thank you!