Modelling of SEDs and spectra of EQJ0704-0350

(A talk from the parallel world)

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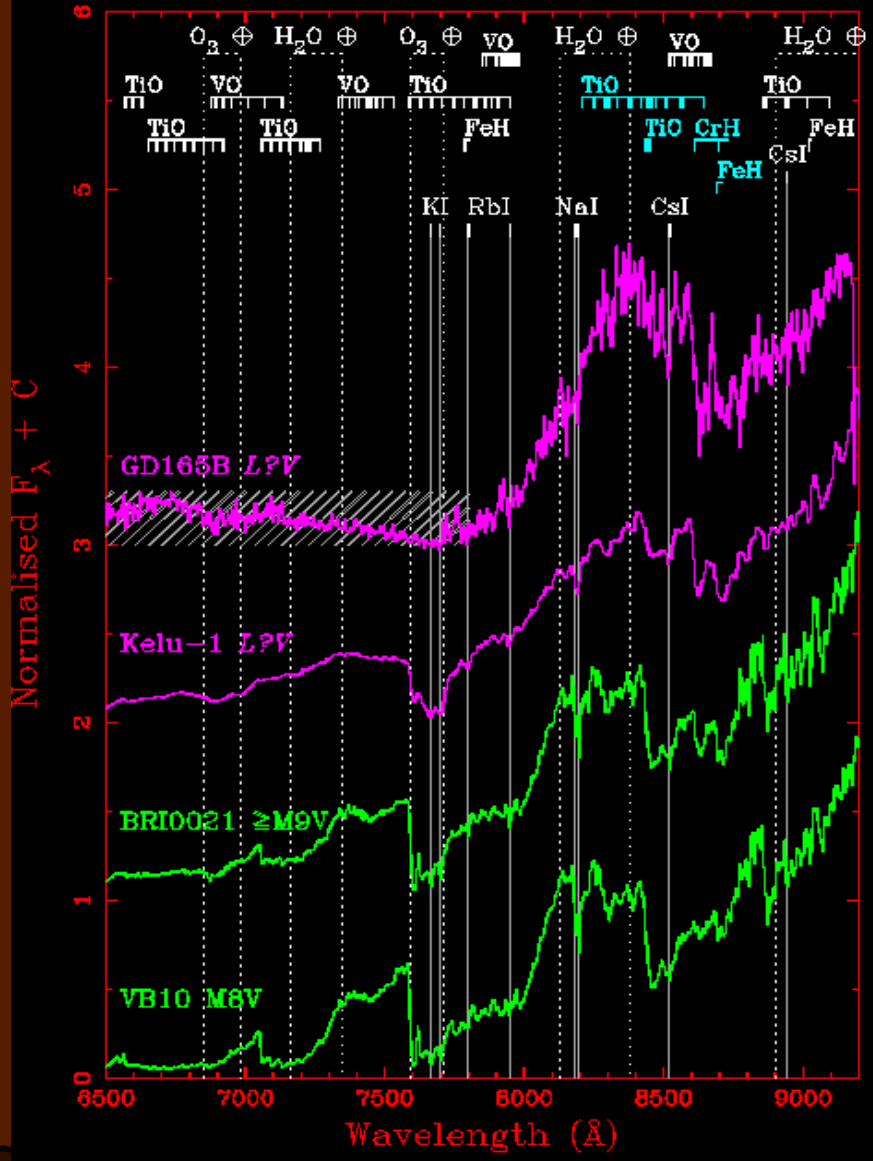
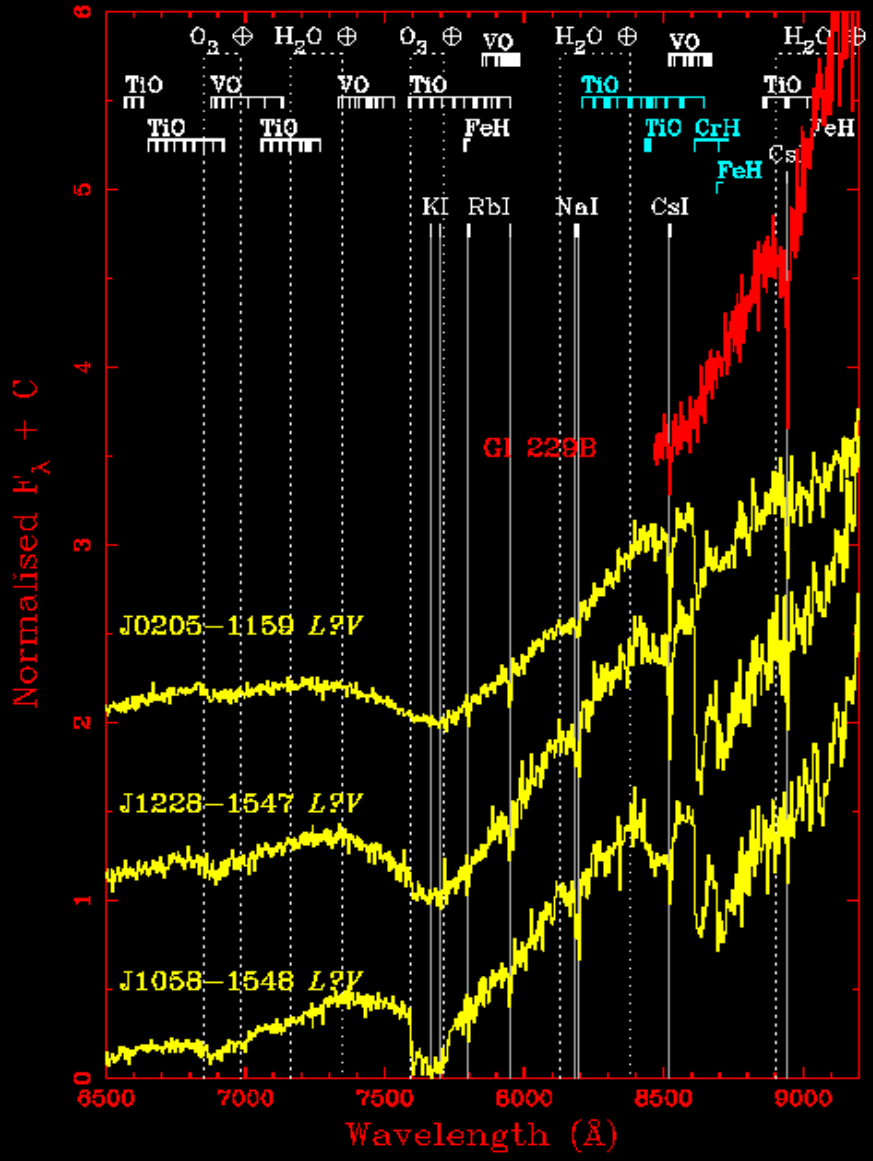

Normalised F_λ + C
Wavelength (Å)
$O_2 \oplus$ $H_2O \oplus$ $O_2 \oplus$ VO $H_2O \oplus$ VO $H_2O \oplus$
TiO VO VO TiO TiO
TiO TiO FeH TiO CrH FeH
FeH CsI
KI RbI NaI CsI
GD165B L?V
Kelu−1 L?V
BRI0021 ≥M9V
VB10 M8V
6500 7000 7500 8000 8500 9000
0 1 2 3 4 5 6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TiO VO VO TiO TiO
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FeH CsI
KI RbI NaI CsI
Gl 229B
J0205−1159 L?V
J1228−1547 L?V
J1058−1548 L?V
6500 7000 7500 8000 8500 9000
0 1 2 3 4 5 6

Topics of my interest:

abundances and SEDs

- Hydrogen-normal stars

--- EQJ0704.0-0350 (?)

--- *M-giants*

--- C-giants (?)

- Hydrogen poor stars

--- *R CrB*

--- Sakurai's object

Collaborators

- Nye Evans, J.Th. van Loon, M.Rushnon, B.Smalley (Keele)
- Yakovina Larisa(MAO)
- Kaminsky Bogdan (MAO)
- Lisa Krause (SAAO)
- Ulisse Munary(INAF)
- A.V.Filippenko (Berkeley)
- Valentina Klochkova (SAO)
- Hilmar Duerbeck (OU)
- Tonu Kipper (IAFA)
- Thomas Geballe (UKIRT)

PROCEDURE

- Model atmospheres

SAM12 (Pavlenko 2003) (ATLAS12 Kurucz 1999),

NextGen(Hauschildt et al. 1999)

1D,

Convection + radiation,

LTE,

No sinks and sources of energy

Opacity sampling for

- Synthetical spectra

WITA(Pavlenko 2000)

1D,

LTE,

Voigt function for lines

VCS theory for H lines

SEDs

OPACITIES:

- C/O < 1,

Opacity sources:
VO, TiO;
H_2O, CO
Methane???

- C/O > 1

CN, CO, CH,
C_2,HCN, C_3,
--- [H]??
--- isotopes!

Fits to observed spectra

$$S(f_{\rm s}, f_{\rm h}, f_{\rm g}) = \sum \left(1 - f_{\rm h} \times r^{\rm synt} / r^{\rm obs}\right)^2$$

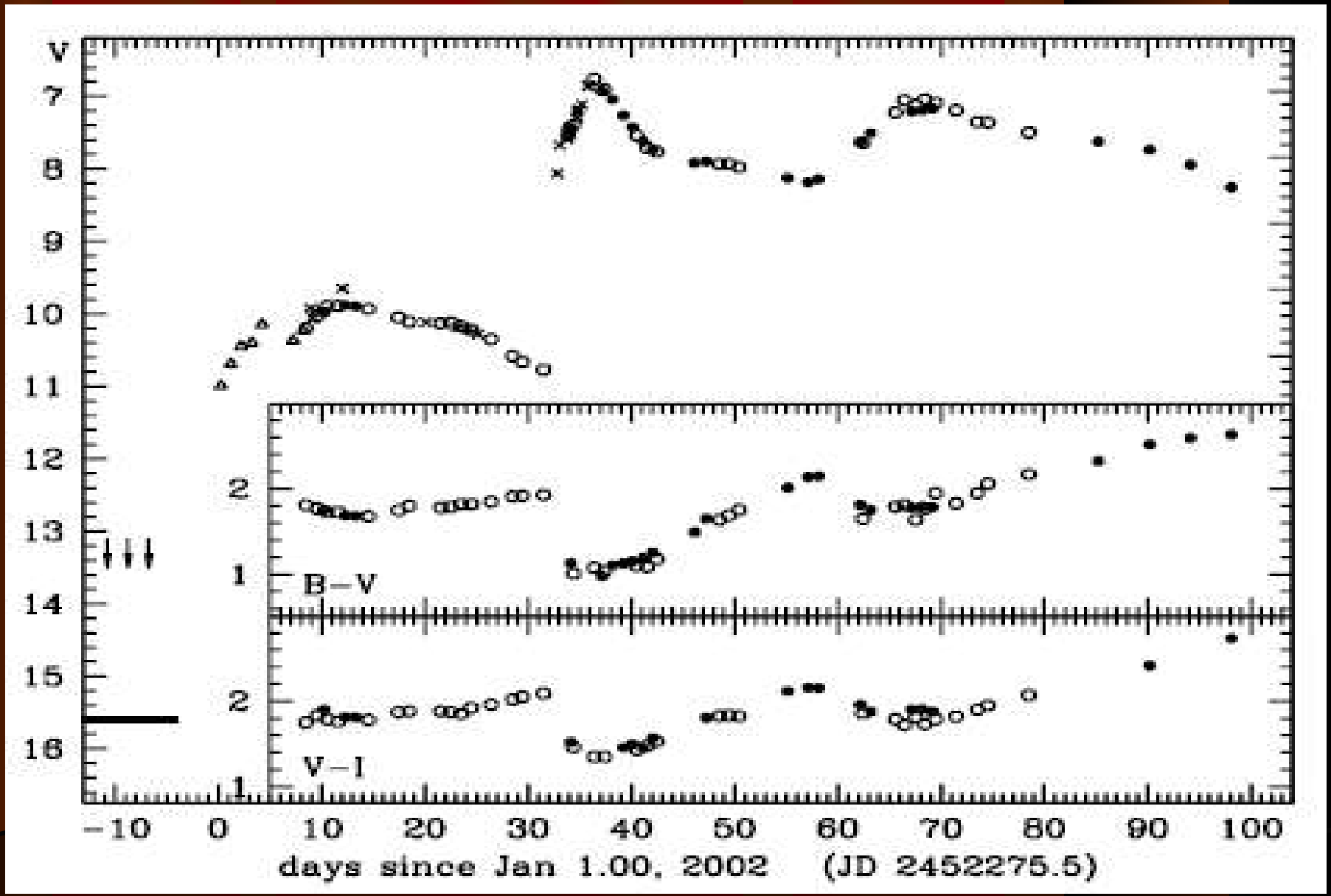
$$r_\nu^x = \int r_\nu^y \times G(x-y) * dy$$

(Pavlenko & Jones 2002, A&A, 397, 967)

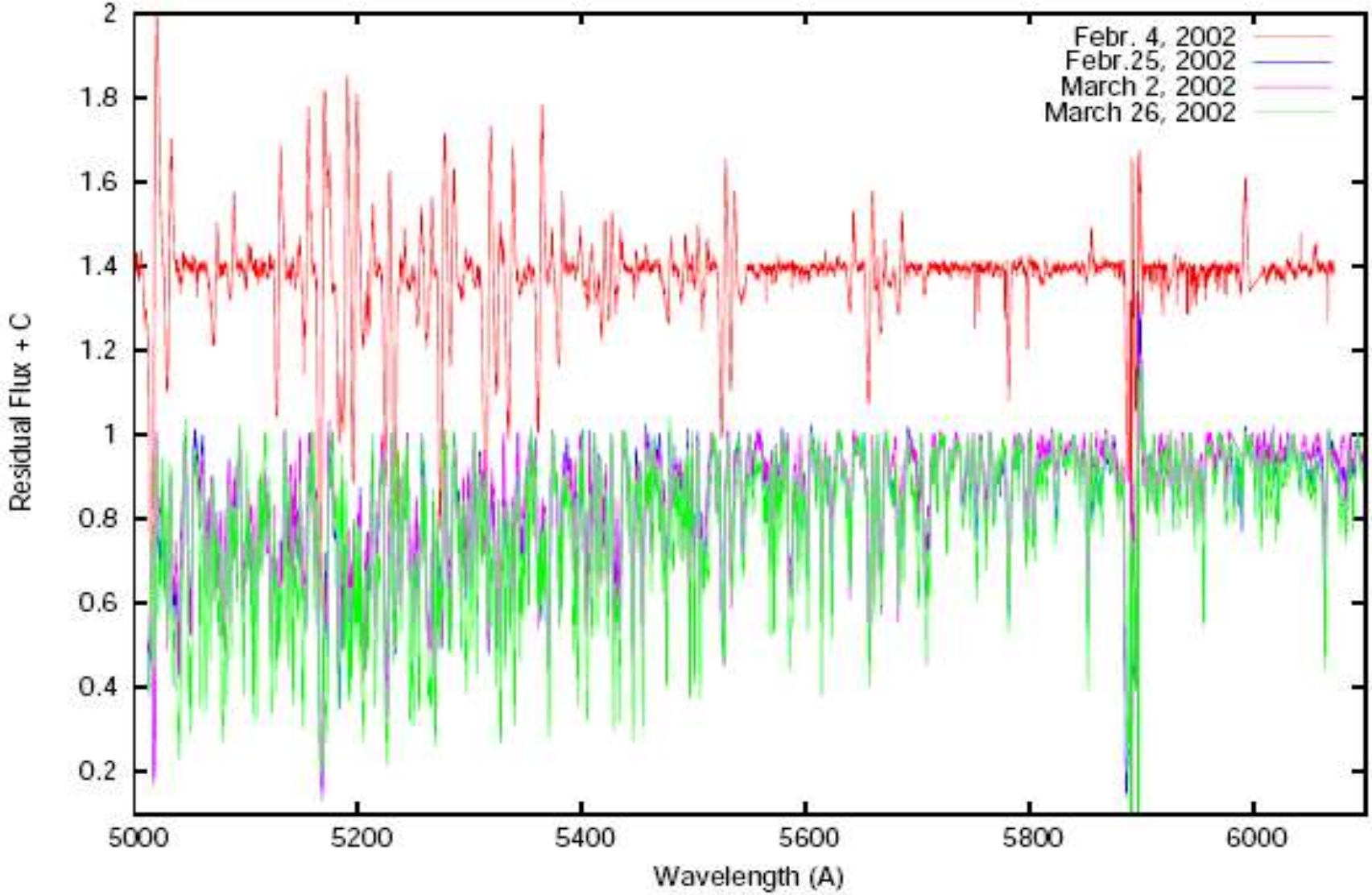
Observational data:

- Eshelle at 6-m relescope (Febr.4: V.Klochkova)
- Eshelle+spectrograph on 1.8 m telrscope (Asiago, Febr.26, March 25: U.Munary)
- Eshelle fibre-red spectrograph at 1.9 m at SAAO telescope (March, 2-nd: L.Crause)
- Kast spectrograph at 3-m Shane telescope (Nov. 6-th: Filippenko)

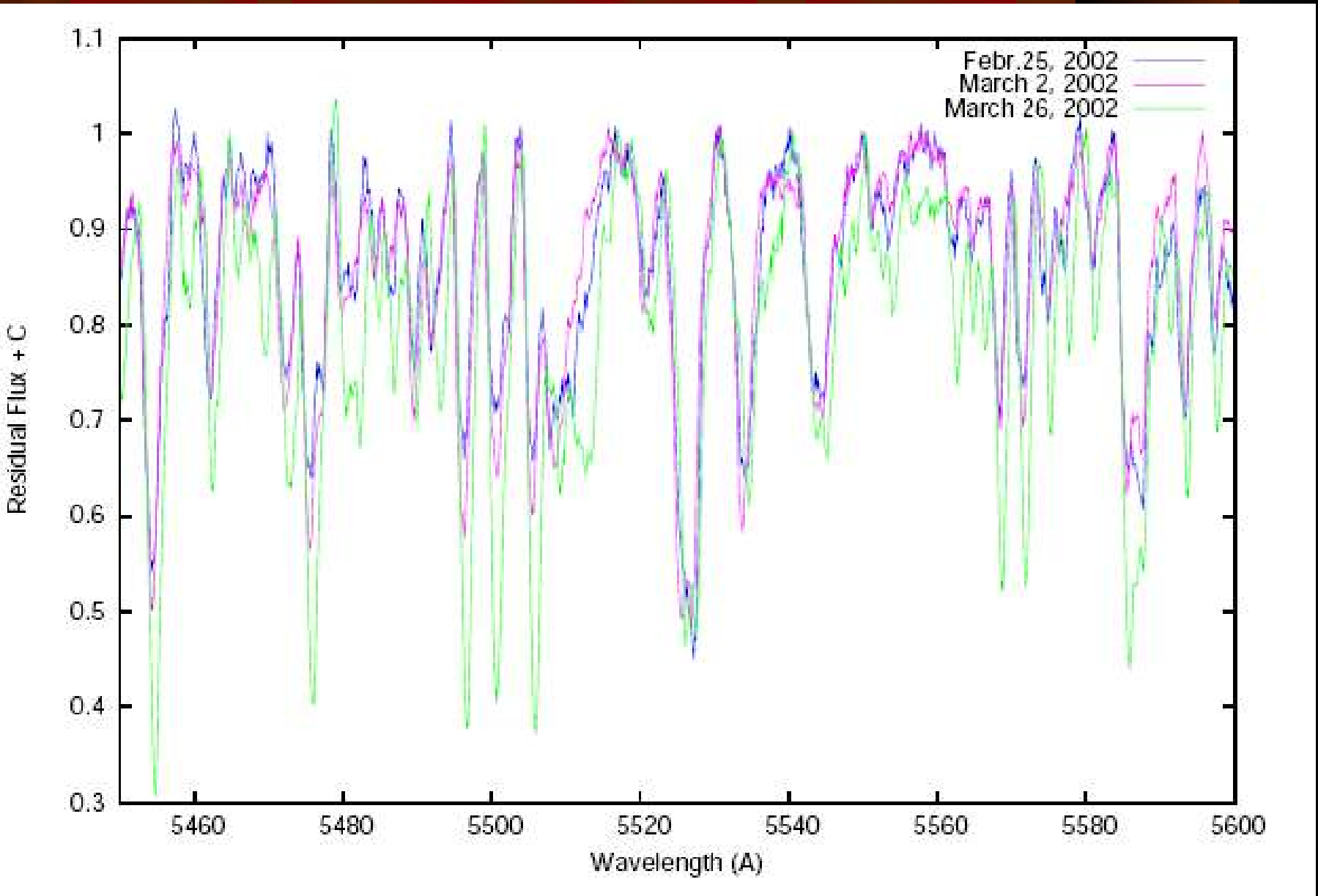
Munari et al. 2002, A&A,389,L51.



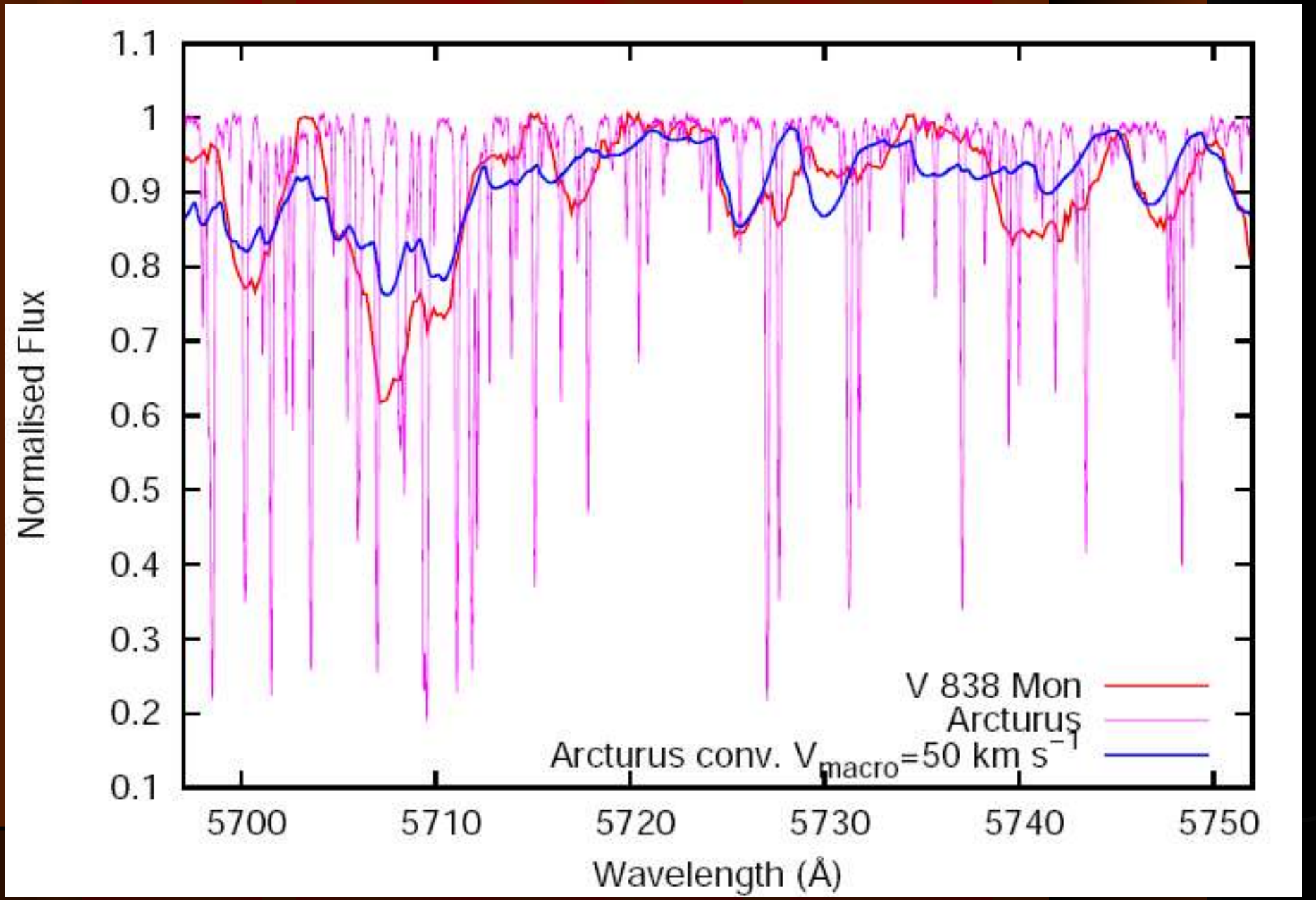
Kaminsky & Pavlenko, 2005, MNRAS, 357, 38.



The same in the larger scale (kaminsky & Pavlenko (2005)



Comparison with Arcturus spectrum (Kaminsky & Pavlenko, 2005).



Kaminsky & Pavlenko (2005)

Table 2. Atmospheric parameters for V838 Mon

Order	Wavelength range (A)	T_{eff} (K)	V_t (km s^{-1})	log N(Fe)	V_g (km s^{-1})	V_r (km s^{-1})
Asiago spectra						
February 25						
11	6480 – 6685	5250	15	-4.7	53.2	-79.6
12	6300 – 6490	5000	14	-4.9	54.5	-76.3
13	6125 – 6315	5250	10	-4.7	56.0	-82.7
14	5960 – 6145	5750	17	-4.5	52.5	-79.5
16	5660 – 5810	5000	9	-4.9	60.7	-67.1
17	5520 – 5670	5750	14	-4.7	51.1	-73.6
Averaged		5330	13.2	-4.73	54.7	-76.5
SAAO spectra						
March 2						
11	6480 – 6685	5500	12	-4.6	45.3	-80.6
12	6300 – 6490	5250	16	-4.9	55.8	-77.3
13	6125 – 6315	5250	7	-4.6	42.8	-78.9
14	5960 – 6145	5750	14	-4.8	49.0	-80.6
16	5660 – 5810	5500	15	-4.9	51.7	-68.1
17	5520 – 5670	6000	16	-4.7	42.1	-80.0
Average		5540	13.3	-4.75	47.8	-77.6
March 26						
11	6480 – 6685	4750	12	-4.8	43.7	-67.3
12	6300 – 6490	4750	14	-4.8	44.7	-68.3
13	6125 – 6315	4750	10	-4.5	46.0	-74.3
14	5960 – 6145	5000	15	-4.8	42.1	-65.8
16	5660 – 5810	5000	11	-4.7	38.8	-52.2
17	5520 – 5670	5500	13	-4.5	39.7	-63.6
Average		4960	12.5	-4.68	42.5	-65.2

Kaminsky & Pavlenko, 2005

Table 1: Atmospheric parameters for V838 Mon

	T_{eff} (K)	V_t (km s^{-1})	log N(Fe)	V_g (km s^{-1})	V_r (km s^{-1})
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Sakurai's object (V4334 Sgr)

Pavlenko & Duerbeck 2001, A&A, 367, 933.

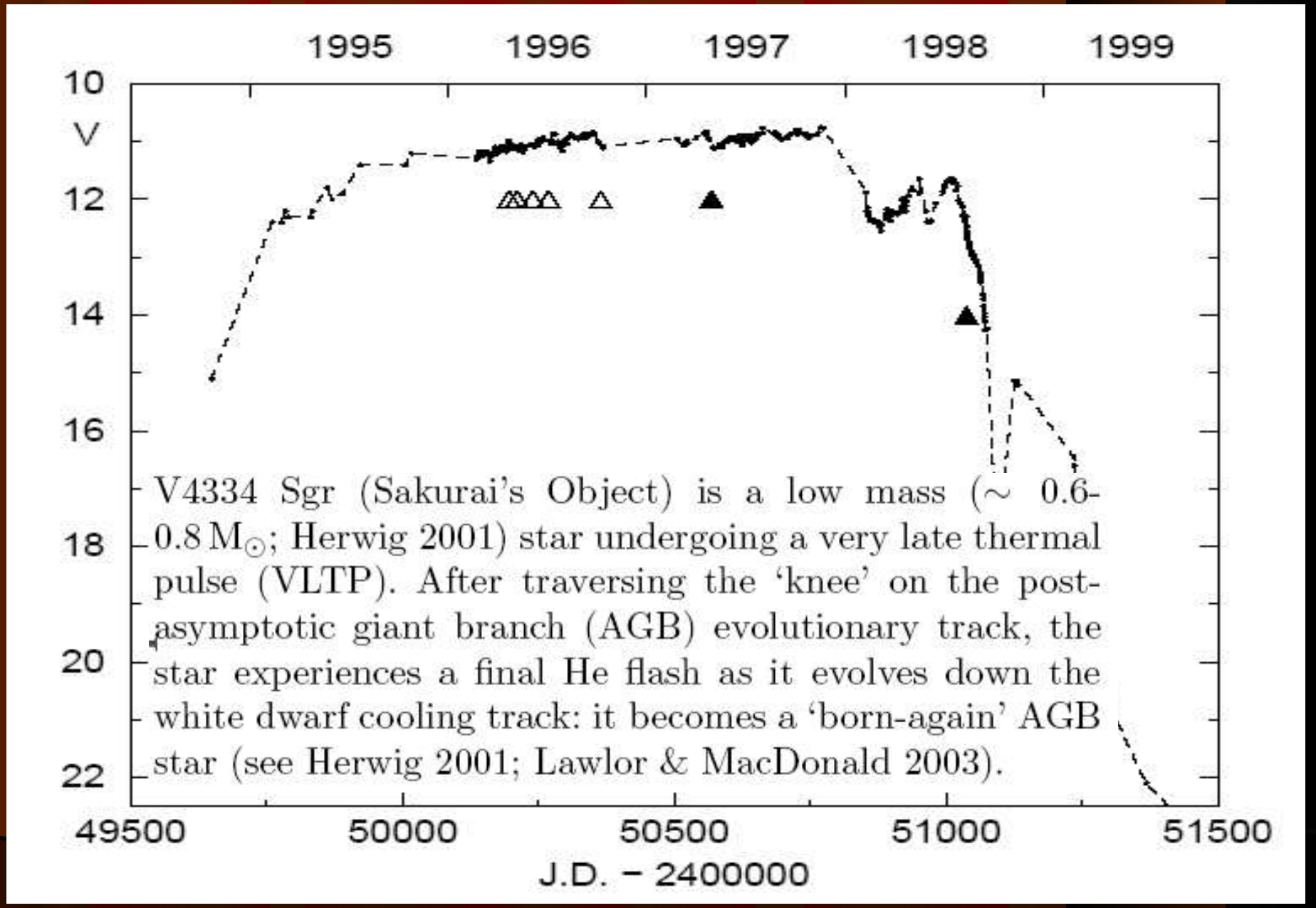
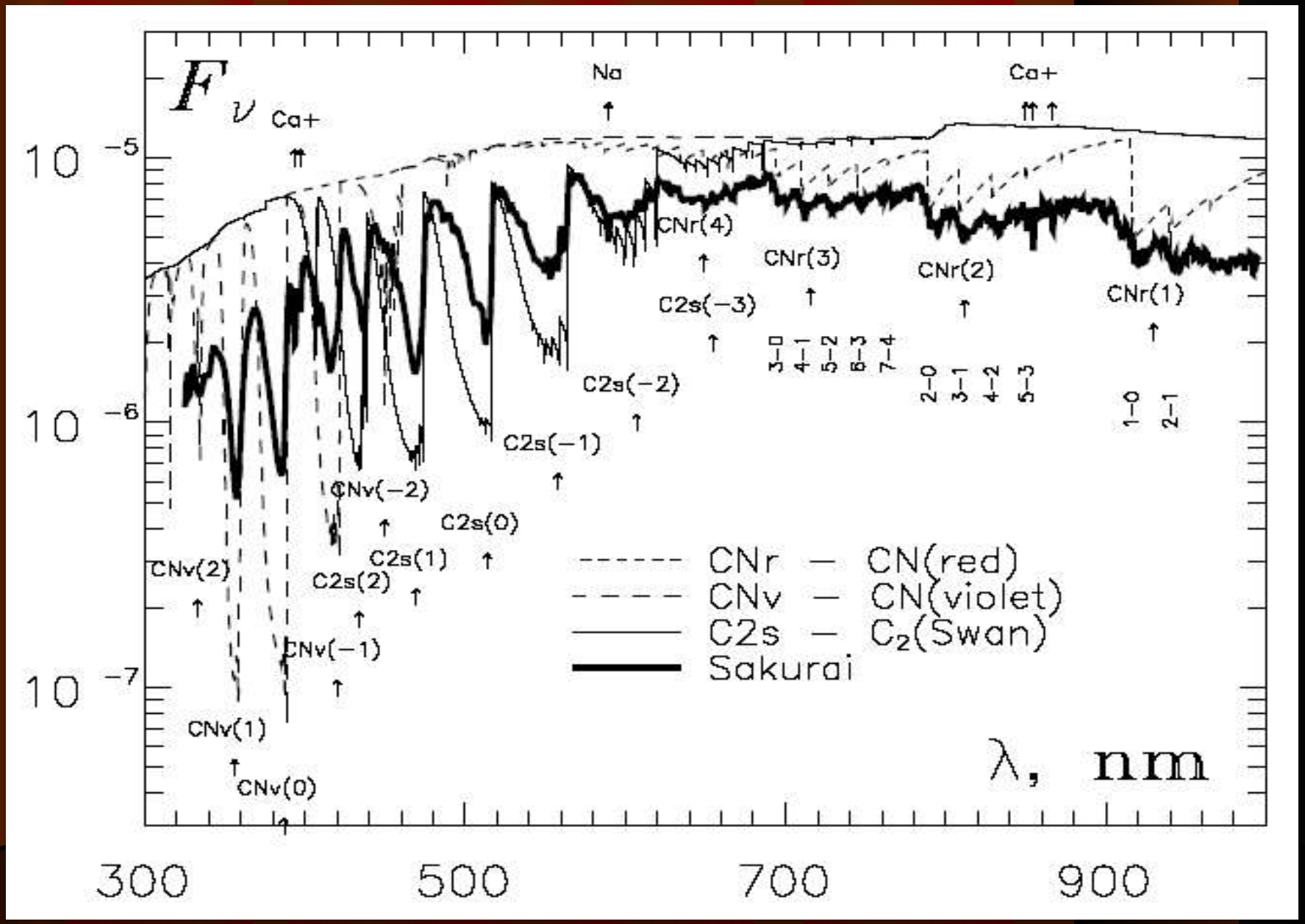


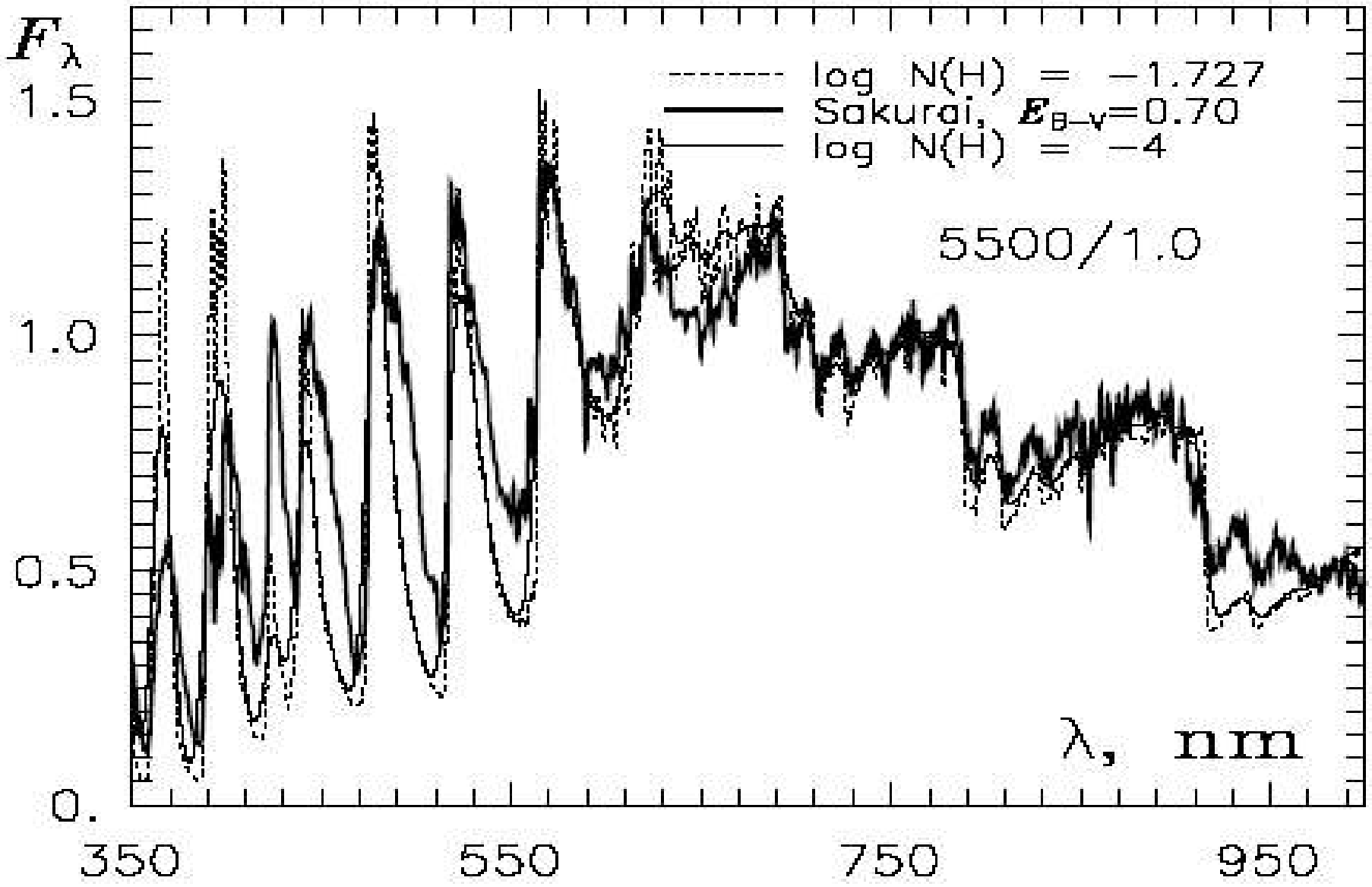
Table 1. Abundances of H, He, C, N, O (scaled to $\sum N_i = 1$) used in this paper.

Element	Asplund et al. (1997)	Asplund et al. (1999)	Kipper & Klochkova (1997)	[C] = +0.6
H	−1.730	−2.42	−2.10	−2.45
He	−0.027	−0.020	−0.01	−0.05
C	−1.73	−1.62	−2.01	−1.05
N	−2.53	−2.52	−2.70	−2.55
O	−1.93	−2.02	−2.59	−2.05

Pavlenko, Yakovina, Duerbeck, 2000, A&A, 355, 245

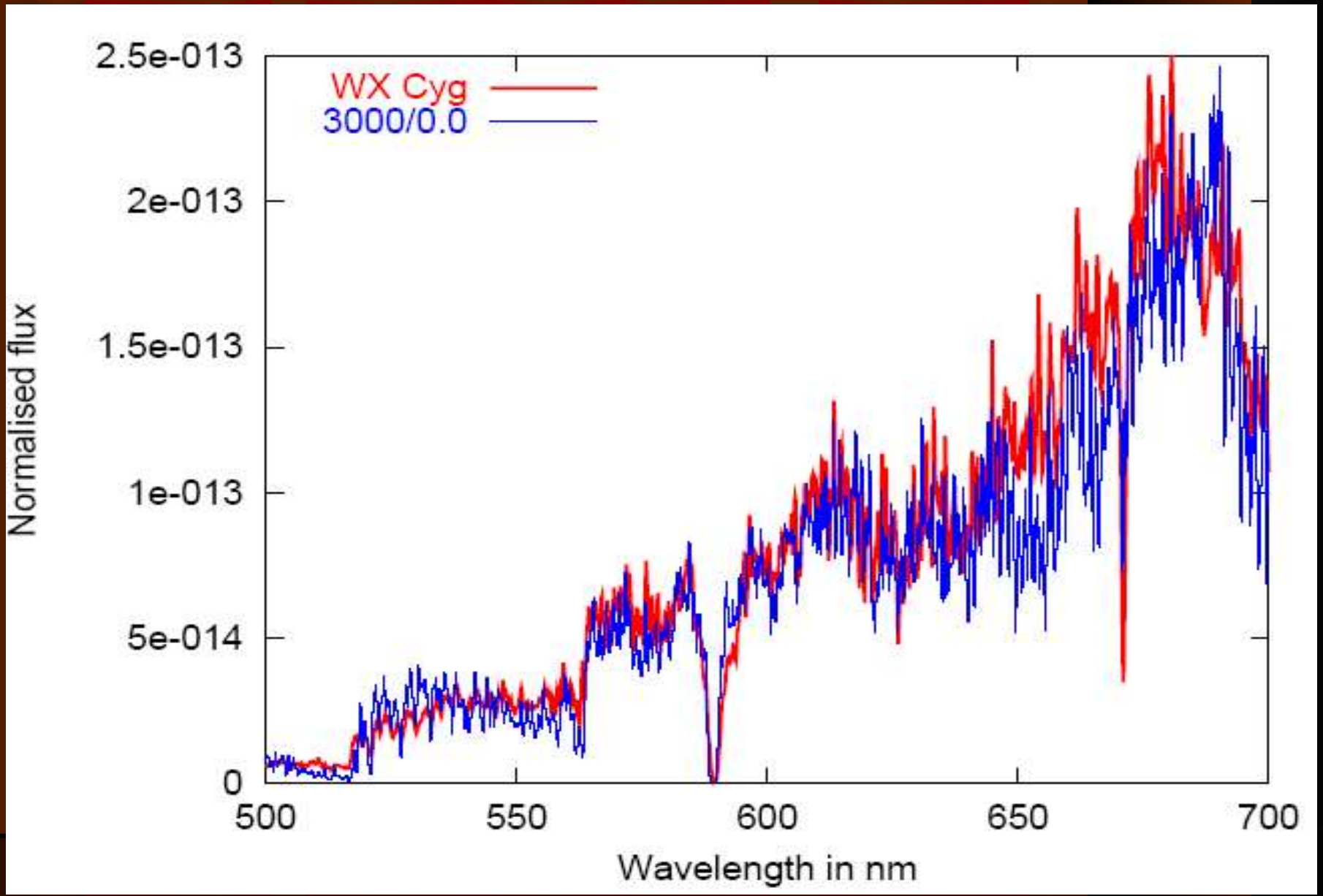


Pavlenko et al. 2000



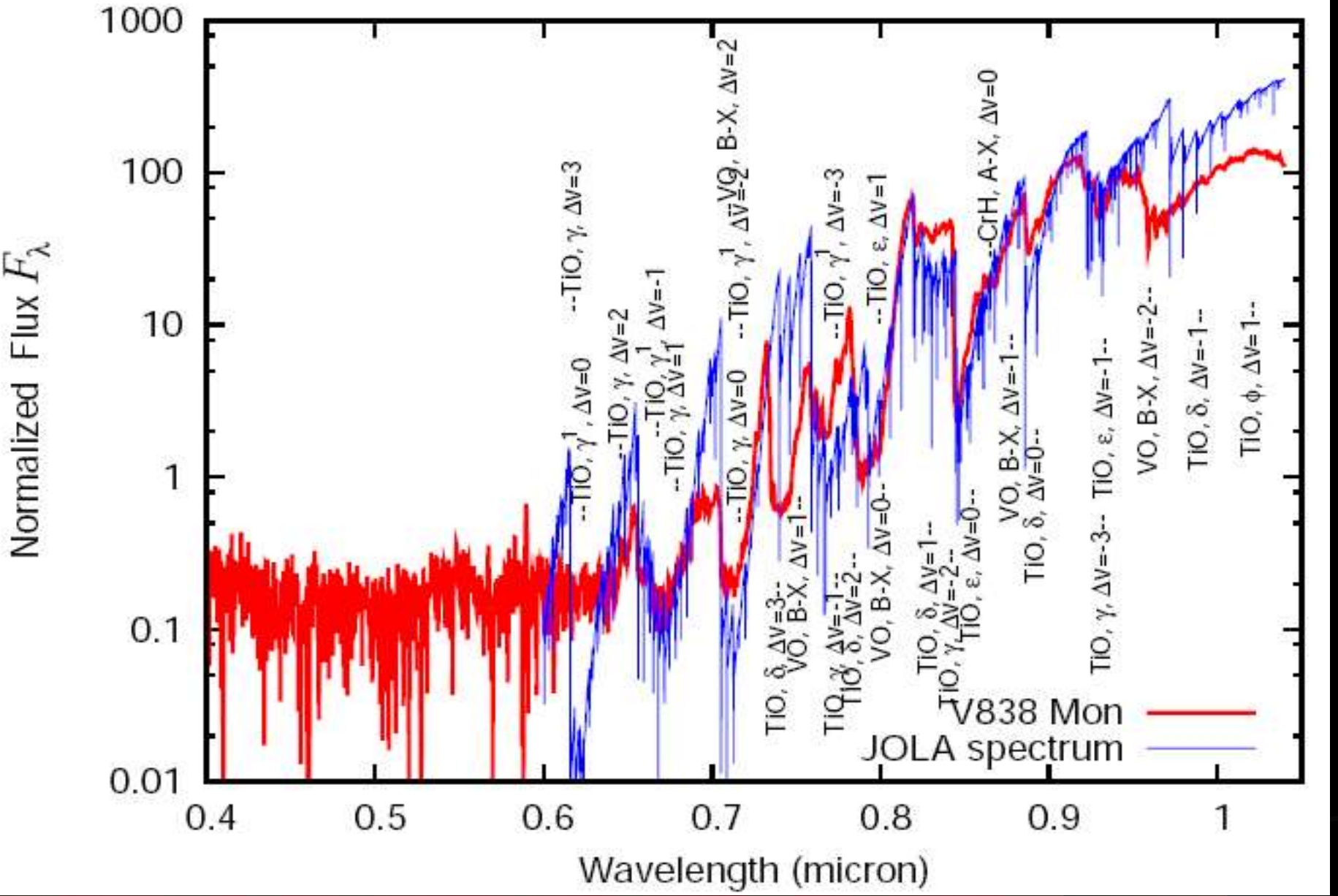
WX Cyg

Pavlenko 2003, Astr. Repts, 47,59.

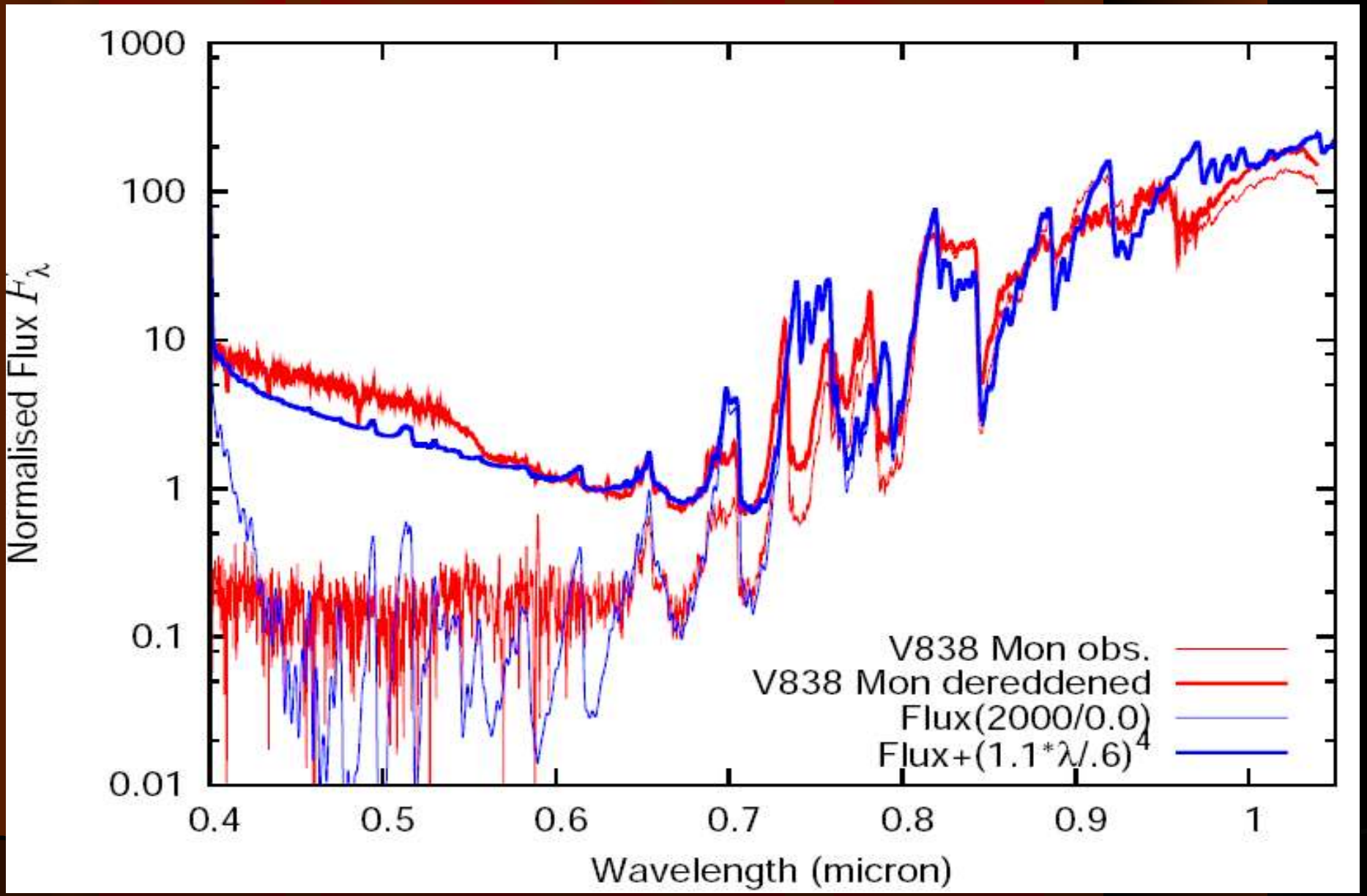


Energy distribution in EQJ0704.0-0350 spectrum at November, 2002

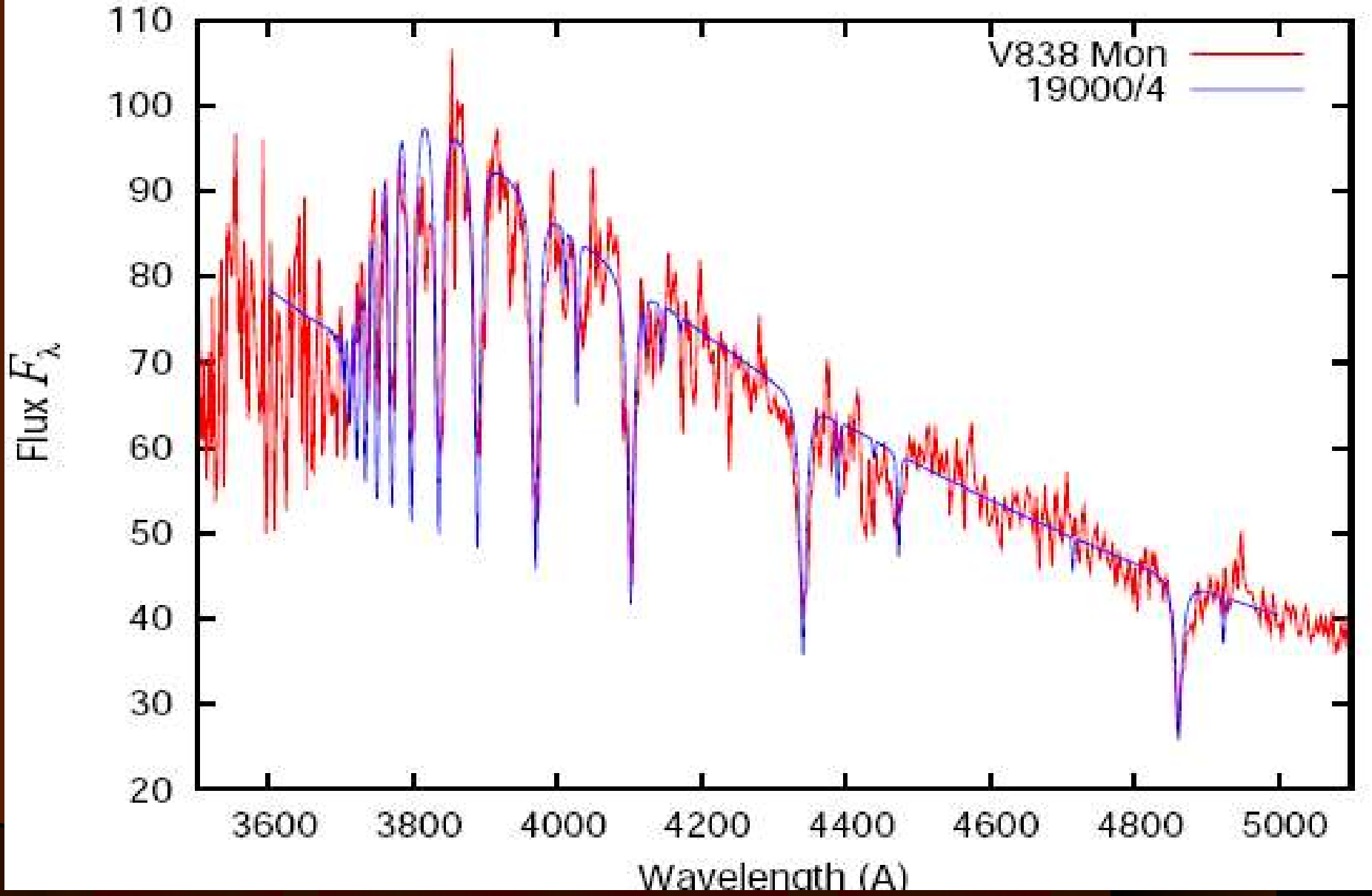
Pavlenko, Evans, Loon et al., A&A, submitted



Pavlenko et al., A&A, submitted.



Pavlenko et al. , A&A, submitted



RADIUS OF EQJ0704.0-0350

in 2002, Nov.

Theory provides:

$Flux_{V838Mon}/Flux_{B3}=0.01$,

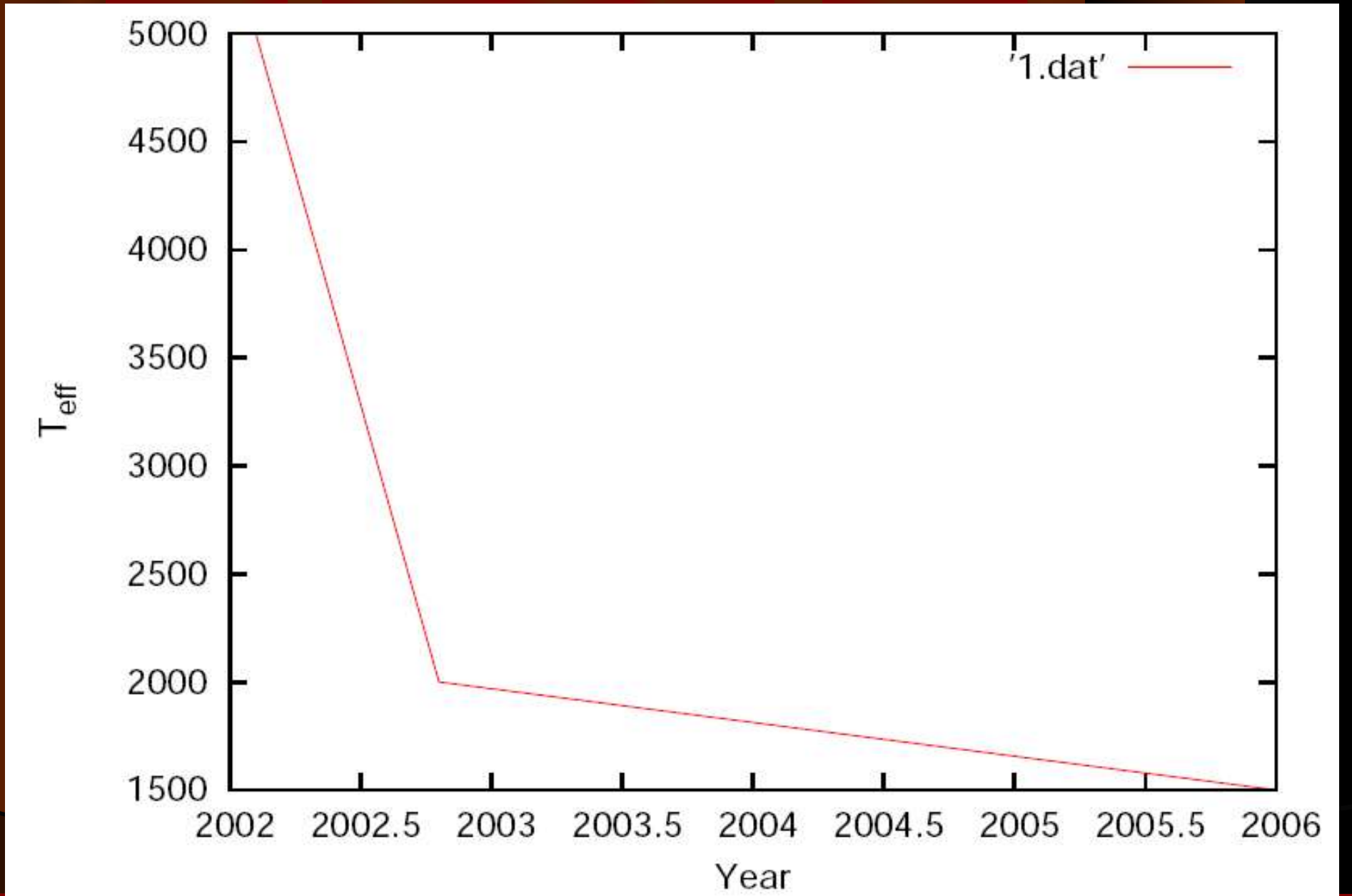
i.e for the equal distance

$$R_{B3V}^{2}*T_{B3V}^{4}/(R_{EQJ....}^{2}*T_{EQJ...}^{4})=100.$$

So:

$$R_{V838\ Mon} = 6000\ R_{o}$$

Teff vs time


'1.dat'
5000
4500
4000
3500
3000
2500
2000
1500
T_{eff}
2002
2002.5
2003
2003.5
2004
2004.5
2005
2005.5
2006
Year