Problems of fitting high resolution spectra of ultra-cool dwarfs and stars

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Outline

- M-dwarfs (Optical spectra)
- Hosting Stars (abundance analysis)

Collaborators

- RoPACS groups from Hatfield and IAC
- James Jenkins (Chile, UK)

M-dwarf spectra

A search for southern ultracool dwarfs in young moving groups

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ABSTRACT

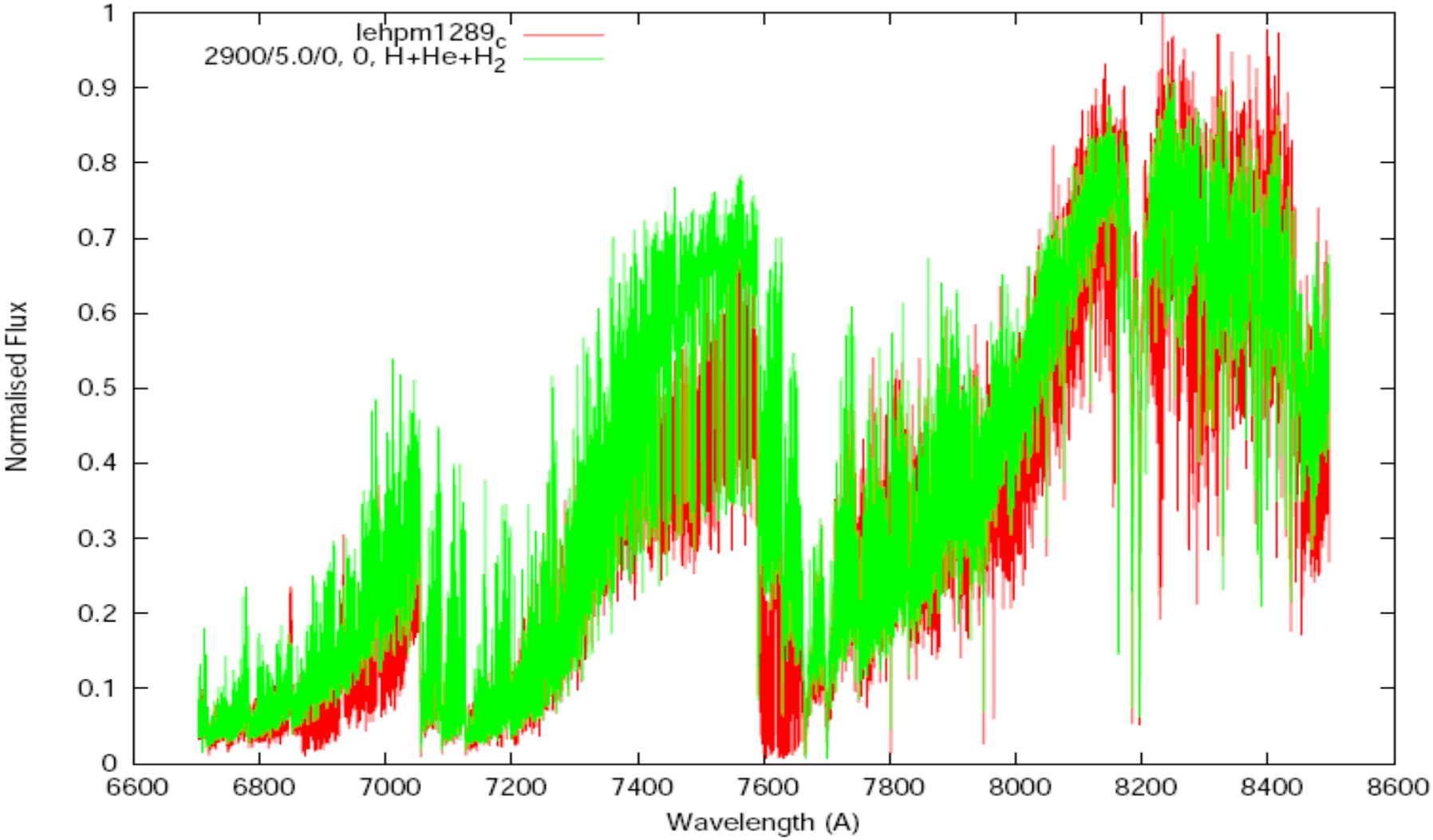
We associate 132 low-mass ultracool dwarfs in the southern hemisphere as candidate members of five moving groups using photometric and astrometric selection techniques. Of these objects, we present high resolution spectroscopy for seven candidates and combine these with previous measurements from the literature to determine spectral types and radial velocities. We thus constrain distance and space motion spectroscopically, allowing the kinematic membership of the moving groups to be assessed. Possible membership of moving groups has allowed ages and metallicities to be constrained for these objects and evolutionary models have been used to estimate their mass. We estimate that up to ∼75 of our candidate moving group members should be genuine, and discuss future work that will confirm and exploit this major new sample.

Key words: stars: low-mass, brown dwarfs – stars: kinematics

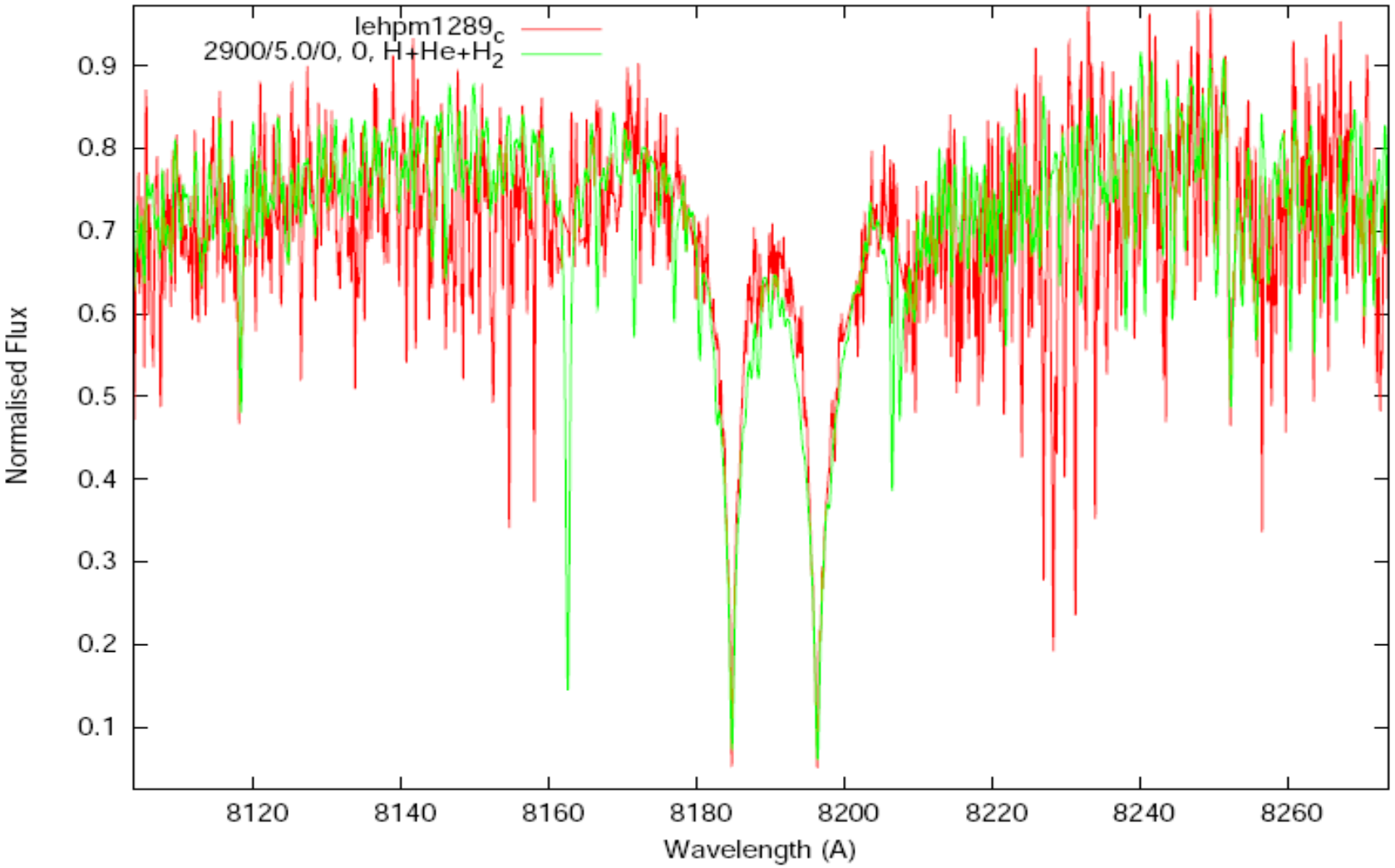
Optical M-dwarf spectra

- TiO dominates, we used Schwenke (1998) line list, only $^{48}Ti^{16}O$ was included.
- A few atomic lines on the neutral alkalies are seen in the spectrum…
- Spectra were computed by Wita for NextGen model atmosphere of [z]=0.

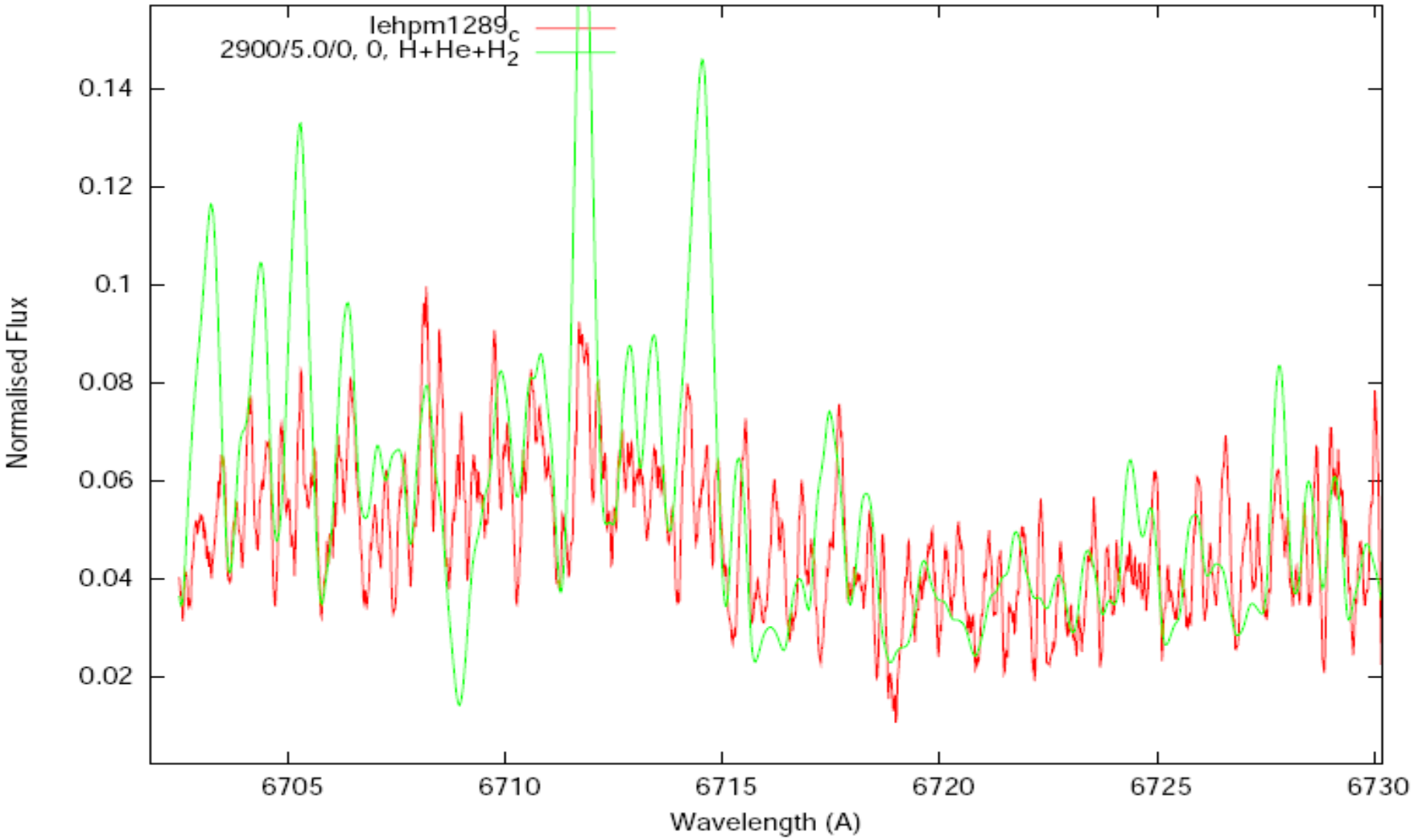
Fits to observed spectra



Fit to observed lines



No Lithium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2900/5.0/0, 0, H+He+H2
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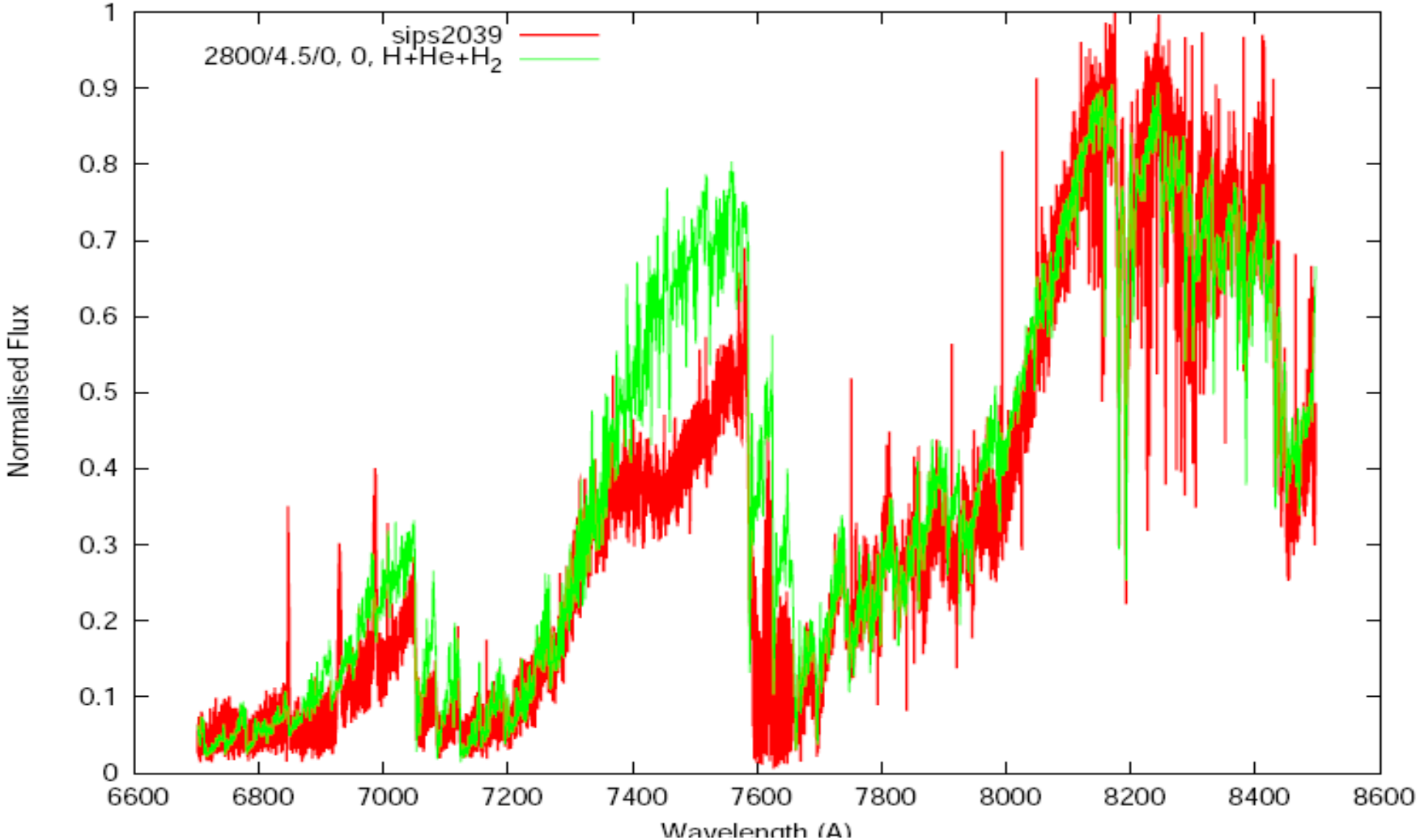
0.12
0.1
0.08
0.06
0.04
0.02
Normalised Flux
6705
6710
6715
6720
6725
6730
Wavelength (A)

Lehpm2039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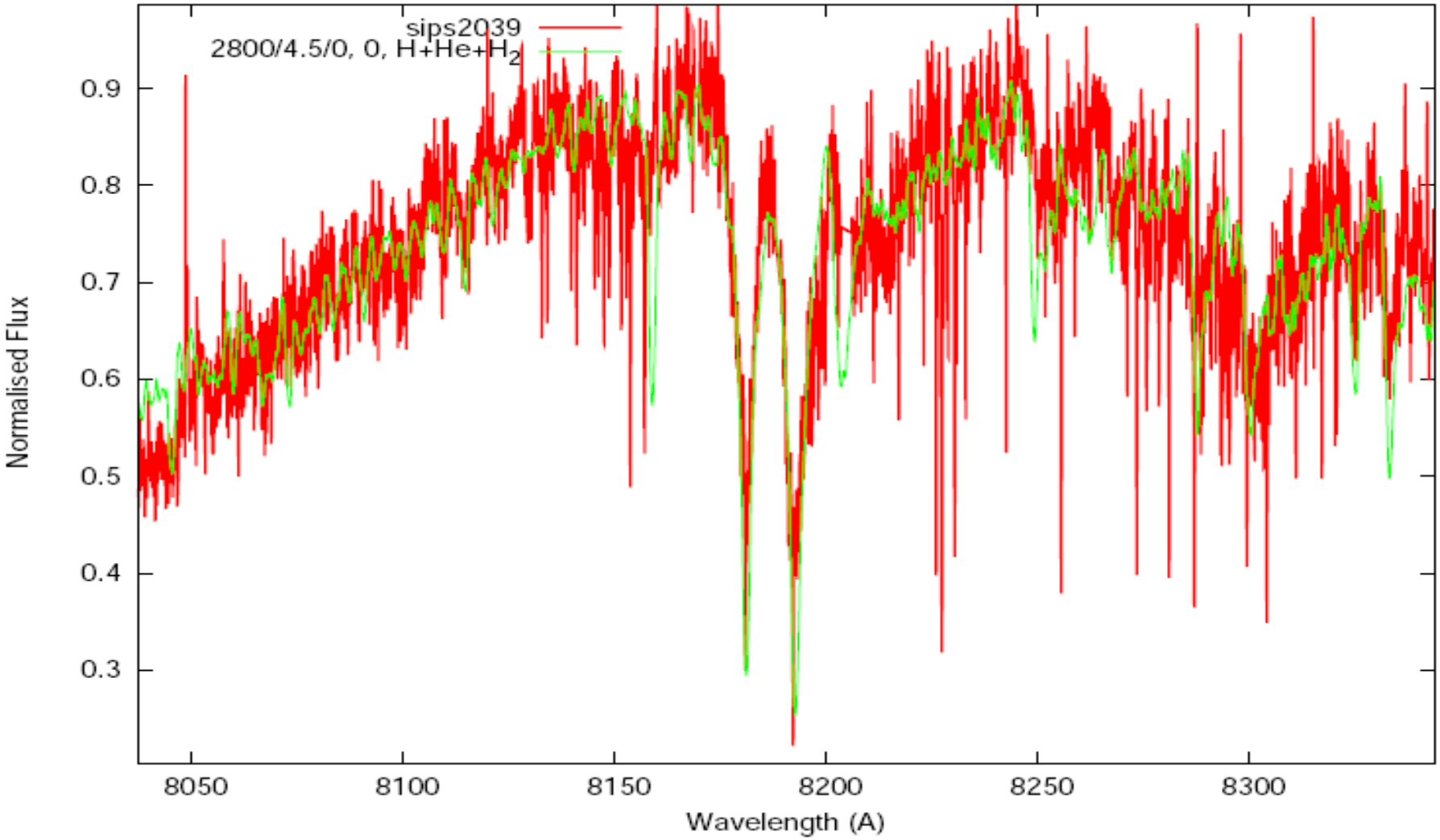
2800/4.5/0, 0, H+He+H2
Normalised Flux
Wavelength (A)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
6600
6800
7000
7200
7400
7600
7800
8000
8200
8400
8600

Na I doublet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Normalised Flux
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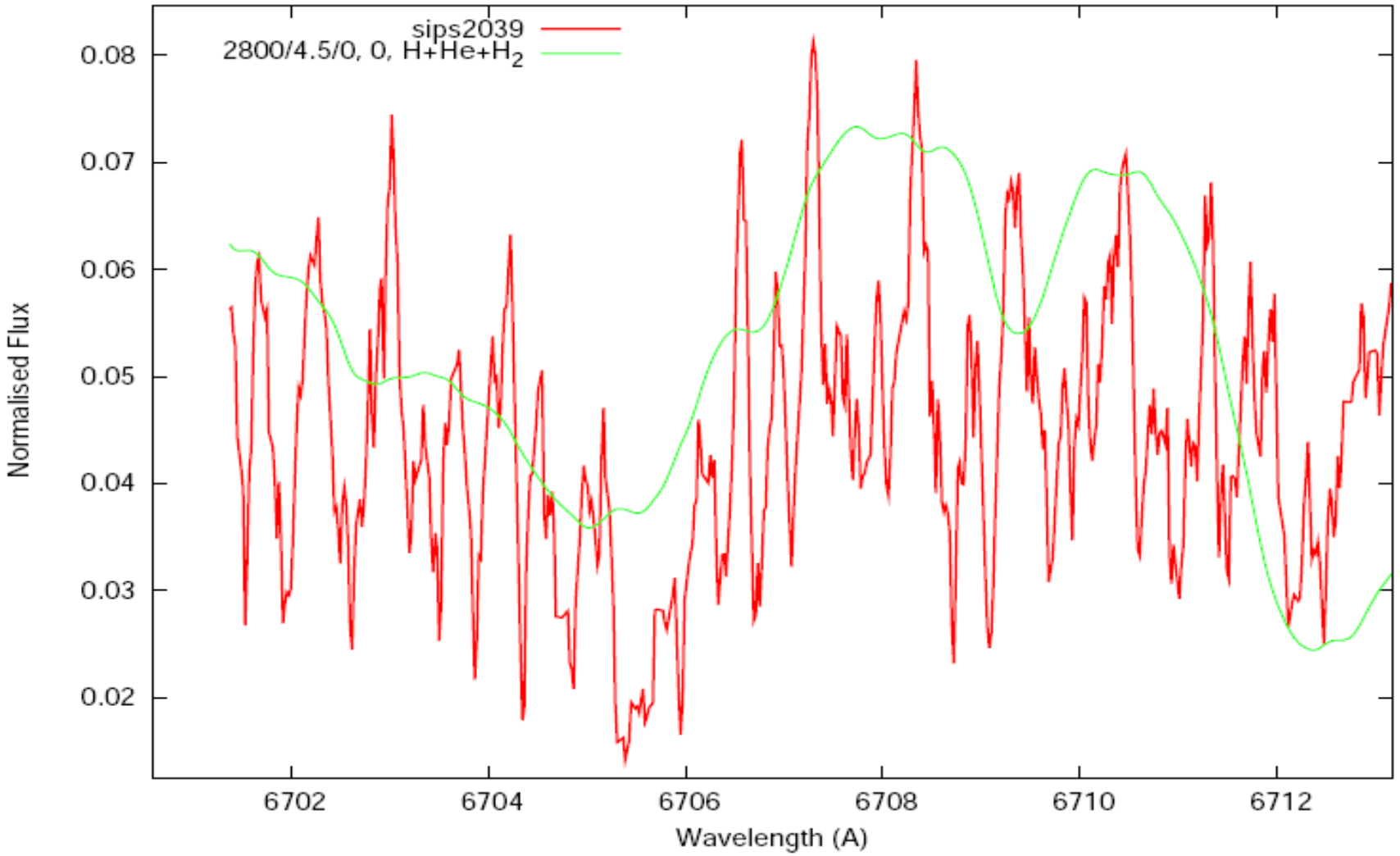
0.8
0.7
0.6
0.5
0.4
0.3
8050
8100
8150
8200
8250
8300
Wavelength (A)

Lithium


sips2039
2800/4.5/0, 0, H+He+H2
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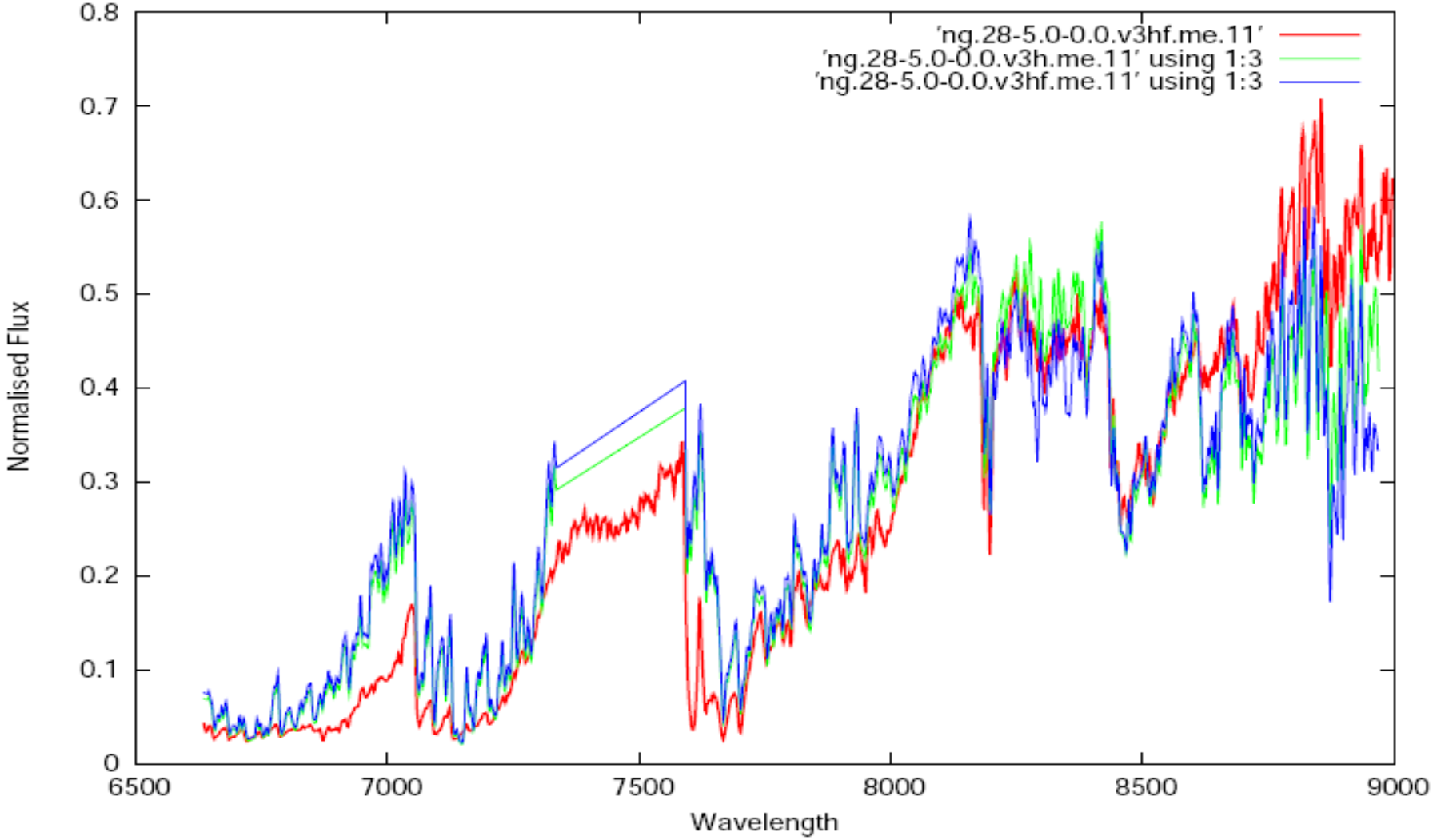
0.07
0.06
0.05
0.04
0.03
0.02
Normalised Flux
6702
6704
6706
6708
6710
6712
Wavelength (A)

VB10 case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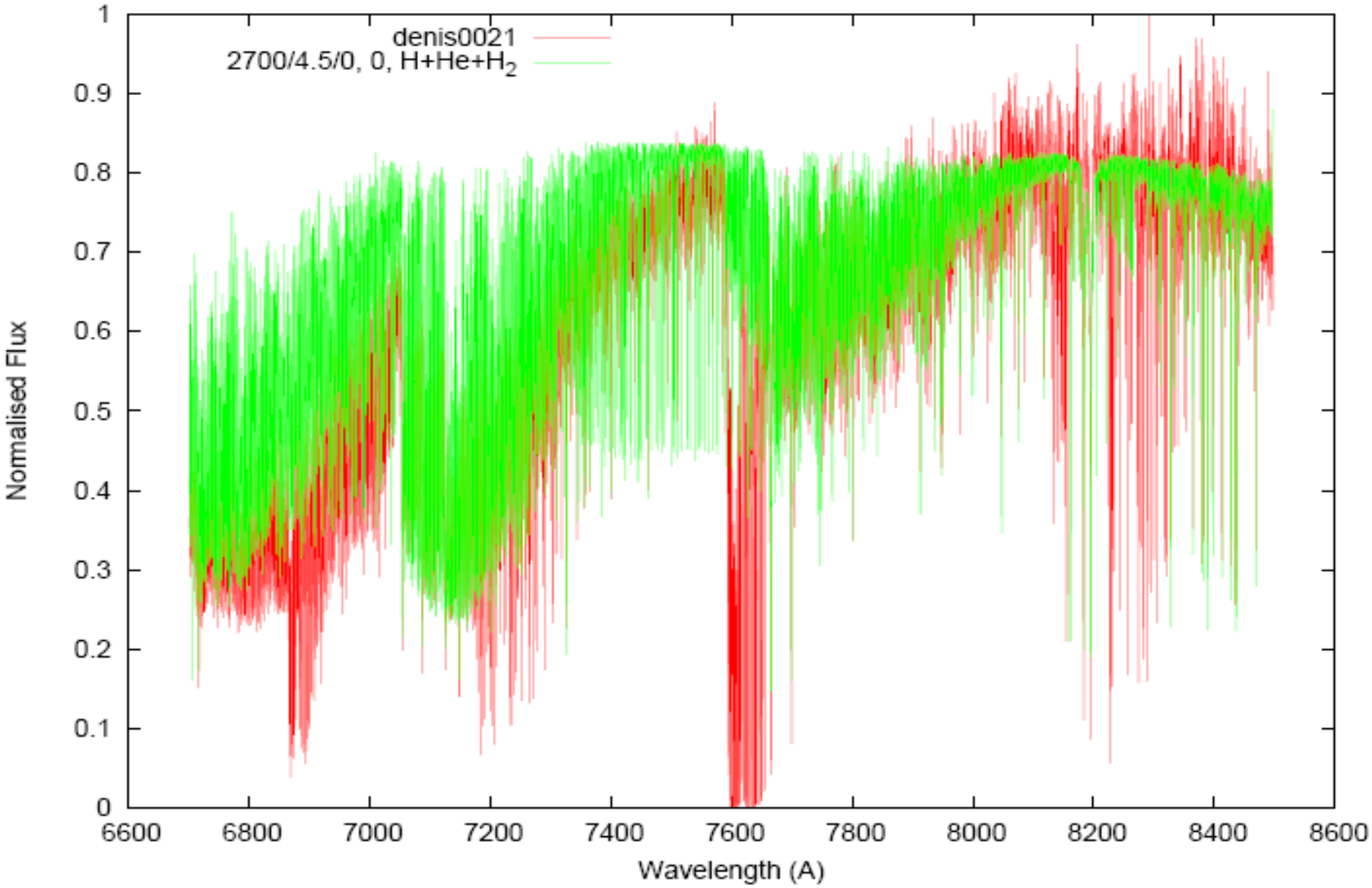
'ng.28-5.0-0.0.v3h.me.11' using 1:3
'ng.28-5.0-0.0.v3hf.me.11' using 1:3
Normalised Flux
Wavelength
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
6500
7000
7500
8000
8500
9000

???VB10!!!


denis0021
2700/4.5/0, 0, H+He+H2
Normalised Flux
Wavelength (A)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
6600
6800
7000
7200
7400
7600
7800
8000
8200
8400
8600

Conclusions I.

- Qality of observations should correspond with the quality of observations.
- We can use our classical procedure to fit M-dwarf spectra of M0-M7.
- Something happens on M7-M8, the most probably dusty effects(?).

Abundances of hosting stars.

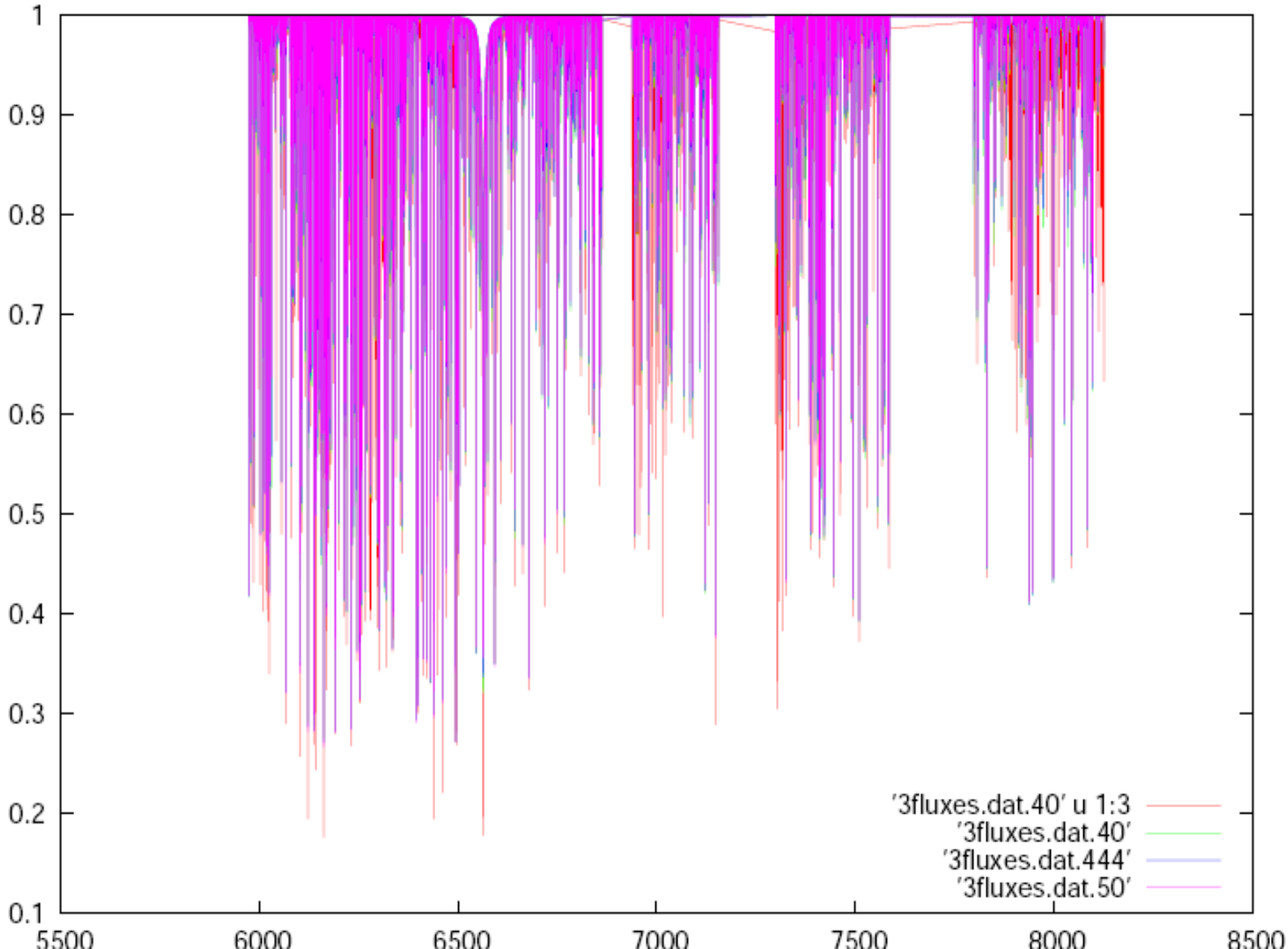
- Observations
- Data reductions
- Abundance processing

LARGE ARRAYS OF THE DATA.

Abundances in hosting stars

- Hundreds of solar-like stars.
- Classical procedures are not very effective.
- A lot of semi-free parameters.

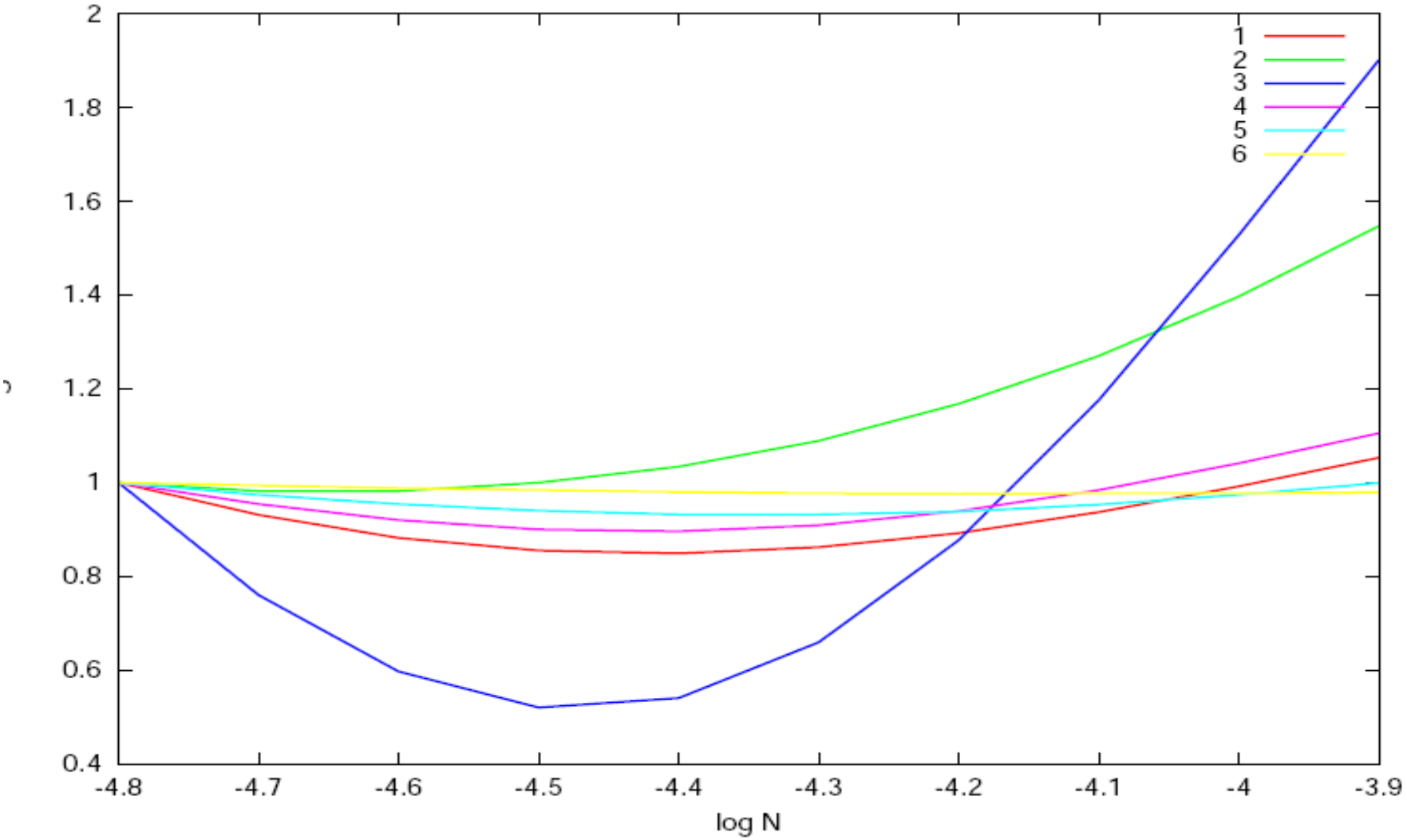
Fitting procedure



Spectral regions

5800.00	6300.00	(1)
6300.00	6800.00	(2)
6800.00	6865.00	(3)
6940.00	7160.00	(4)
7300.00	7590.00	(5)
7800.00	8130.00	(6)

S = f (log N)



Abundances

	Sun	HD1835
Fe	-4.44 +/-0.05	-4.2 +/- 0.05
Si	-4.4 +/-0.05	-4.2 +/-0.05
Al	-5.65 +/-0.05	-5.45+/-0.05
[z]	0	+0.2

Perspectives

- Fine analysis of late dwarf spectra
- T and Y dwarfs spectra
- CM Dra
- Abundances hosting stars

Superconclusion