Synthetic colours in Galactic Plane Surveys

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Synthetic colours in EGAPS

IPHAS (INT/WFC Photometric Halpha Survey of the Northern Galactic Plane) (Drew et al. 2005) in r', i' and Hα.

UVEX (UV-Excess Survey of the Northern Galactic Plane) in U, g', r' and HeI

VPHAS+ (VST/OMEGACAM Photometric Halpha Survey of the Southern Galactic Plane) in U, g', r', i' and Hα

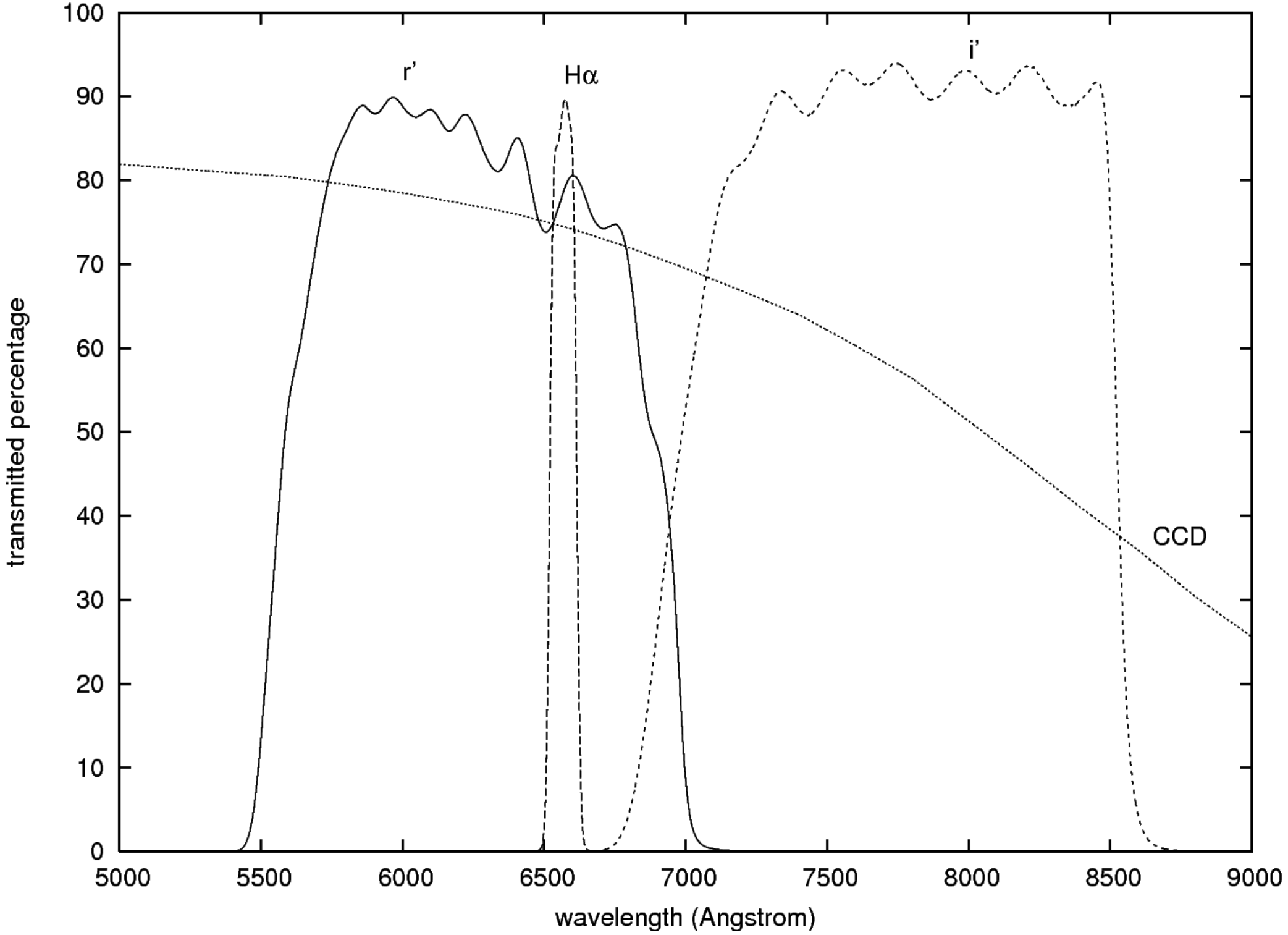
Synthetic colours in EGAPS

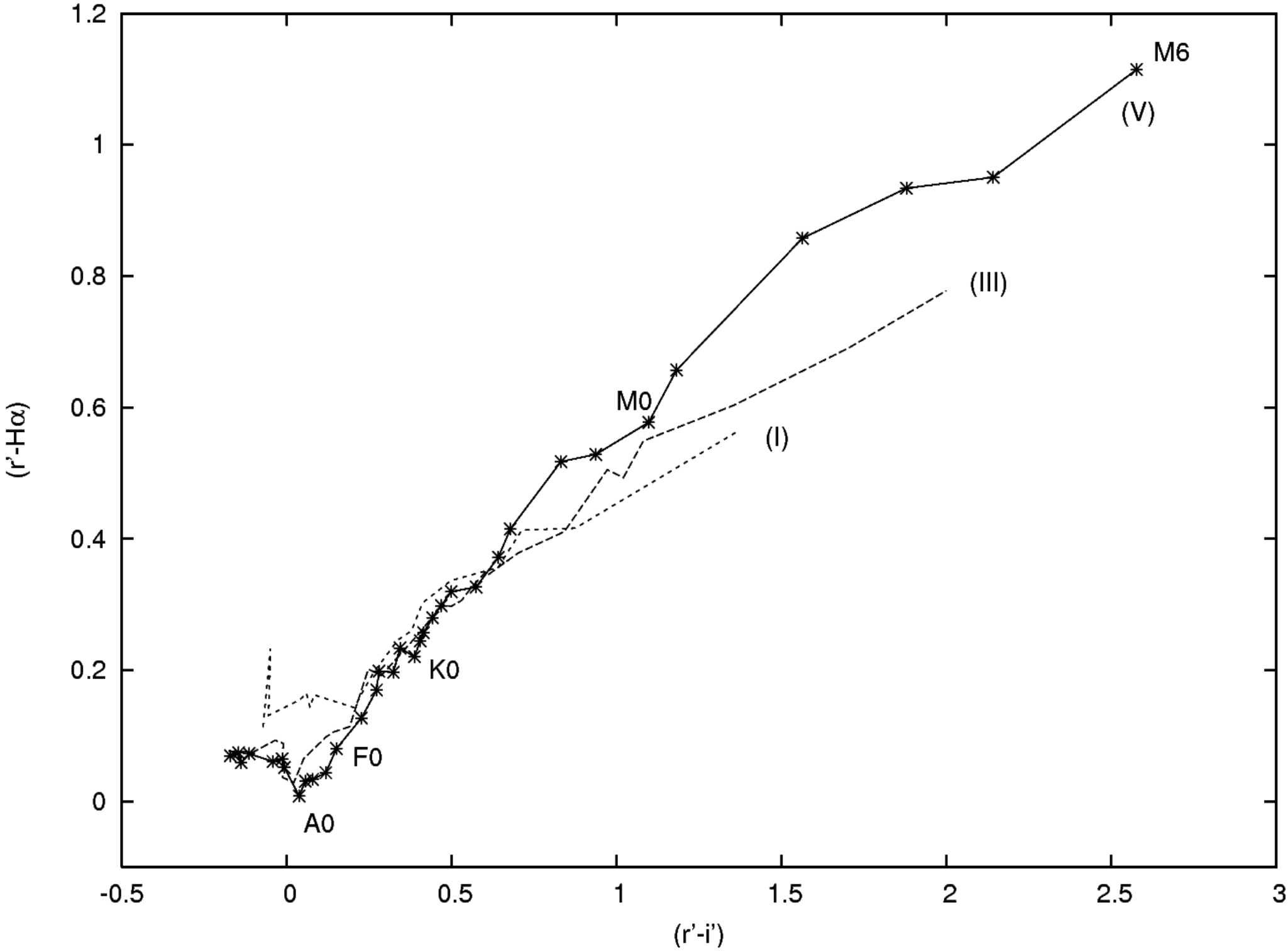
Ingredients:

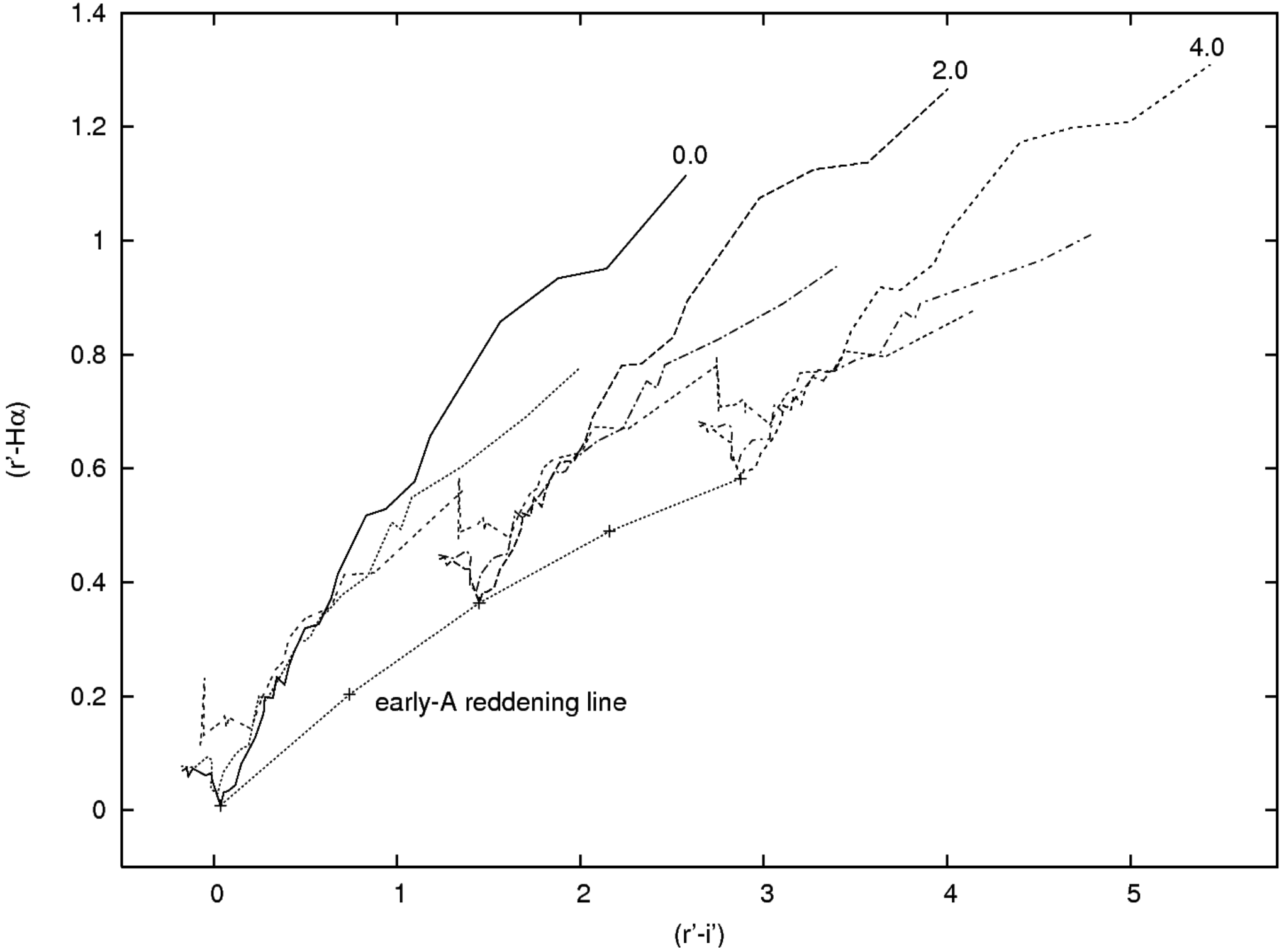
- Pickles Stellar Spectra (Pickles, 1998):
  spectral types (V), (III), (I)

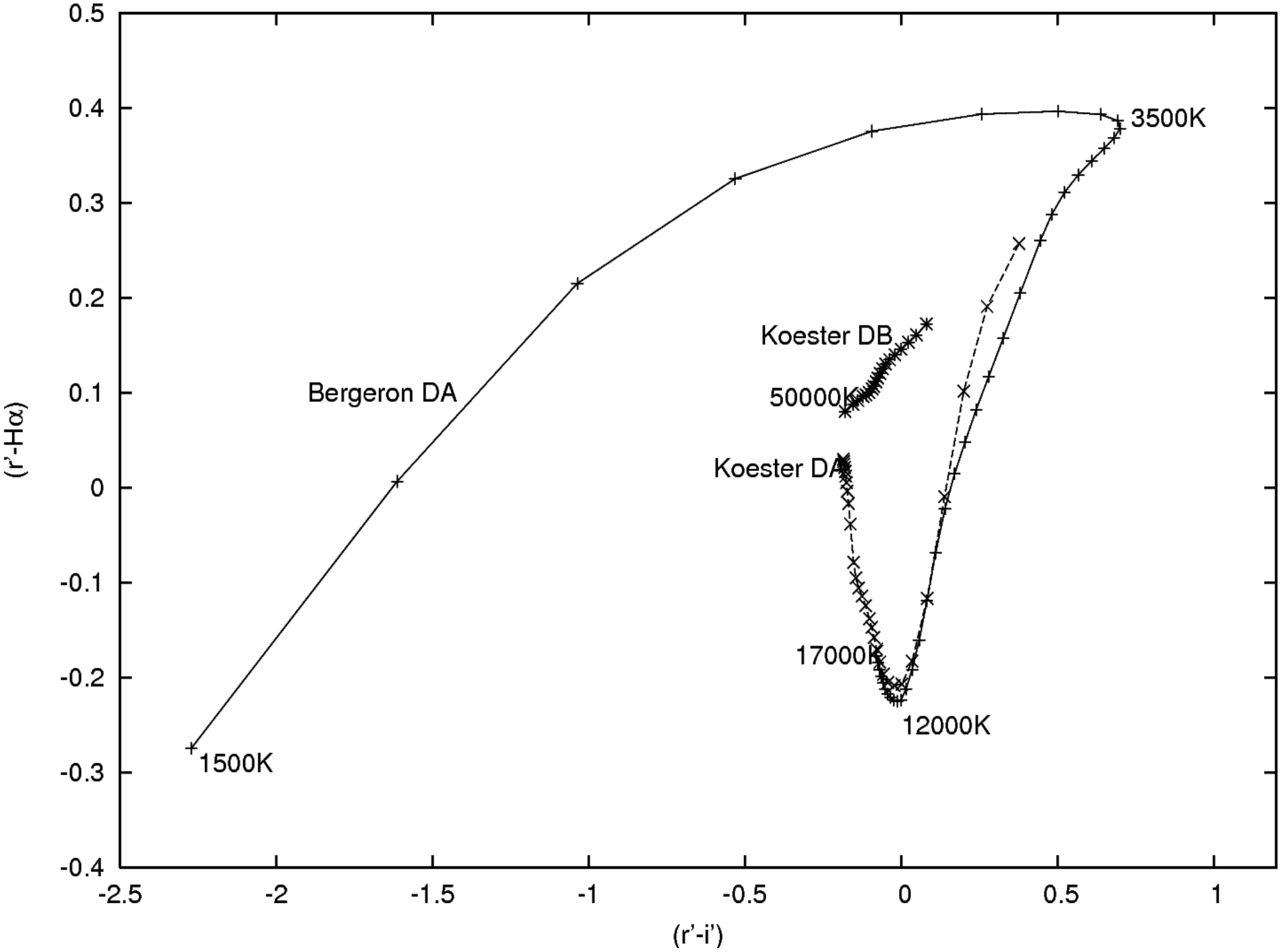
- White dwarf (WD) models with (log(g)=8.0):
- Bergeron DA (1500<T<17.000K)
- Koester DA (6000<T<80.000K)
- Koester DB (10.000<T<50.000)

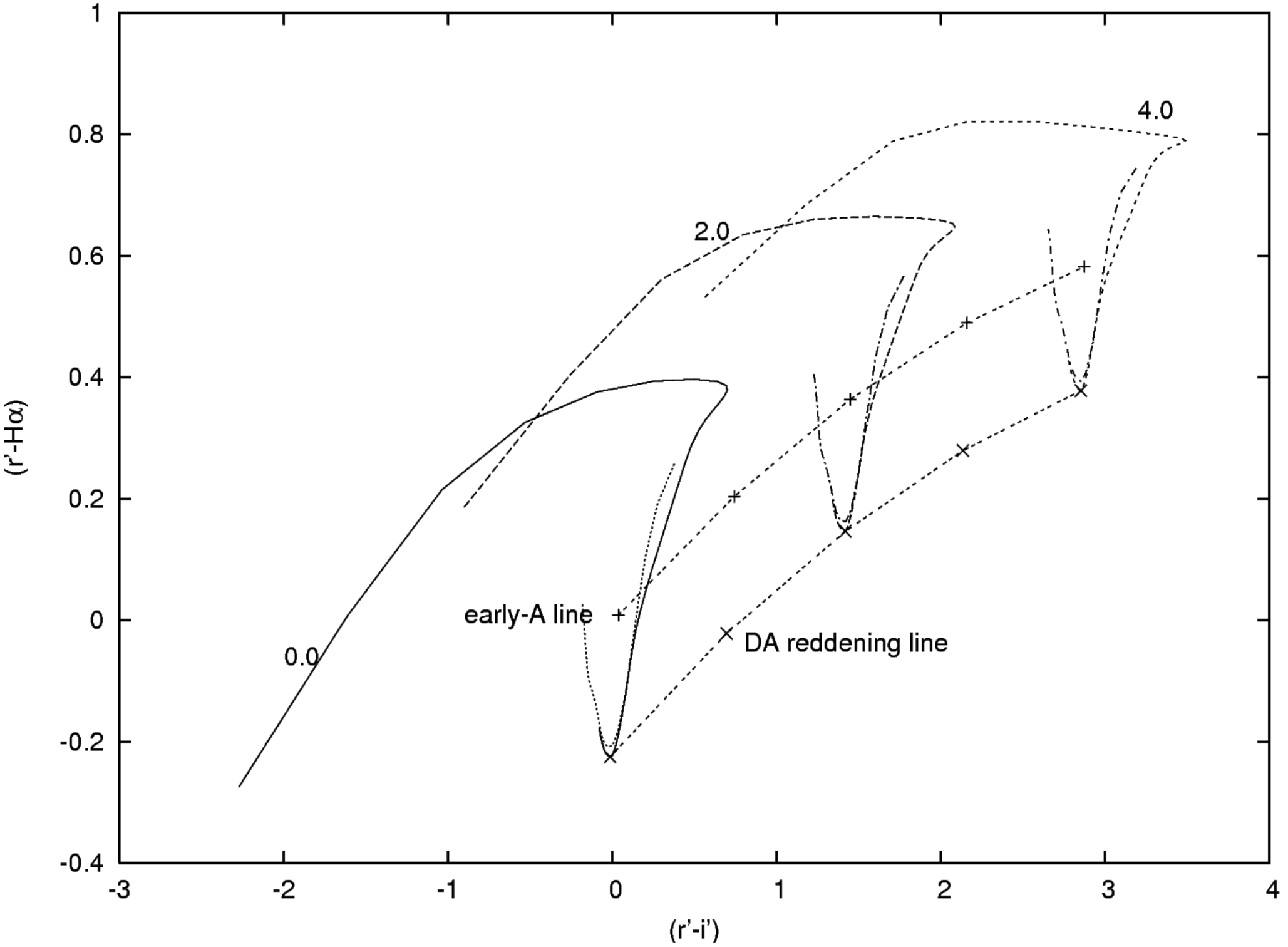
- Reddening E(B-V)=0.0 to 4.0 (Cardelli, 1989)

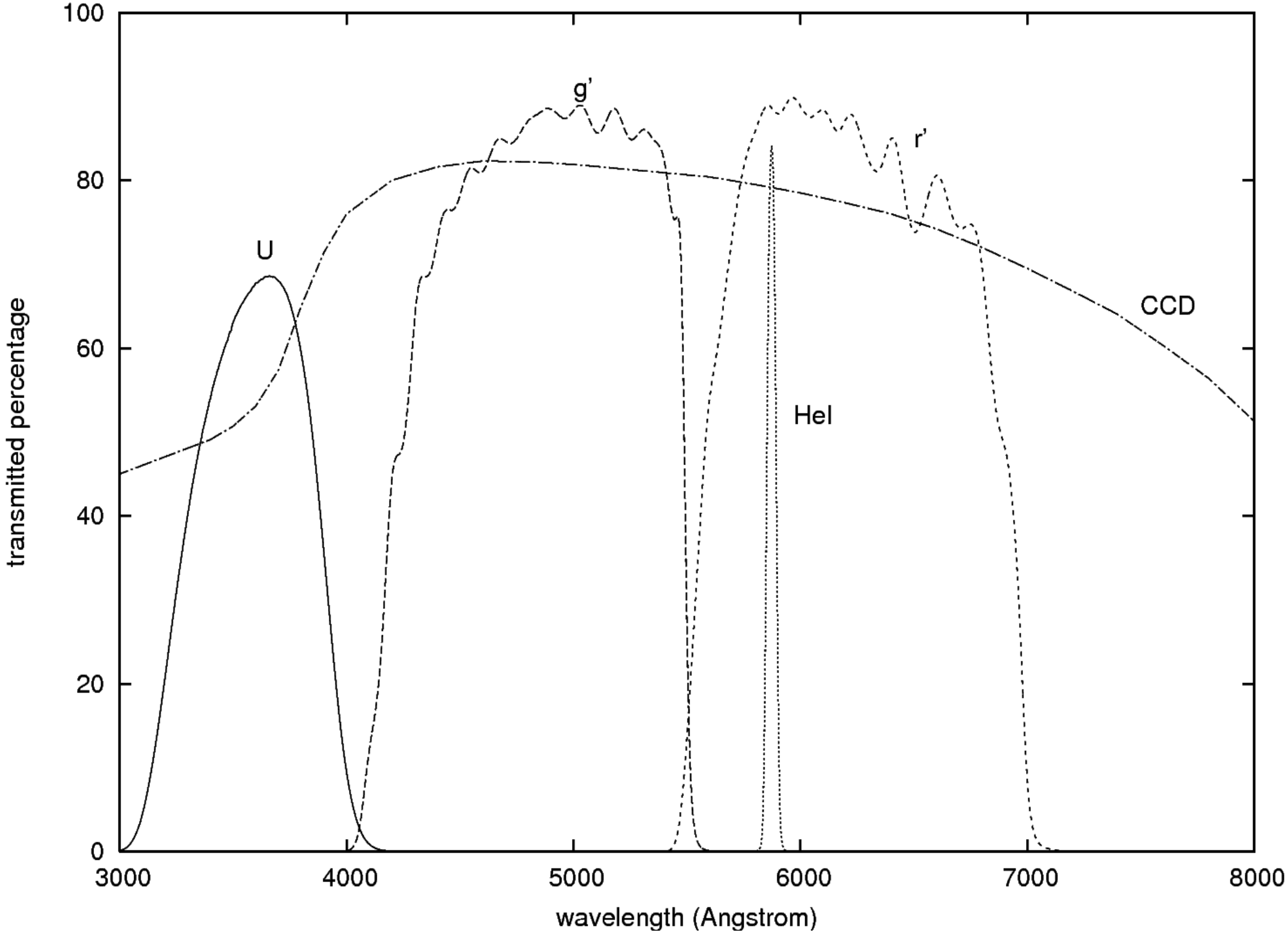

r'
Hα
i'
CCD
transmitted percentage
wavelength (Angstrom)
100
90
80
70
60
50
40
30
20
10
0
5000
5500
6000
6500
7000
7500
8000
8500
9000

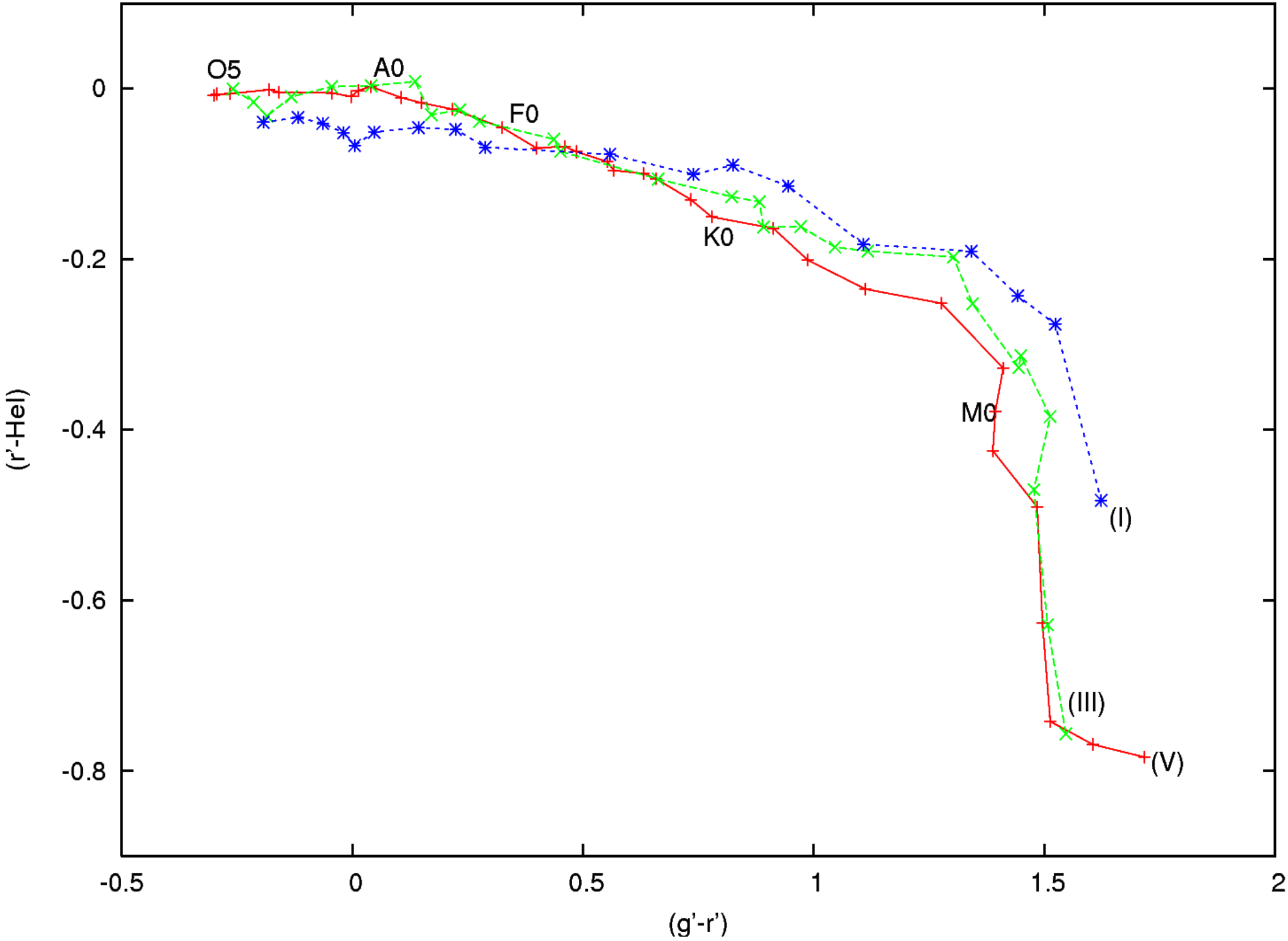

1.2
1
0.8
0.6
0.4
0.2
0
-0.5
0
0.5
1
1.5
2
2.5
3
(r'-Hα)
(r'-i')
M6
(V)
M0
(III)
(I)
K0
F0
A0

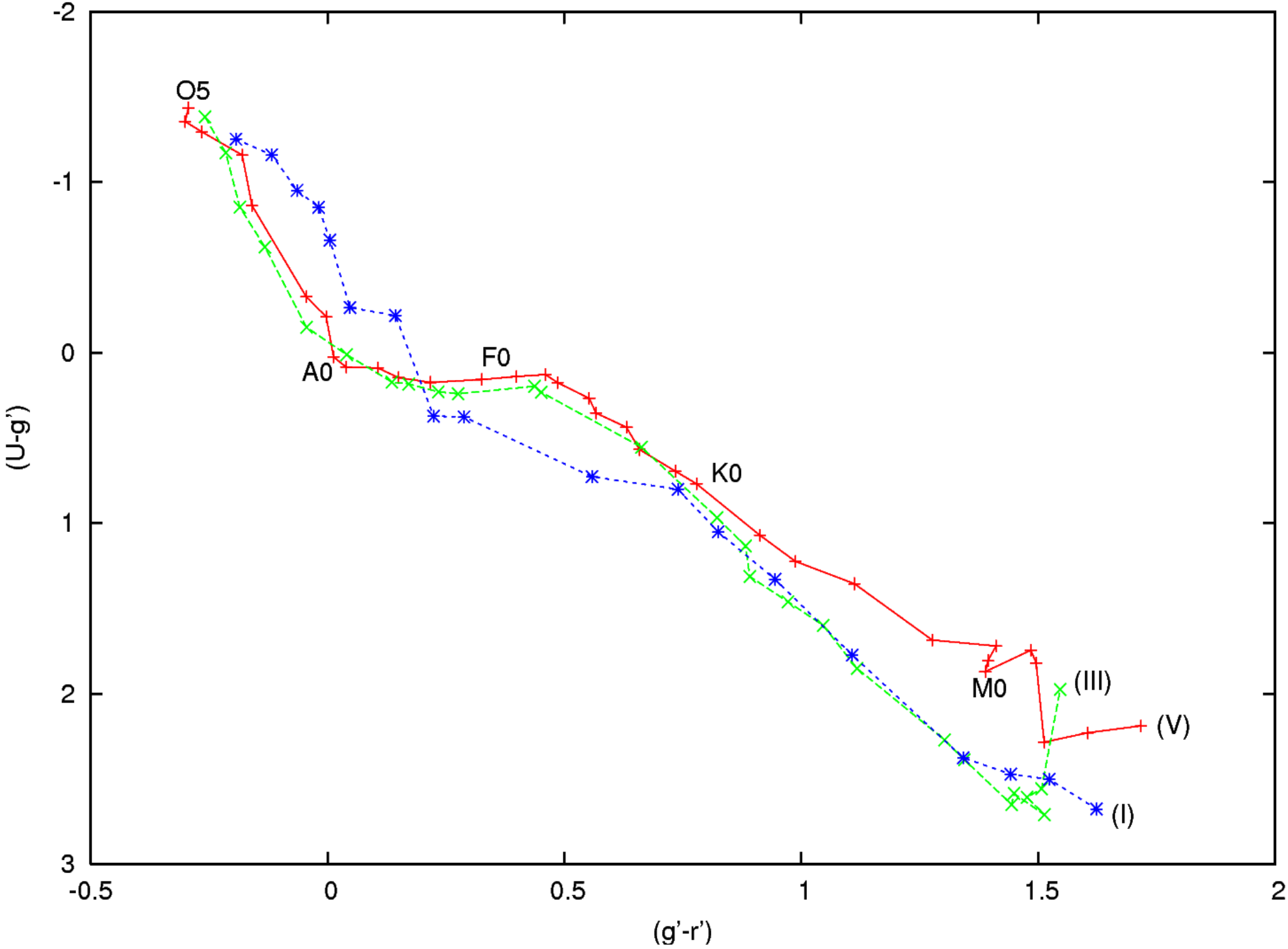

1.4
1.2
1
0.8
0.6
0.4
0.2
0
(r'-Hα)
0
1
2
3
4
5
(r'-i')
0.0
2.0
4.0
early-A reddening line

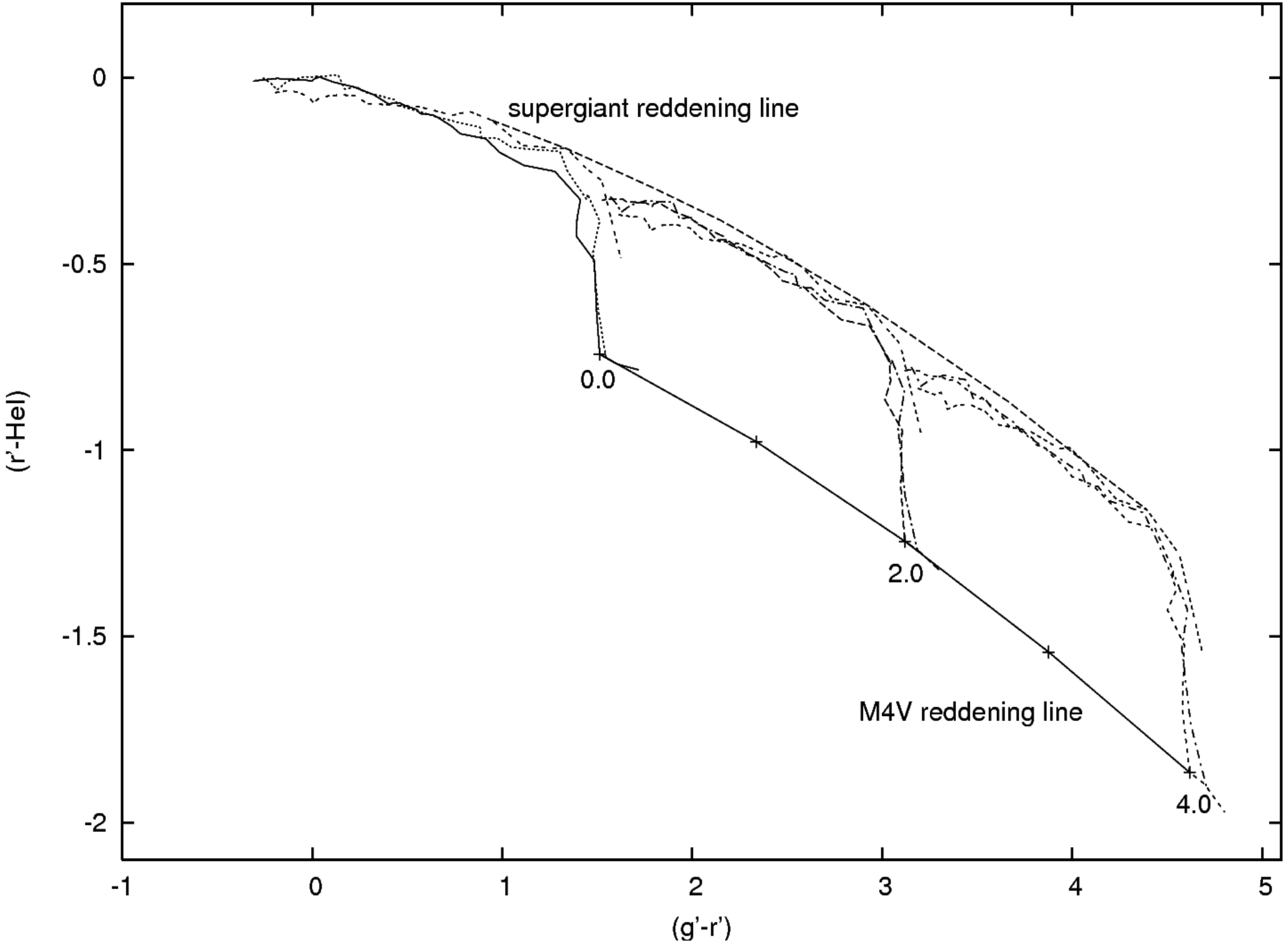

0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
(r'-Hα)
(r'-i')
3500K
Koester DB
50000K
Bergeron DA
Koester DA
17000K
12000K
1500K

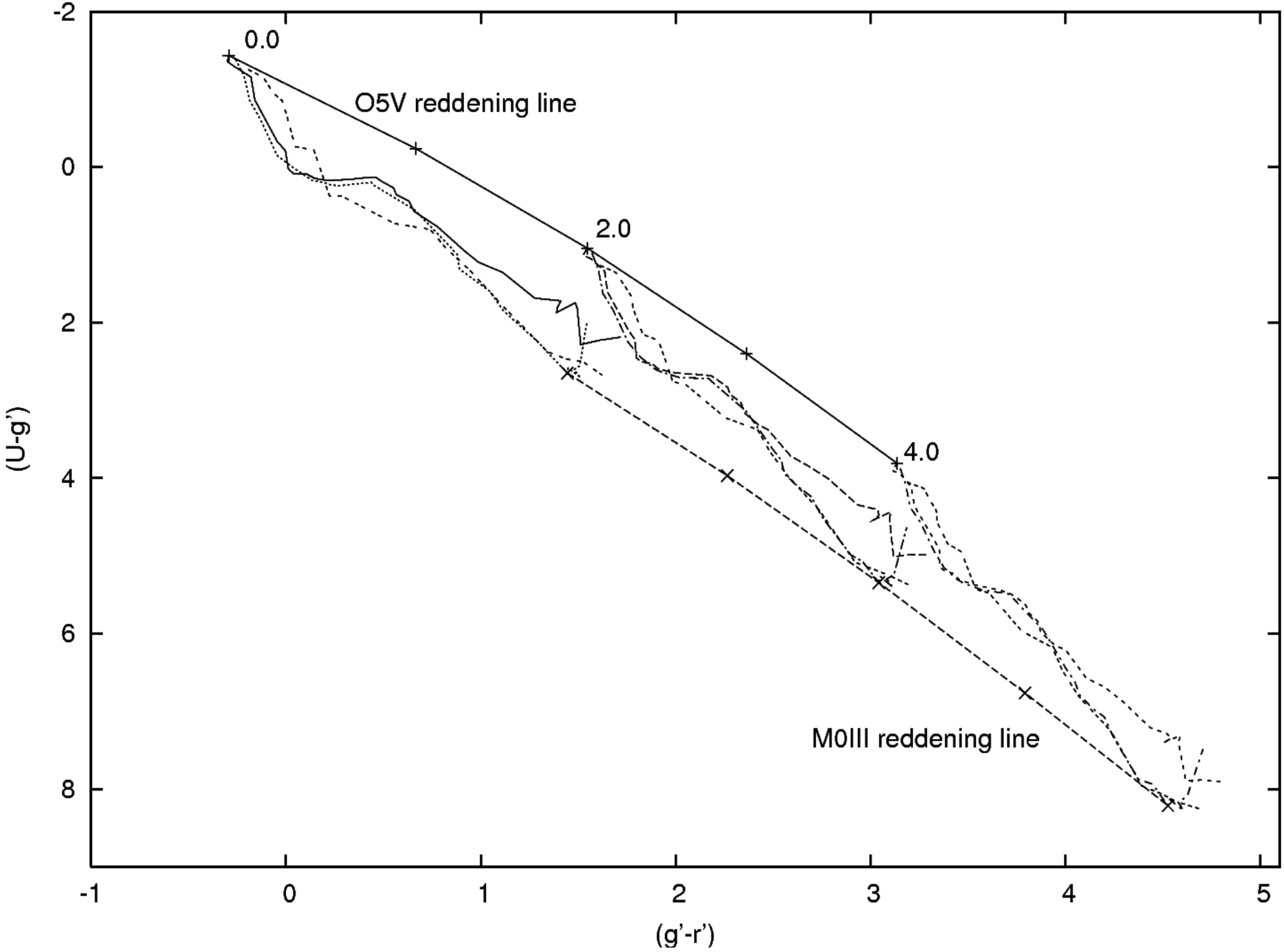

1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-3
-2
-1
0
1
2
3
4
(r'-Hα)
(r'-i')
0.0
2.0
4.0
early-A line
DA reddening line

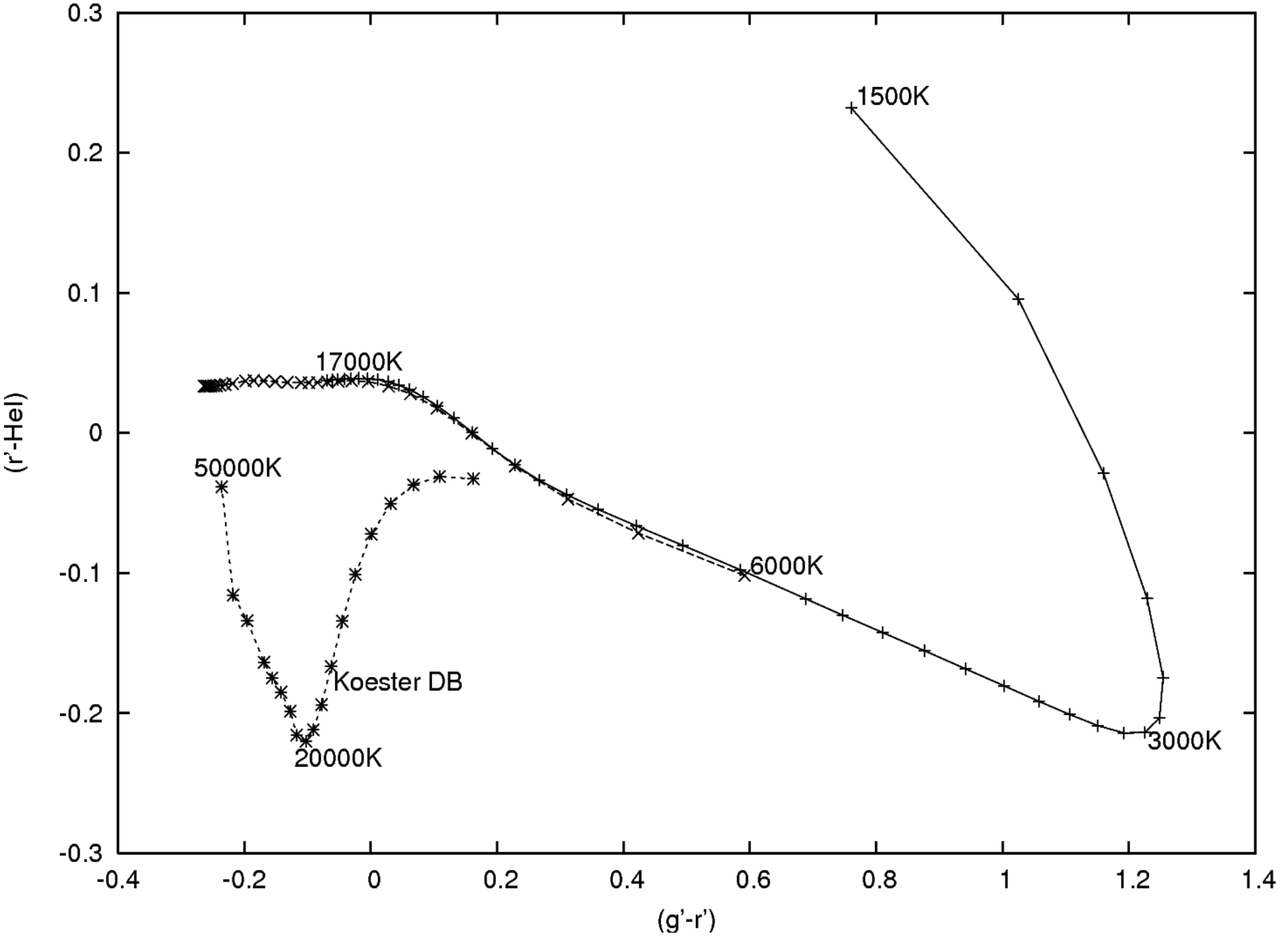

100
80
60
40
20
0
3000
4000
5000
6000
7000
8000
transmitted percentage
wavelength (Angstrom)
U
g'
r'
HeI
CCD

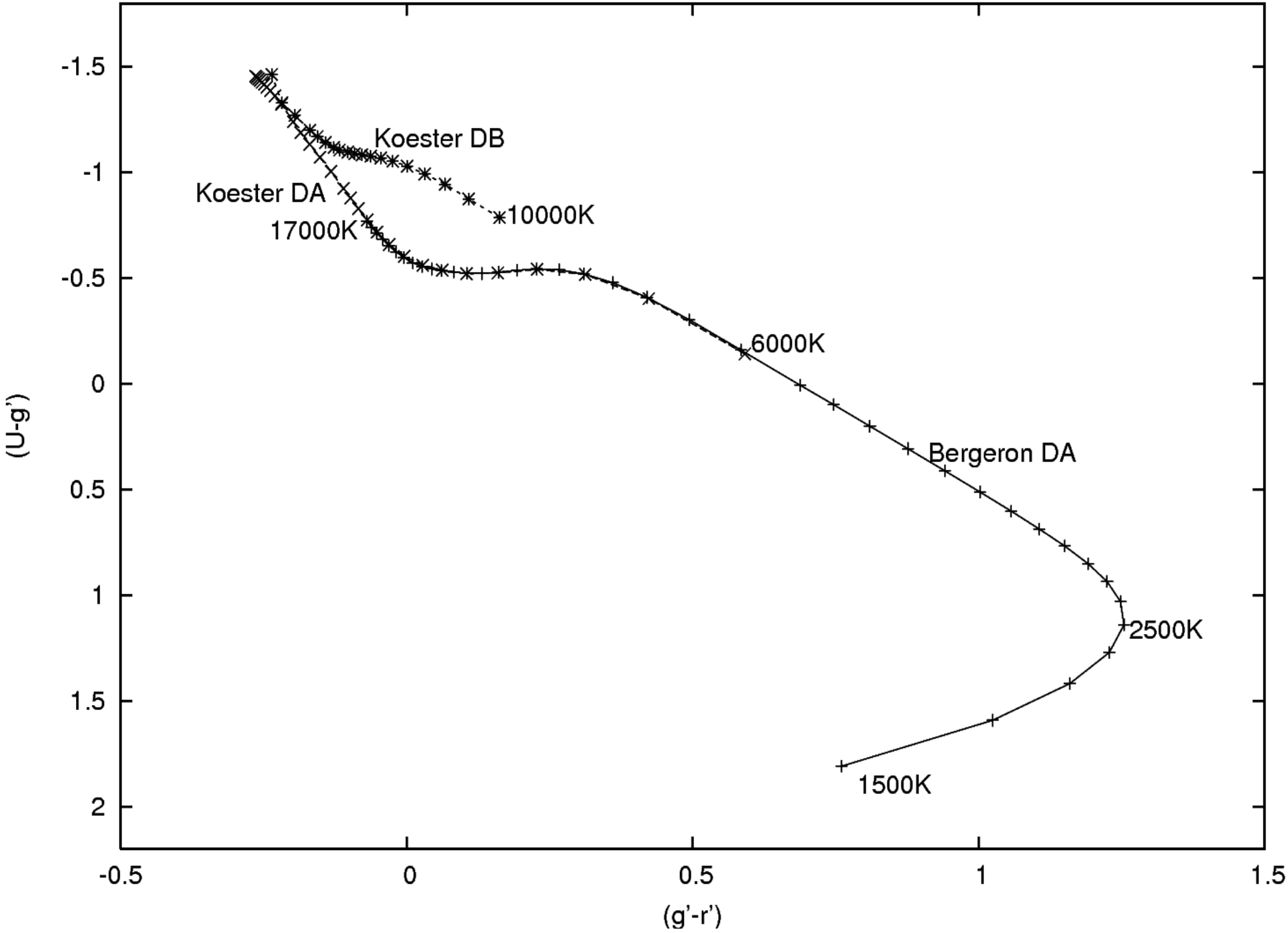

O5
A0
F0
K0
M0
(I)
(III)
(V)
0
-0.2
-0.4
-0.6
-0.8
(r'-Hel)
-0.5
0
0.5
1
1.5
2
(g'-r')

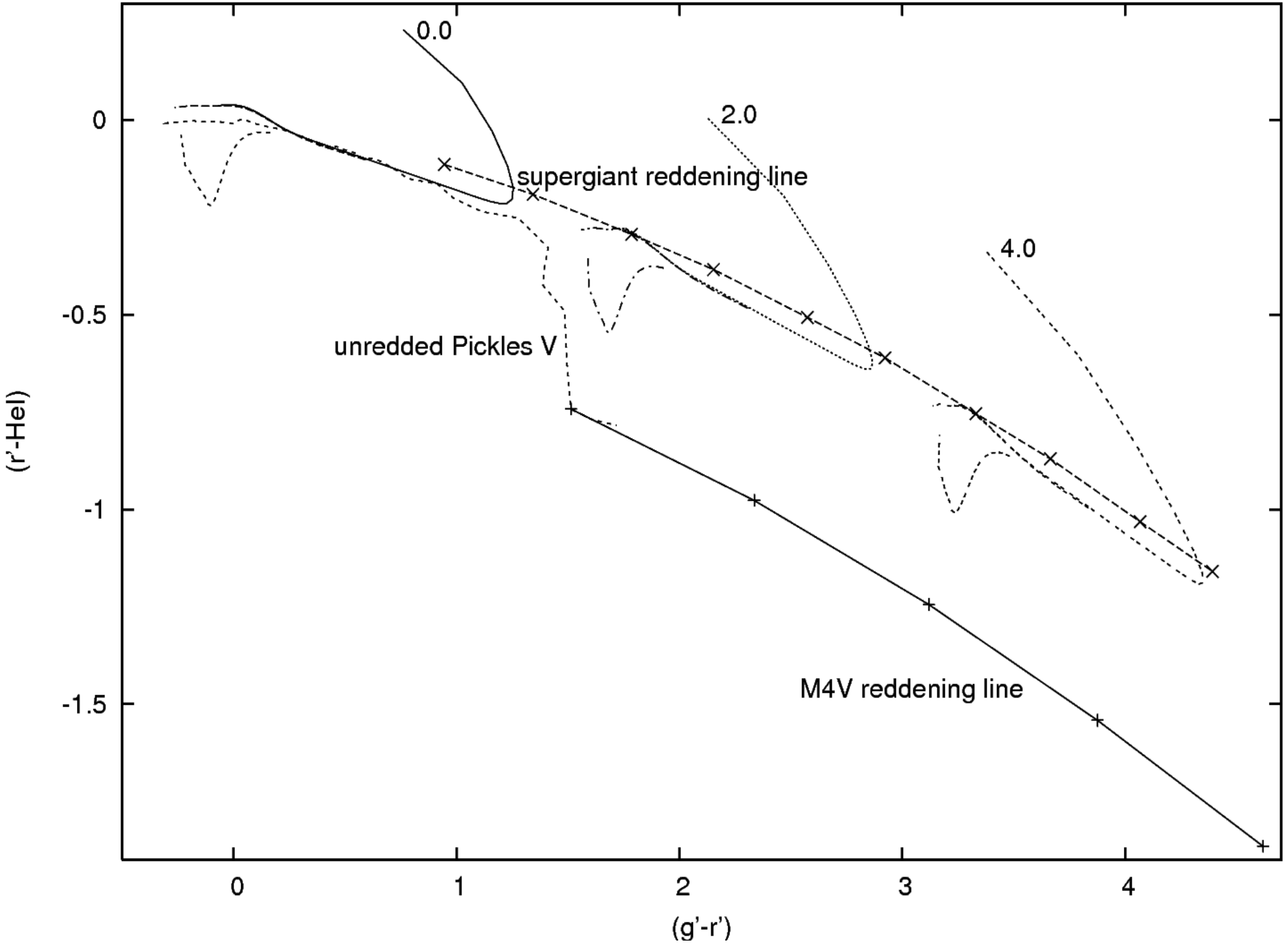

O5
A0
F0
K0
M0
(III)
(V)
(I)
(U-g')
(g'-r')
-2
-1
0
1
2
3
-0.5
0
0.5
1
1.5
2

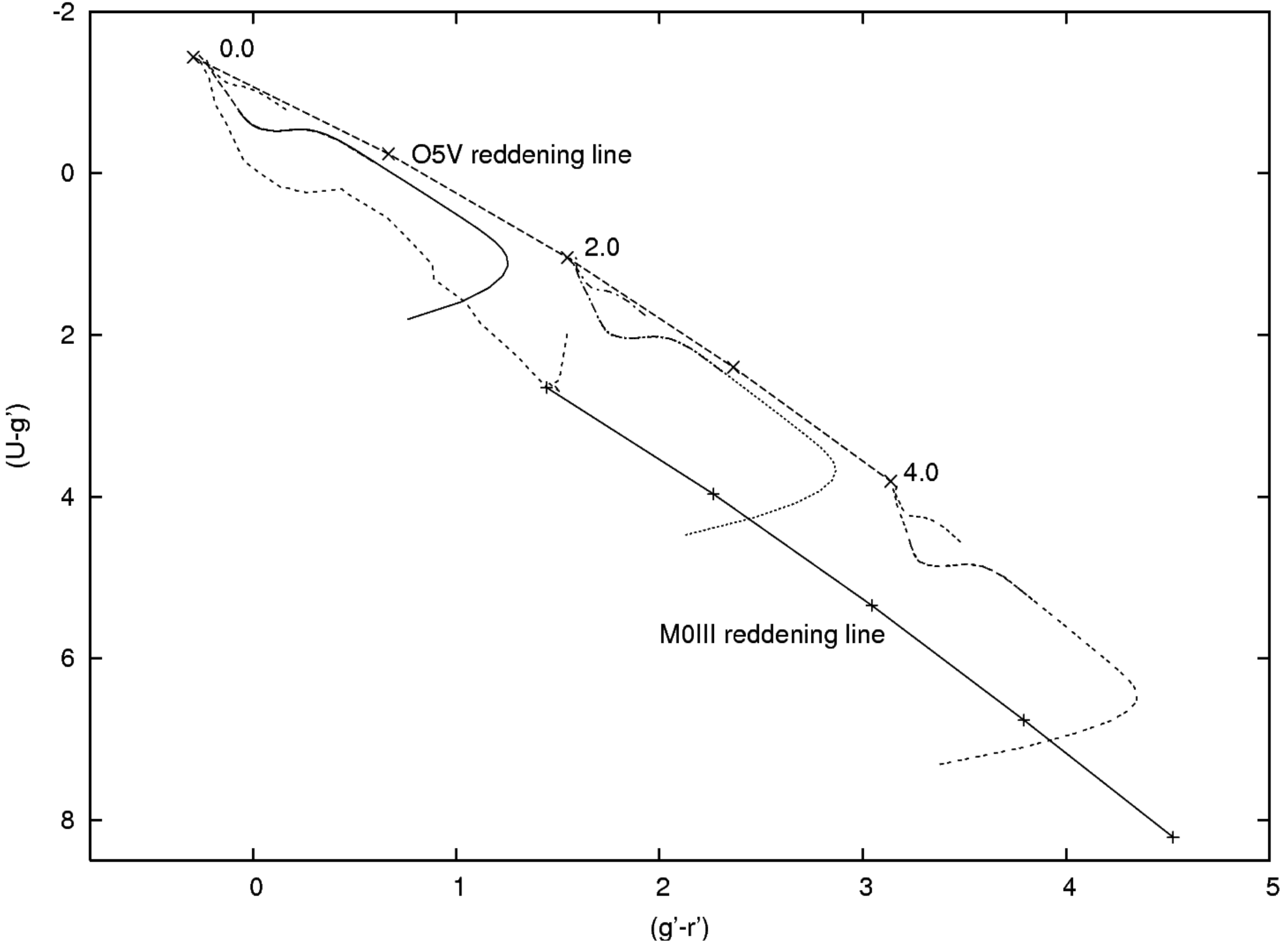

supergiant reddening line
0.0
2.0
4.0
M4V reddening line
0
-0.5
-1
-1.5
-2
(r'-Hel)
-1
0
1
2
3
4
5
(g'-r')

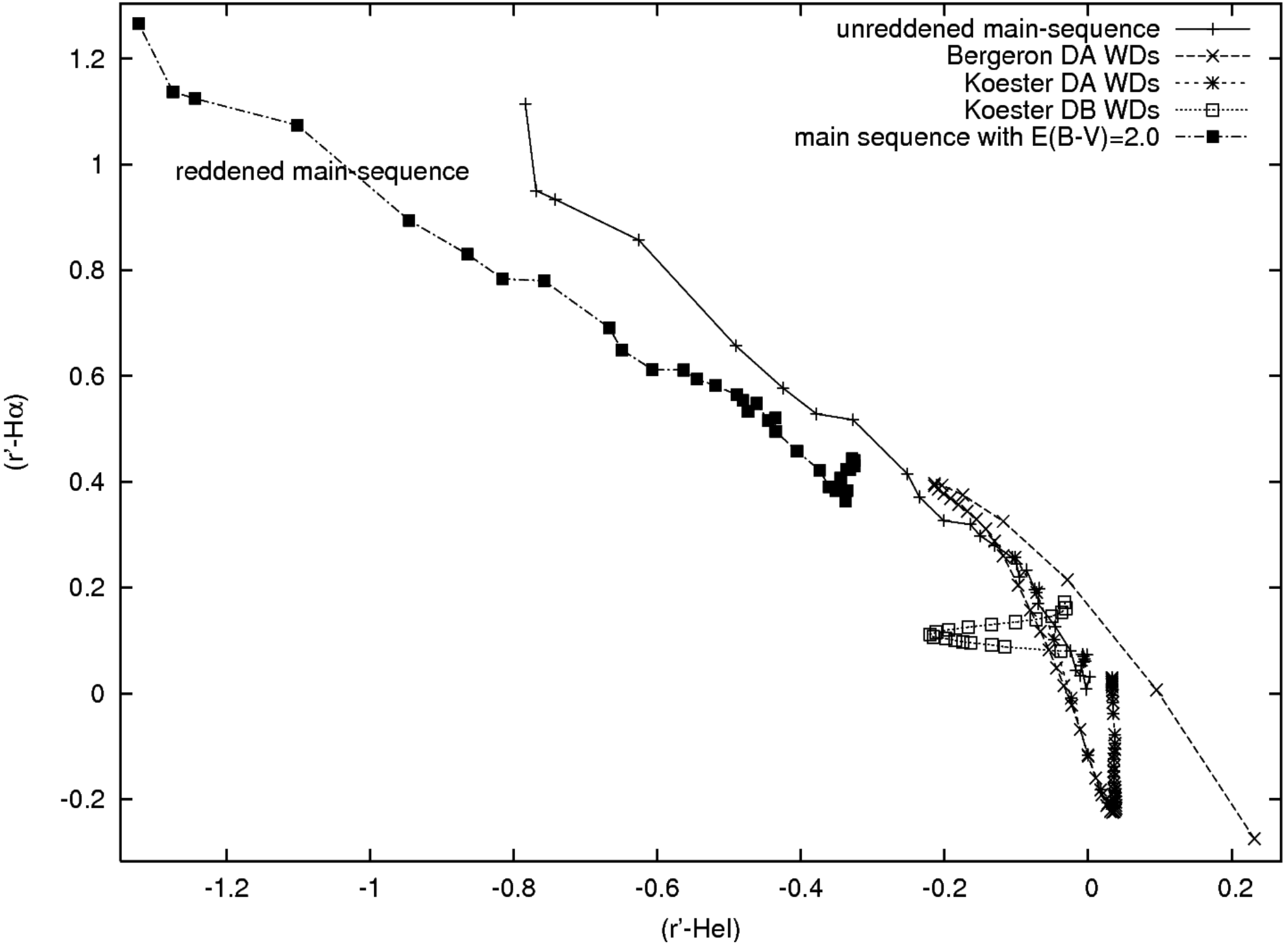

0.0
O5V reddening line
2.0
4.0
M0III reddening line
(U-g')
(g'-r')
-2
0
2
4
6
8
-1
0
1
2
3
4
5


0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
(r'-Hel)
(g'-r')
1500K
17000K
50000K
6000K
Koester DB
20000K
3000K


Koester DB
Koester DA
17000K
10000K
6000K
Bergeron DA
2500K
1500K
(U-g')
(g'-r')
-1.5
-1
-0.5
0
0.5
1
1.5
2
-0.5
0
0.5
1
1.5


0.0
2.0
4.0
supergiant reddening line
unredded Pickles V
M4V reddening line
0
-0.5
-1
-1.5
(r'-Hel)
0
1
2
3
4
(g'-r')


0.0
O5V reddening line
2.0
4.0
M0III reddening line
(U-g')
(g'-r')
-2
0
2
4
6
8
0
1
2
3
4
5


unreddened main-sequence
Bergeron DA WDs
Koester DA WDs
Koester DB WDs
main sequence with E(B-V)=2.0
reddened main-sequence
(r'-Hα)
(r'-HeI)
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-1.2
-1
-0.8
-0.6
-0.4
-0.2
0
0.2

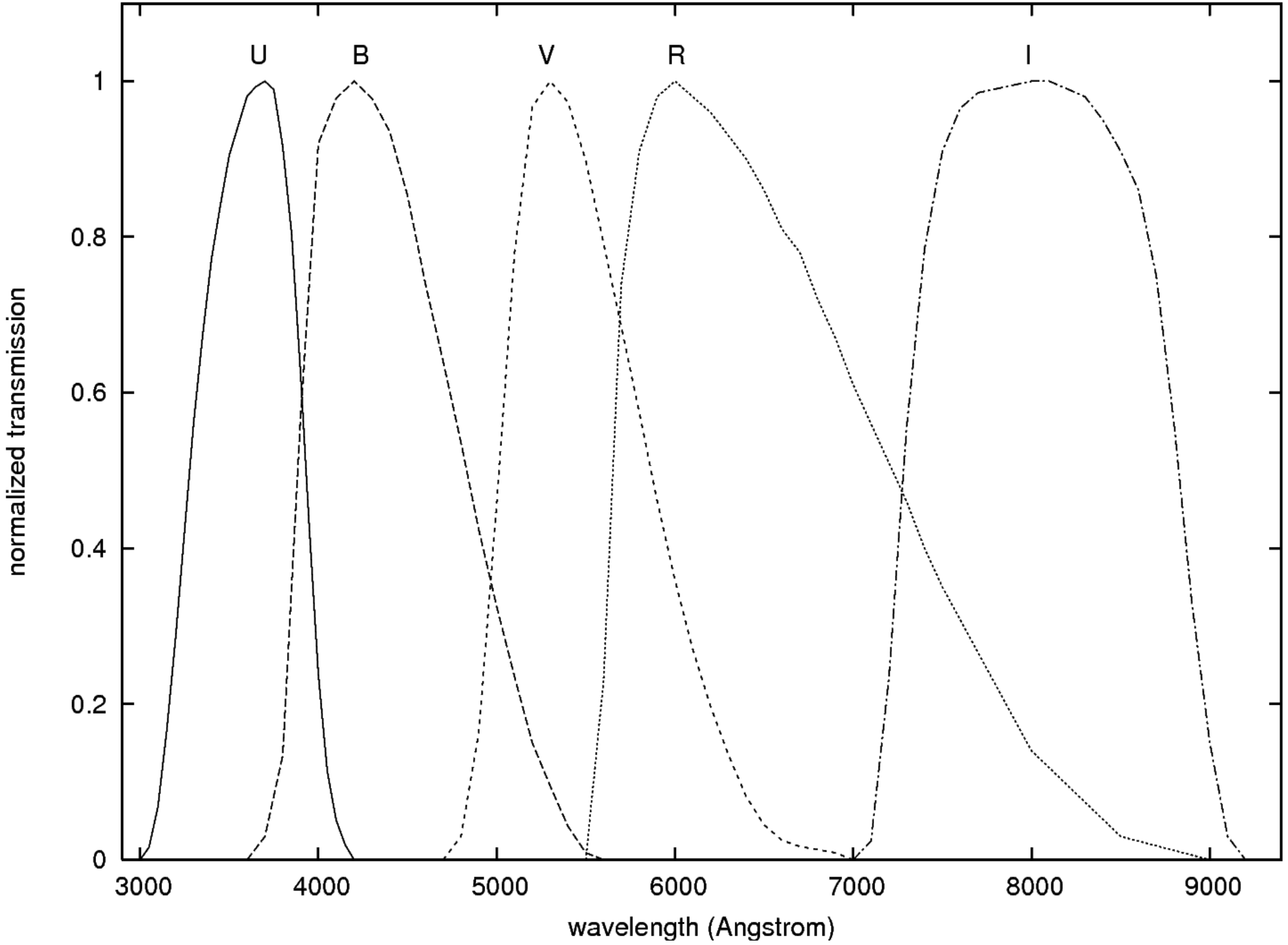
Conclusions for EGAPS

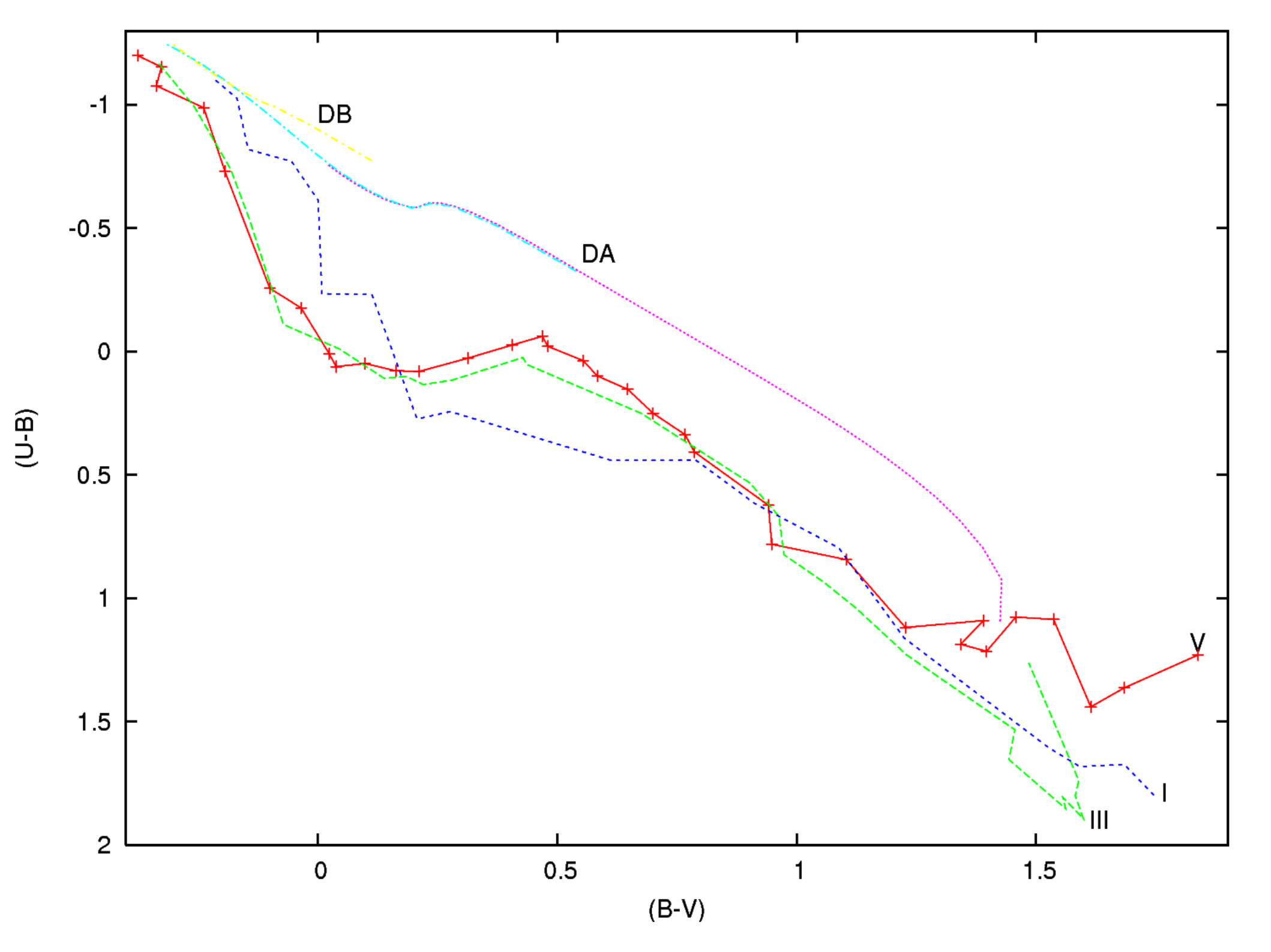
- IPHAS: DA white dwarfs with 8500<T<35.000K are under the A0V reddening line.

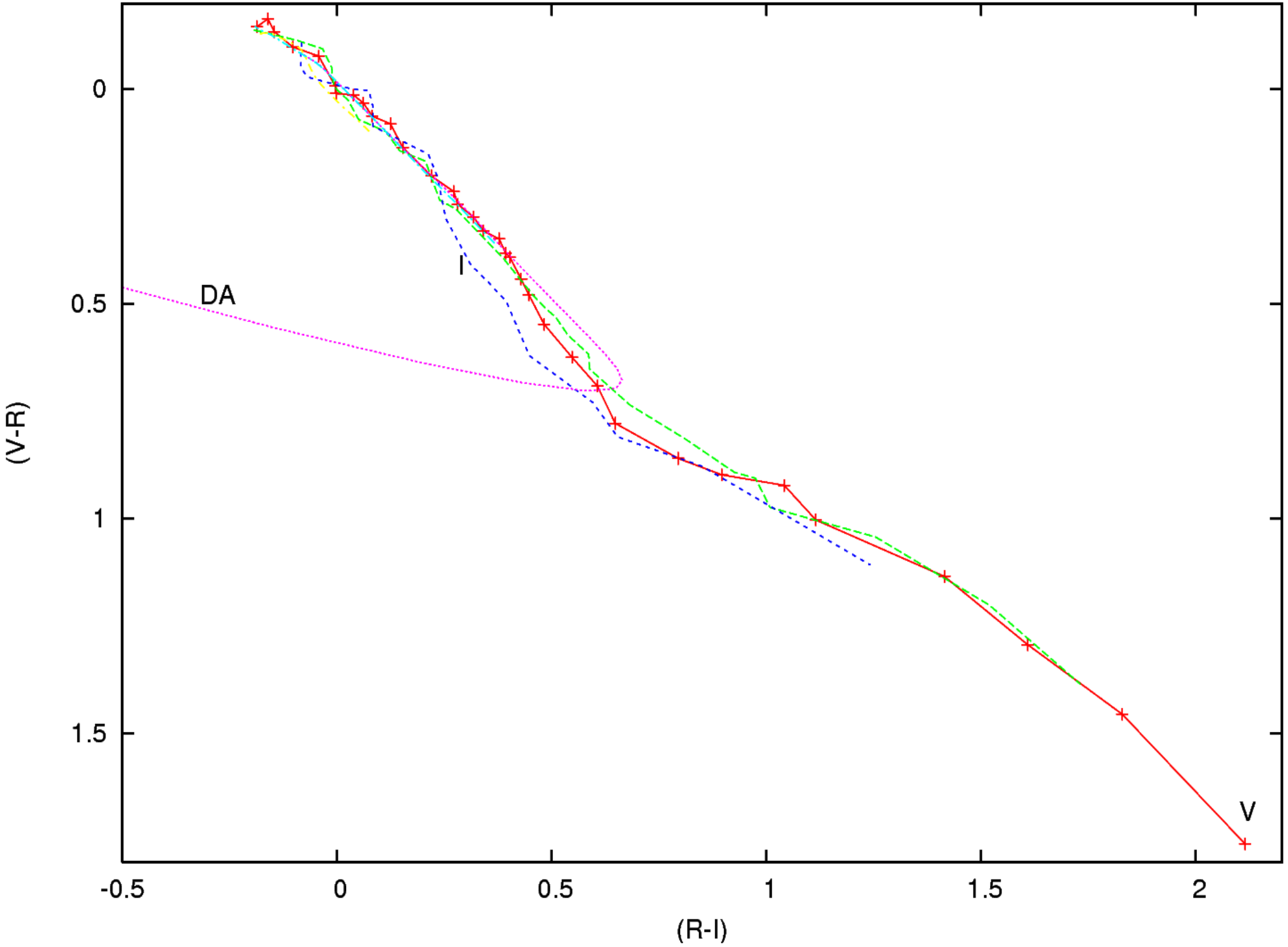
- UVEX: the (g'-r')(r'-HeI) diagram shows a strip with DB white dwarfs with E(B-V)<1,5 and 10.000<T<50.000K

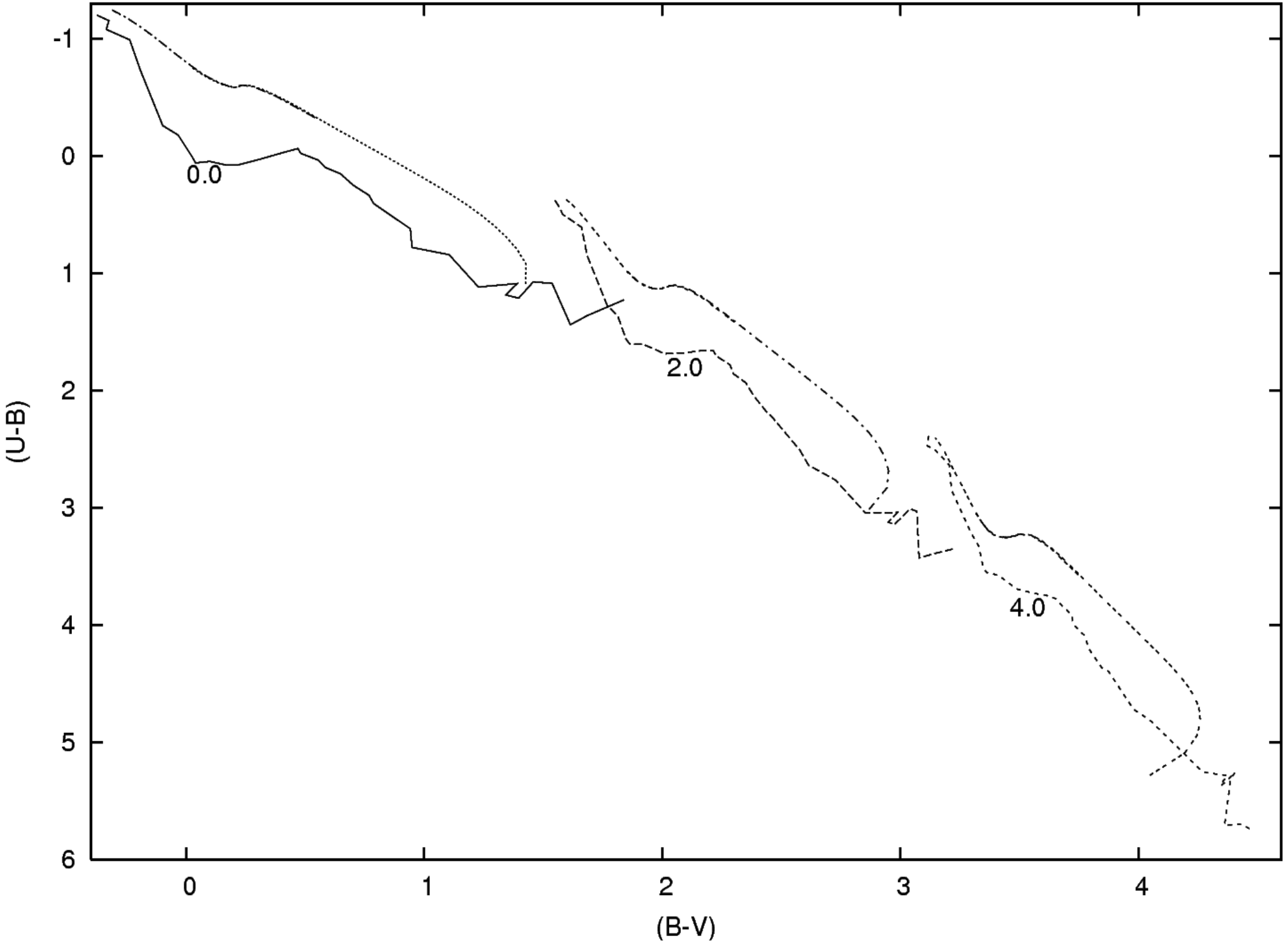
- UVEX: DA white dwarfs with T<2500K are located in a strip above the supergiant reddening line in the (g'-r')(r'-HeI) diagram.

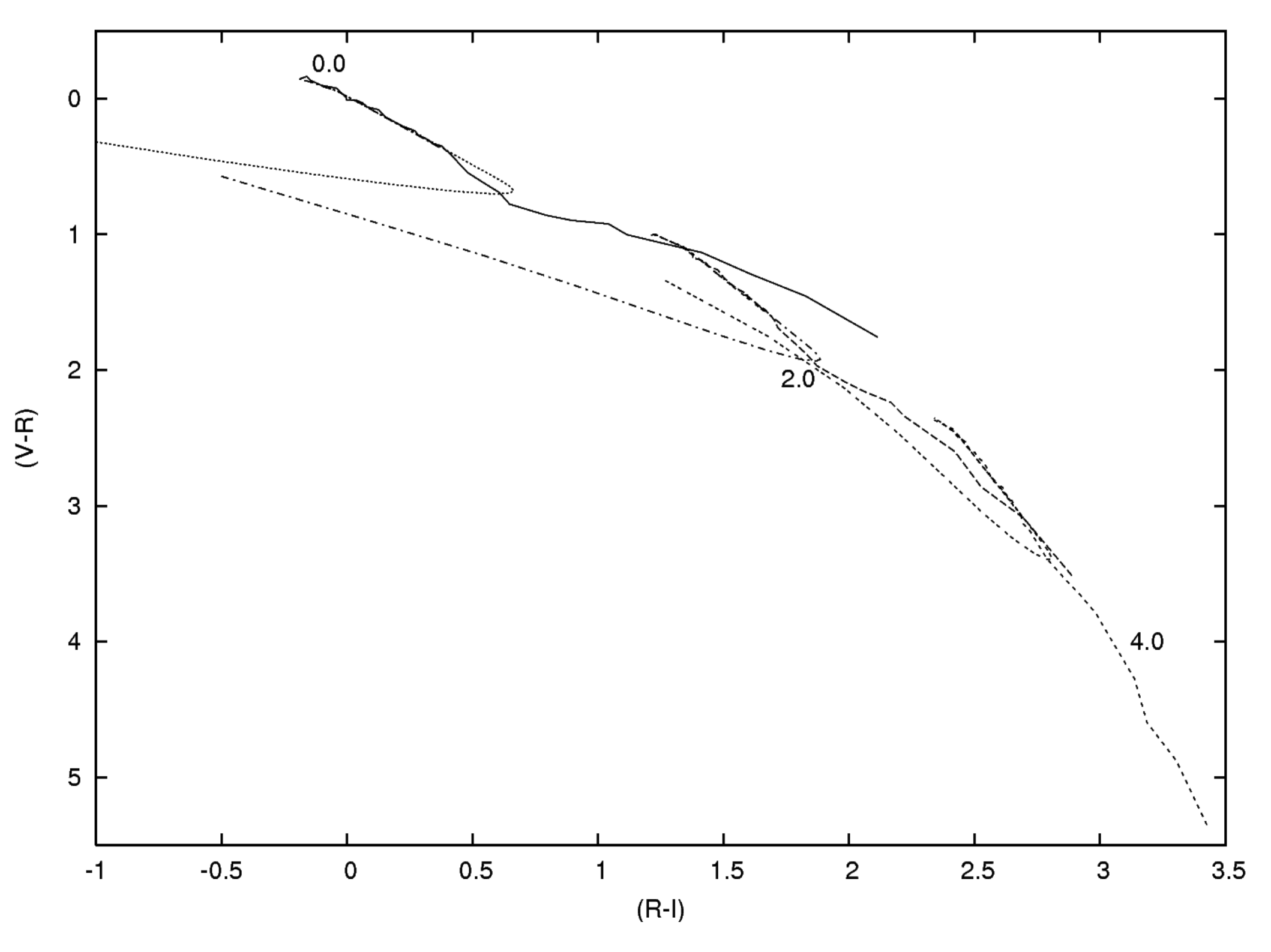
Synthetic colours in the Johnson-Cousins Photometric system.


U
B
V
R
I
1
0.8
0.6
0.4
0.2
0
normalized transmission
3000
4000
5000
6000
7000
8000
9000
wavelength (Angstrom)


DB
DA
V
I
III
-1
-0.5
0
0.5
1
1.5
2
(U-B)
0
0.5
1
1.5
(B-V)


0
0.5
1
1.5
(V-R)
-0.5
0
0.5
1
1.5
2
(R-I)
DA
I
V

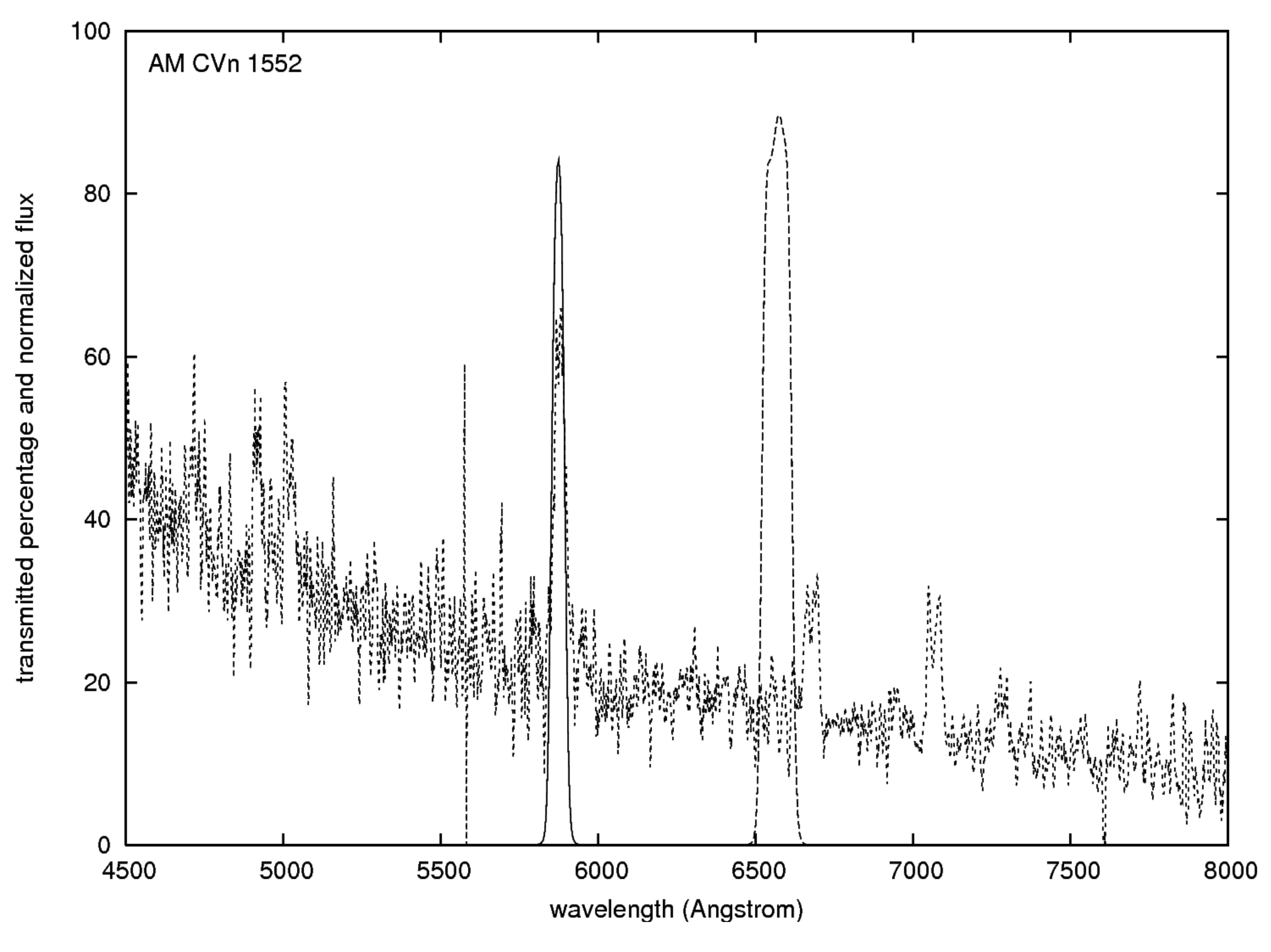

-1
0
1
2
3
4
5
6
(U-B)
0
1
2
3
4
(B-V)
0.0
2.0
4.0

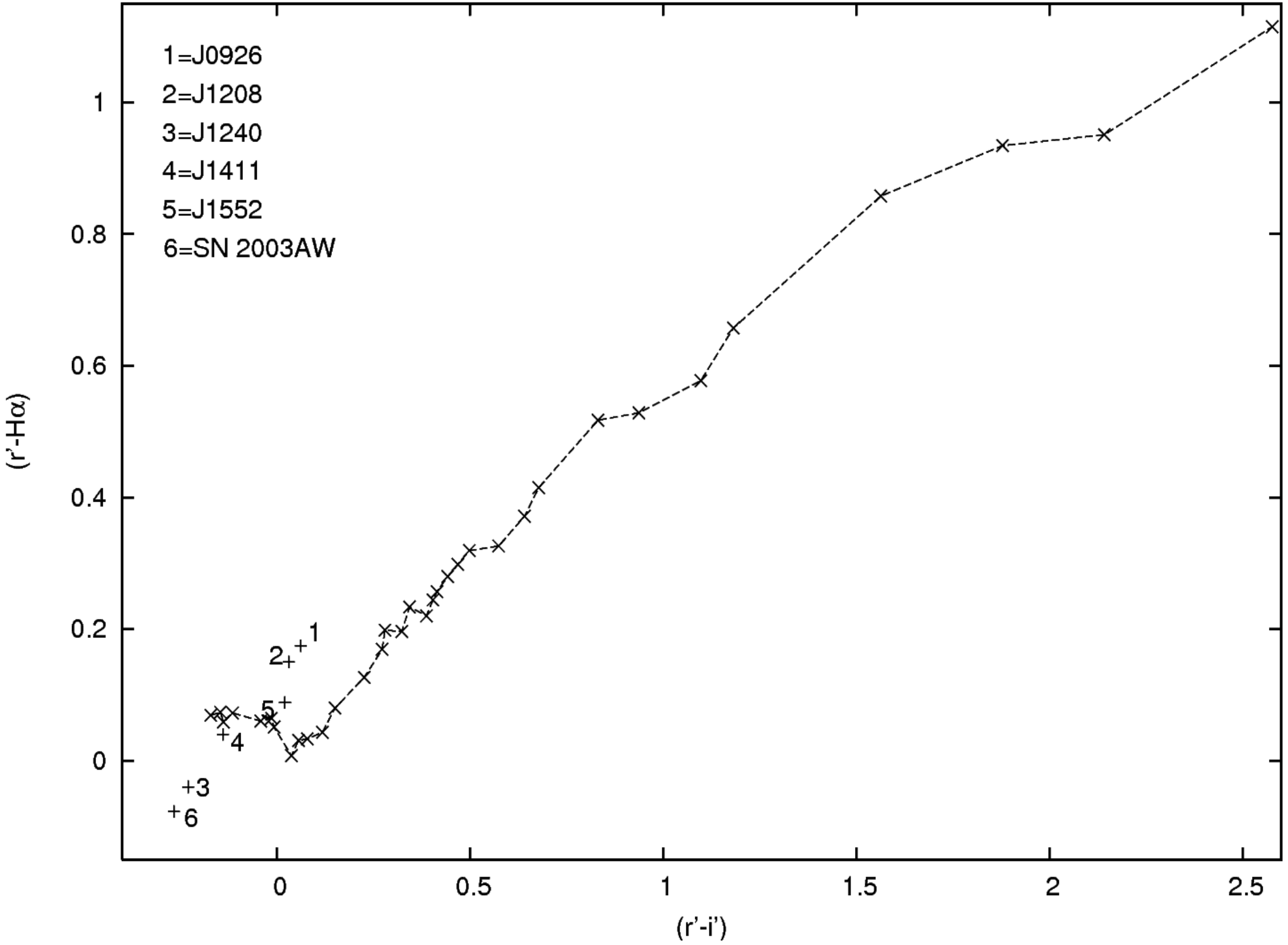

0.0
2.0
4.0
(V-R)
(R-I)
0
1
2
3
4
5
-1
-0.5
0
0.5
1
1.5
2
2.5
3
3.5

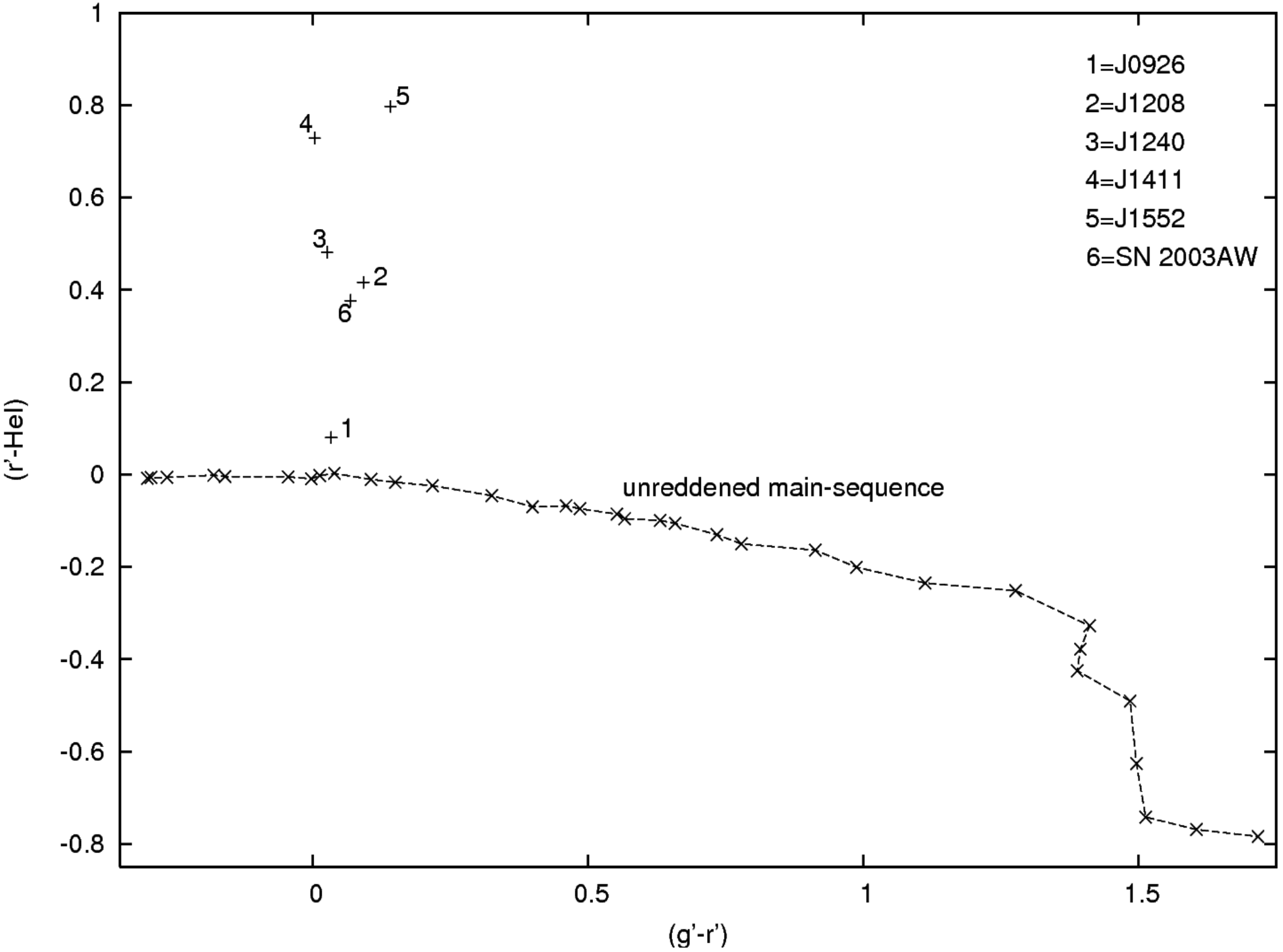
Synthetic colours of AM Cvn's in EGAPS

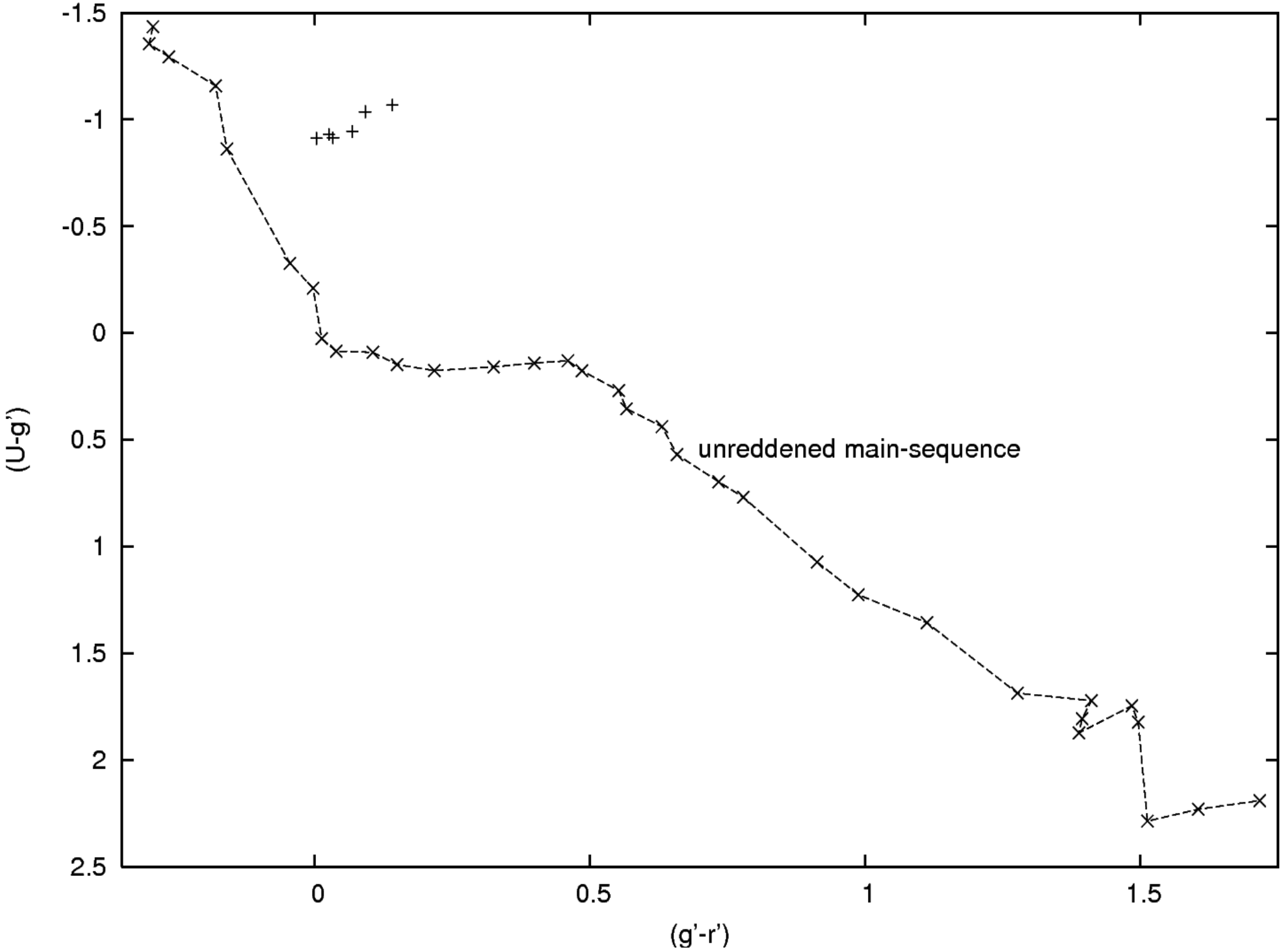
6 VLT AM CVn spectra:
J0926, J1208, J1240, J1411, J1552, SN2003AW

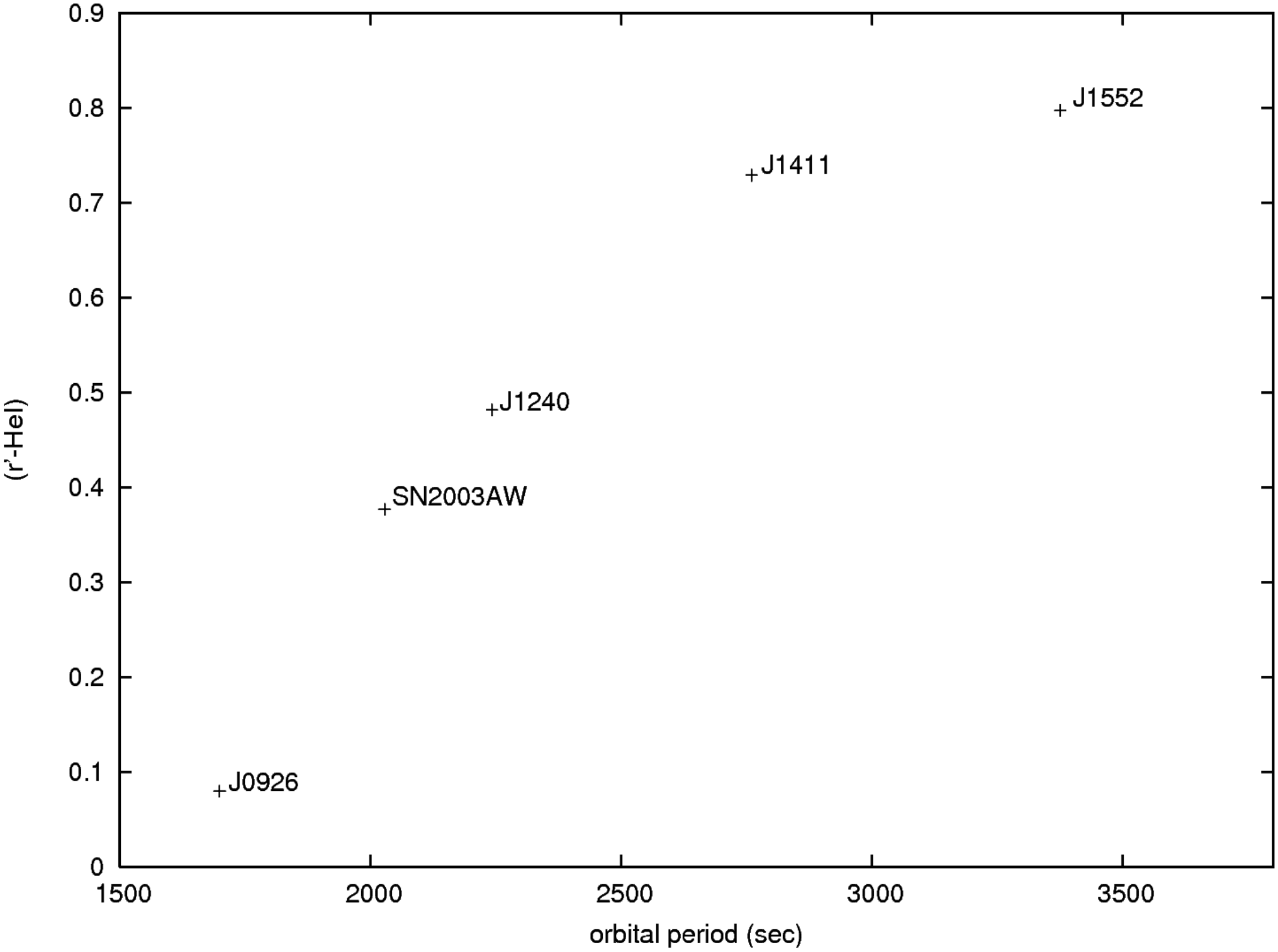
7 Sloan SDSS spectra:
J0129, J0804, J0926, J1208, J1240, J1411, J1552

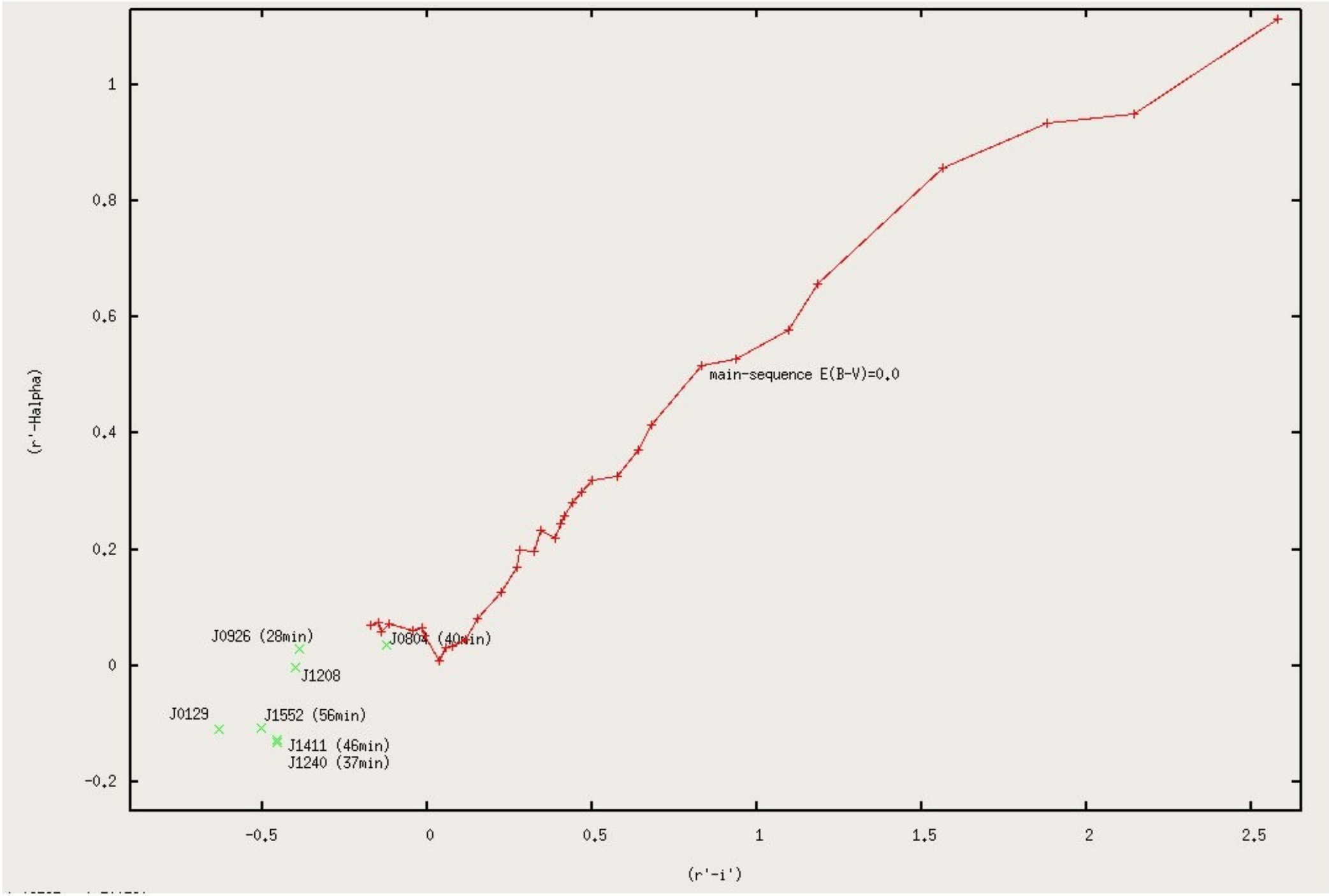

AM CVn 1552
transmitted percentage and normalized flux
wavelength (Angstrom)
0
20
40
60
80
100
4500
5000
5500
6000
6500
7000
7500
8000

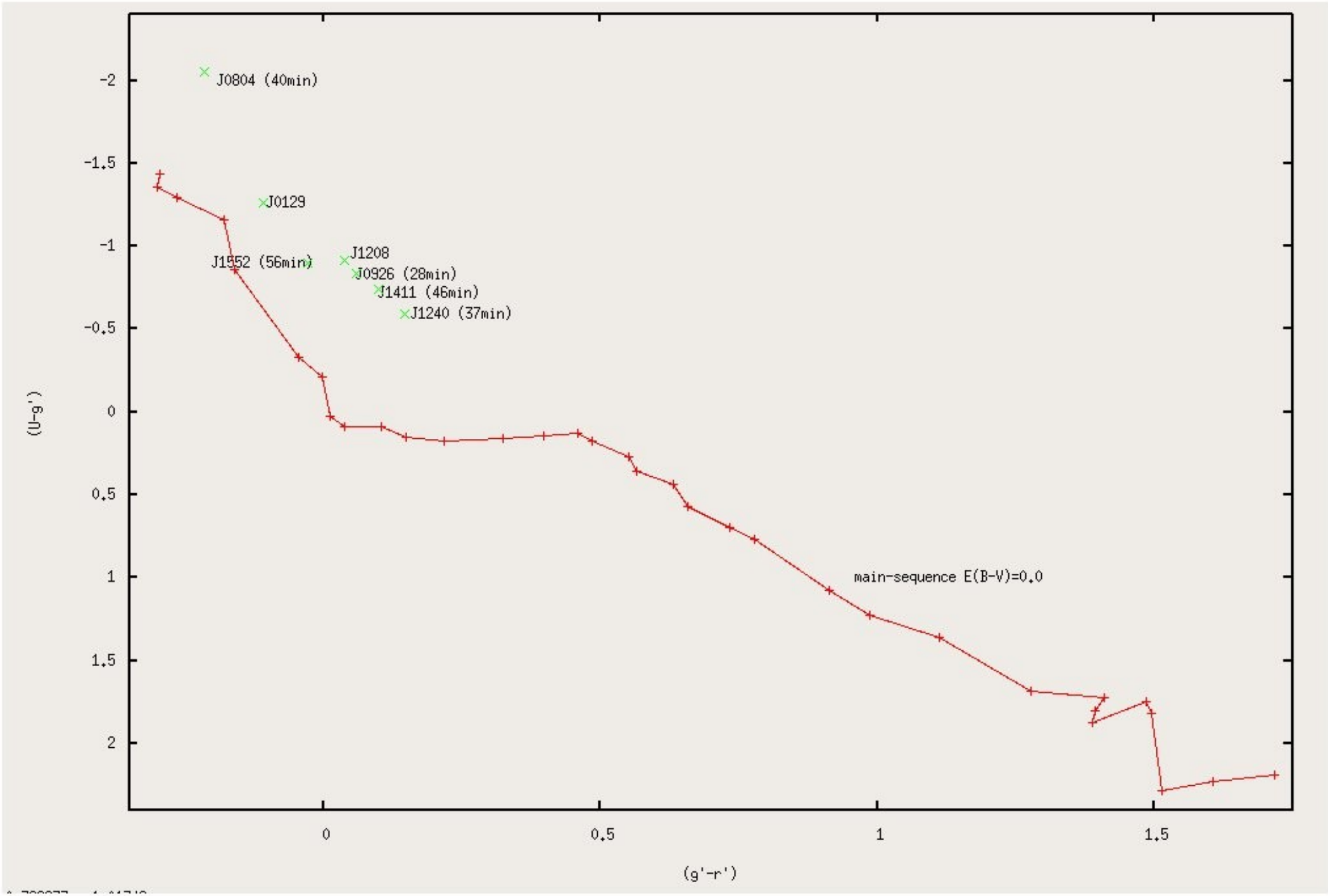

1=J0926
2=J1208
3=J1240
4=J1411
5=J1552
6=SN 2003AW
(r'-Hα)
(r'-i')
1
2
3
4
5
6
0
0.2
0.4
0.6
0.8
1
0
0.5
1
1.5
2
2.5

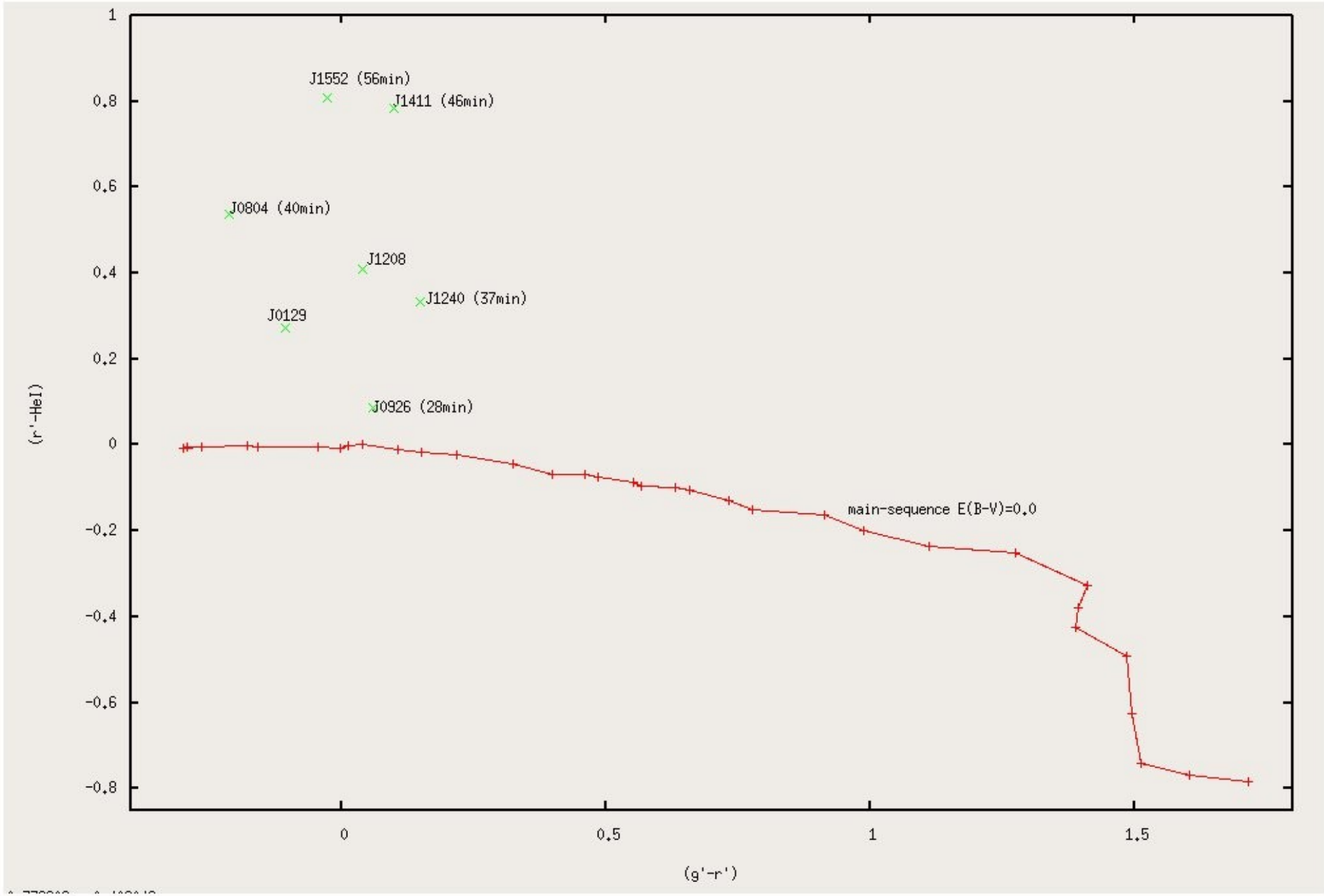

1=J0926
2=J1208
3=J1240
4=J1411
5=J1552
6=SN 2003AW
unreddened main-sequence
(r'-Hel)
(g'-r')
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
0
0.5
1
1.5

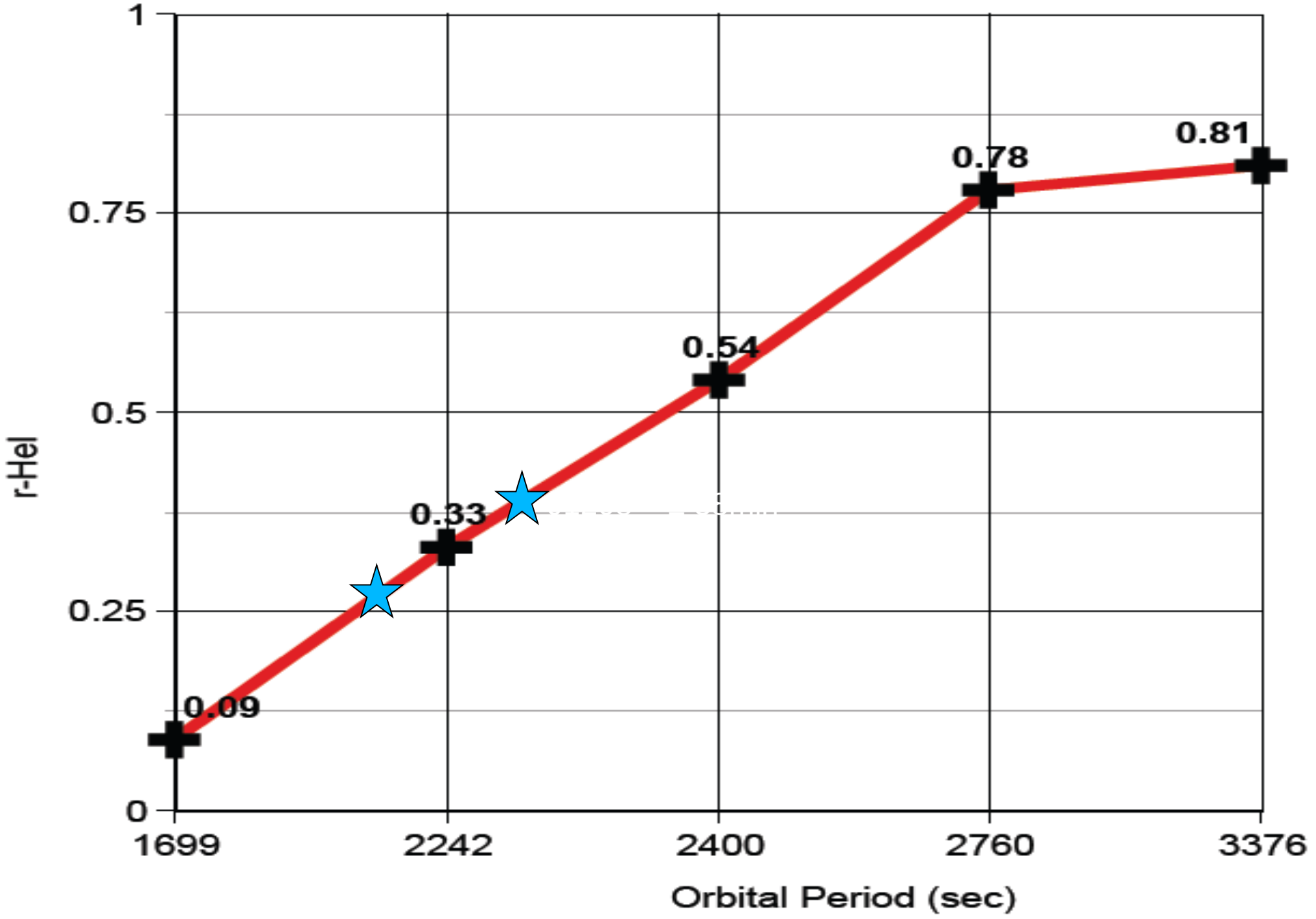

-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
(U-g')
0
0.5
1
1.5
(g'-r')
unreddened main-sequence


0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
(r'-Hel)
1500
2000
2500
3000
3500
orbital period (sec)
J1552
J1411
J1240
SN2003AW
J0926


1
0.8
0.6
0.4
0.2
0
-0.2
(r'-Halpha)
-0.5
0
0.5
1
1.5
2
2.5
(r'-i')
main-sequence E(B-V)=0.0
J0926 (28min)
J0804 (40min)
J1208
J0129
J1552 (56min)
J1411 (46min)
J1240 (37min)


J0804 (40min)
J0129
J1552 (56min)
J1208
J0926 (28min)
J1411 (46min)
J1240 (37min)
main-sequence E(B-V)=0.0
(U-g')
(g'-r')
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
0
0.5
1
1.5


J1552 (56min)
J1411 (46min)
J0804 (40min)
J1208
J1240 (37min)
J0129
J0926 (28min)
main-sequence E(B-V)=0.0
(r'-HeI)
(g'-r')
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
0
0.5
1
1.5


1
0.75
0.5
0.25
0
r-Hel
0.09
0.33
0.54
0.78
0.81
1699
2242
2400
2760
3376
Orbital Period (sec)

Prediction from the UVEX colour-colour diagram:

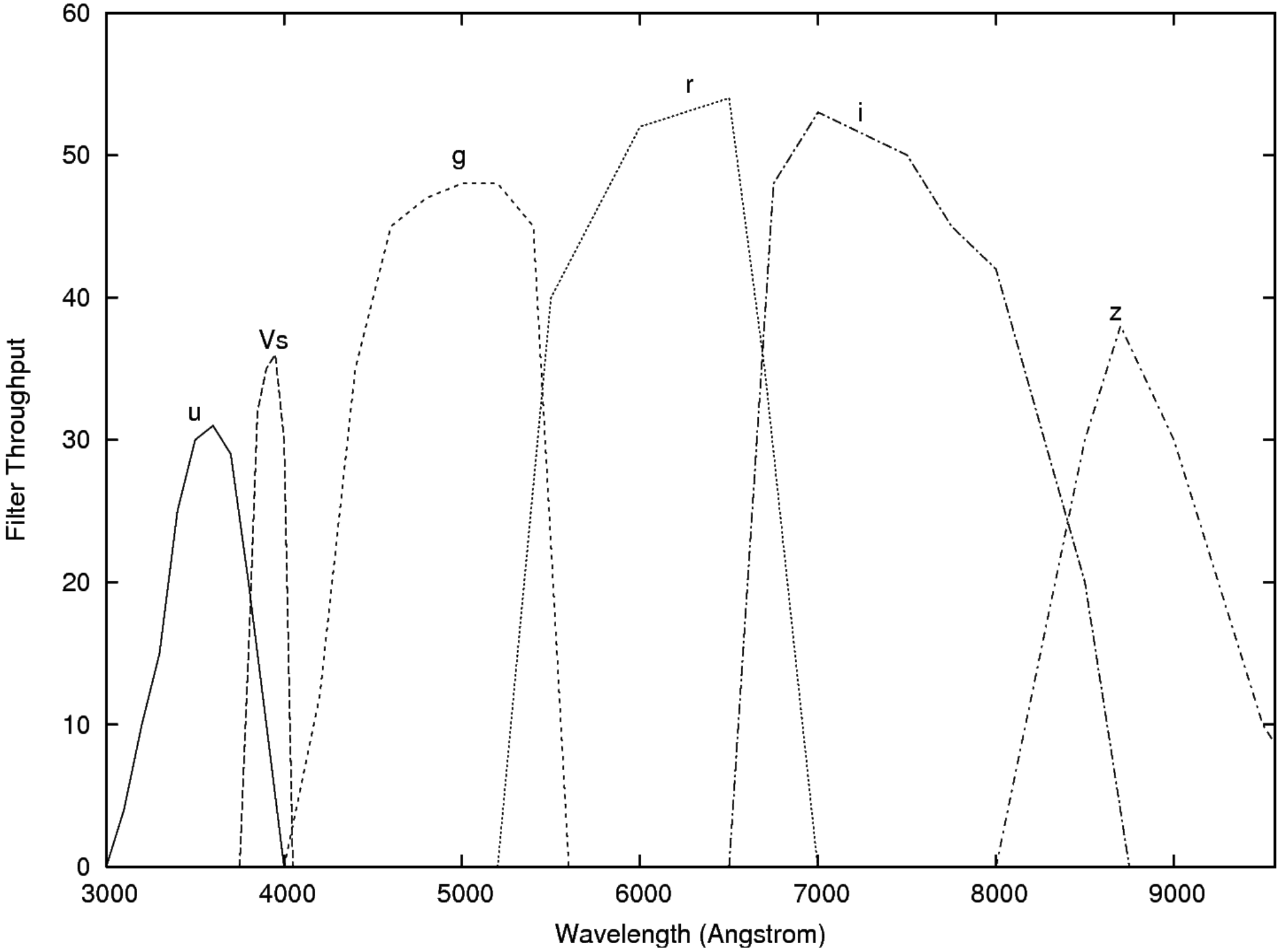
Period of SDSS J0129 = 35min

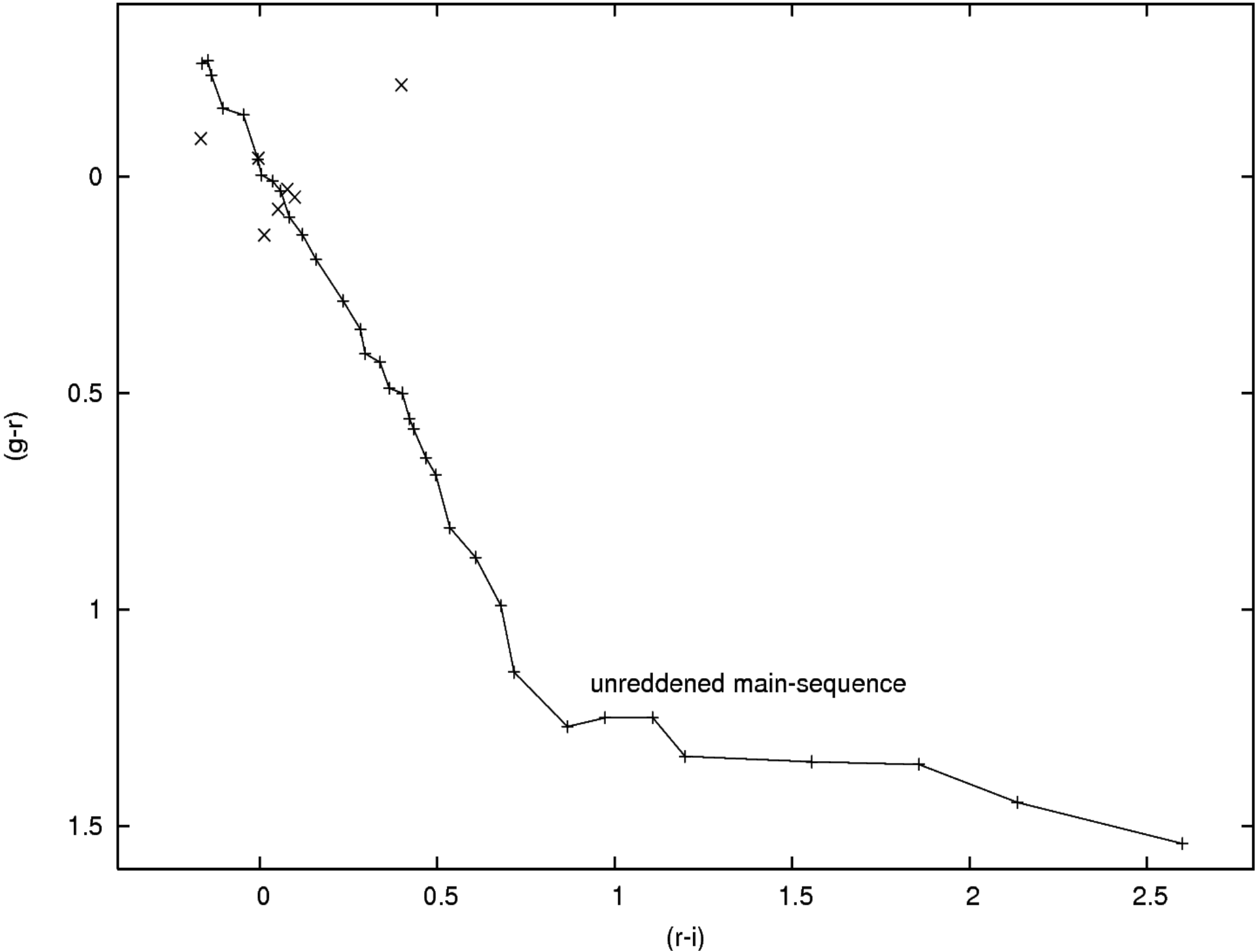
Period of SDSS J1208 = 38min

Synthetic colours of AM CVn's in the Skymapper Southern Sky Survey

The 1.3 mtr Australian Skymapper Telescope maps the southern sky in u, g, r, i, z and Vs

This Cassegrain telescope has a FOV of 8 square degrees, the camera has 32 4x2k CCD's

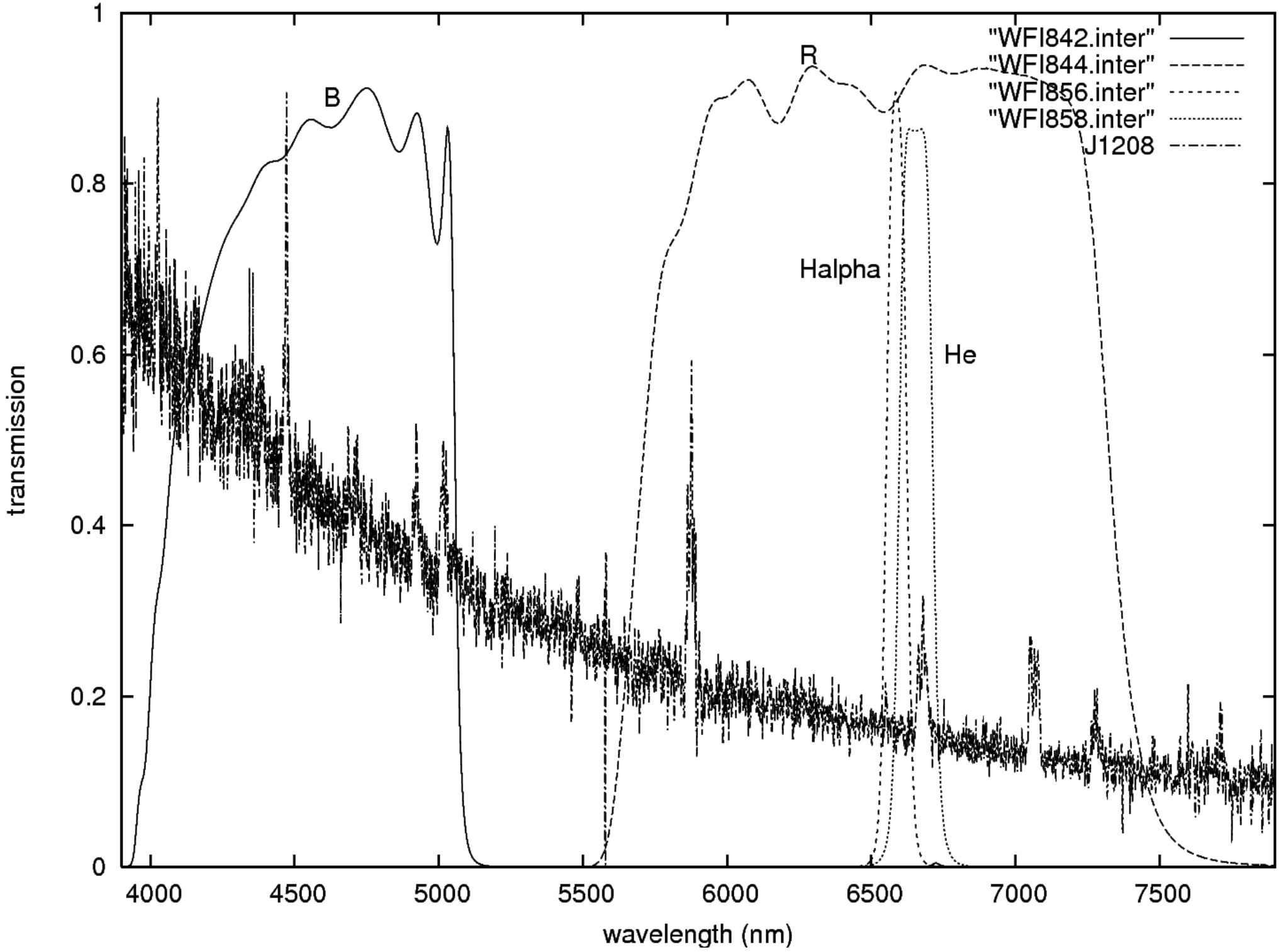

60
50
40
30
20
10
0
Filter Throughput
3000
4000
5000
6000
7000
8000
9000
Wavelength (Angstrom)
u
Vs
g
r
i
z

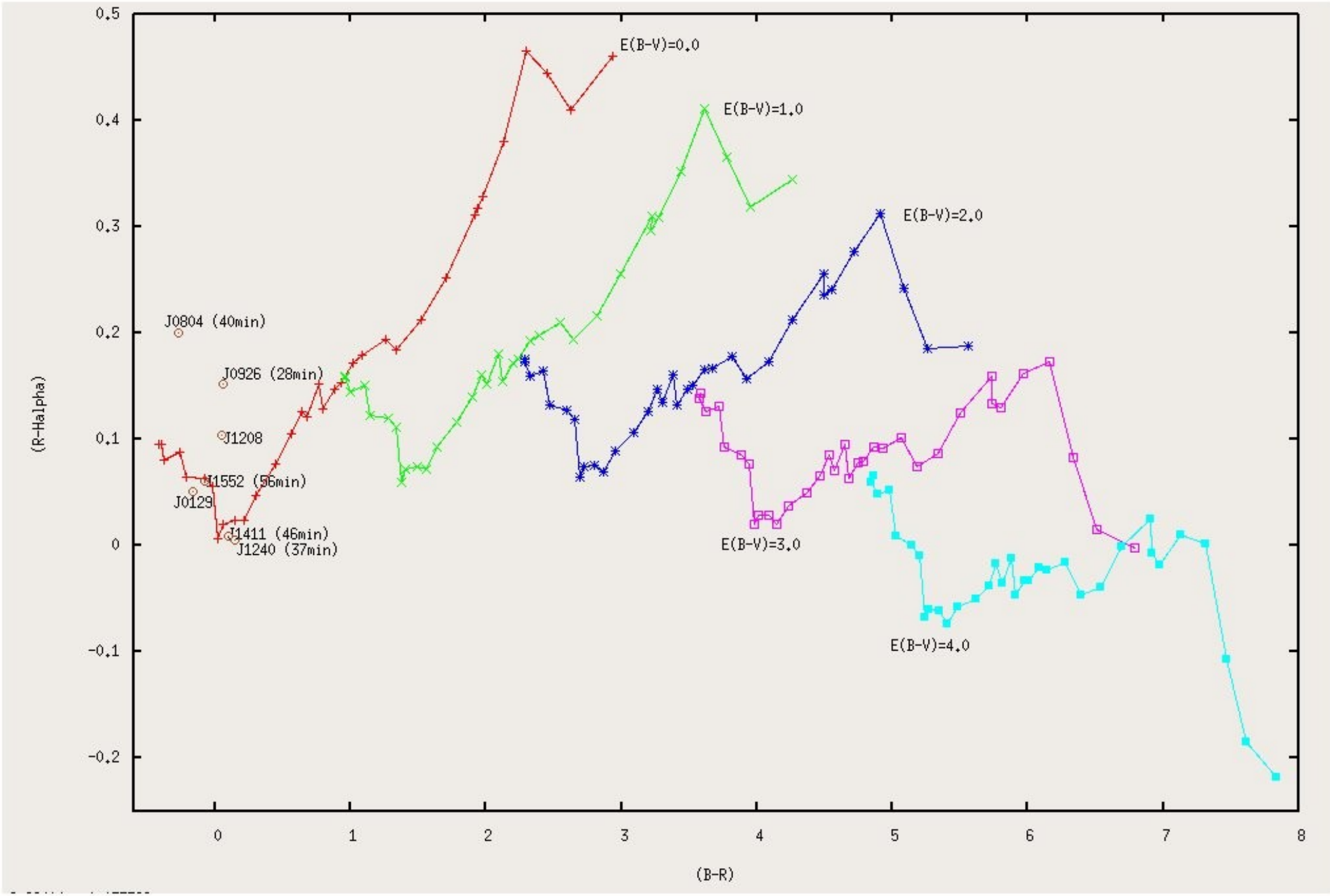

0
0.5
1
1.5
(g-r)
0
0.5
1
1.5
2
2.5
(r-i)
unreddened main-sequence

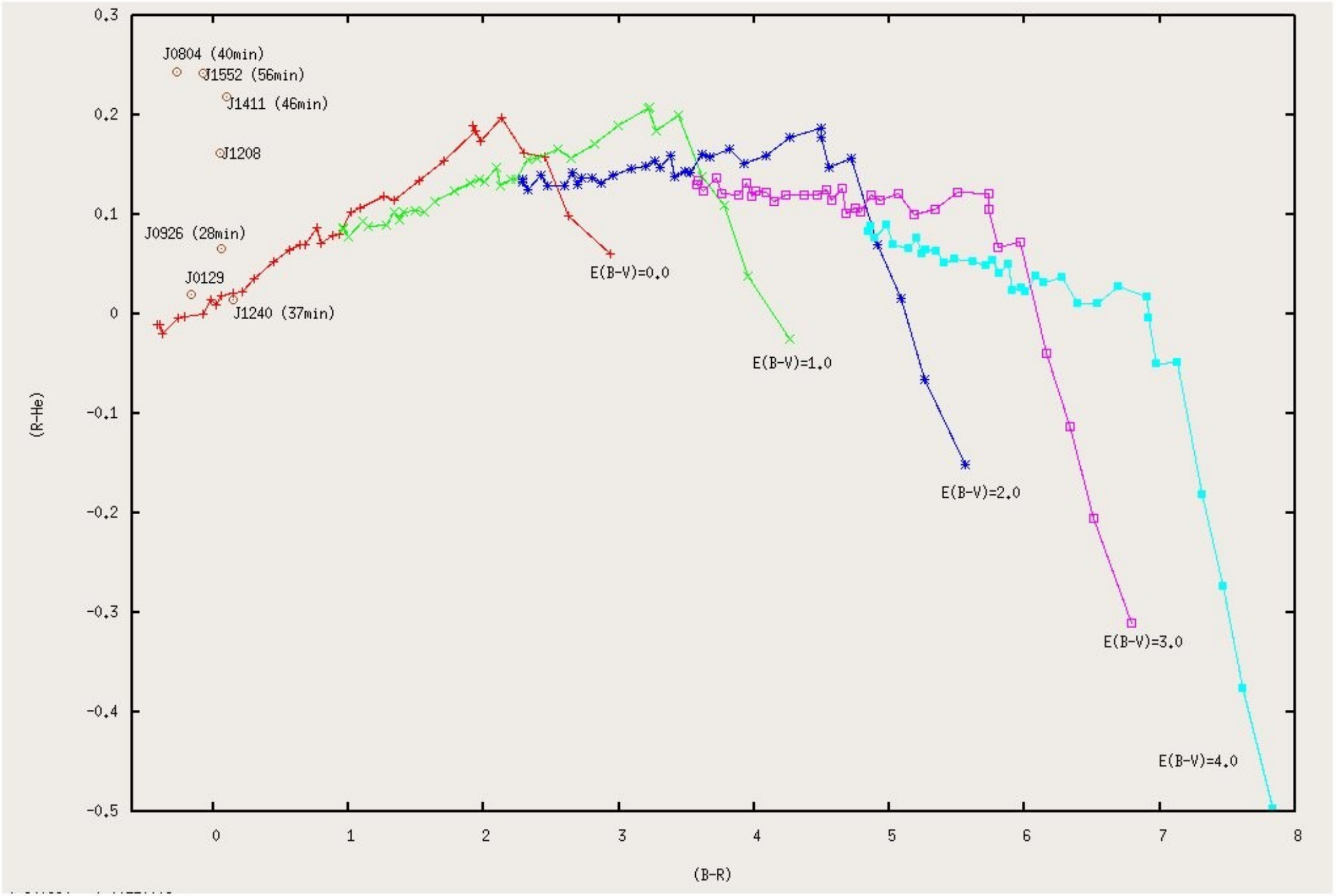
Synthetic colours of AM CVn's in the AM CVn Mini Survey

AM Cvn mini survey: WFI at the 2.2mtr ESO telescope (La Silla)

Mini Survey in B, R, Hα and He


"WFI842.inter"
"WFI844.inter"
"WFI856.inter"
"WFI858.inter"
J1208
B
R
Halpha
He
transmission
wavelength (nm)
0
0.2
0.4
0.6
0.8
1
4000
4500
5000
5500
6000
6500
7000
7500


E(B-V)=0.0
E(B-V)=1.0
E(B-V)=2.0
E(B-V)=3.0
E(B-V)=4.0
J0804 (40min)
J0926 (28min)
J1208
J1552 (56min)
J0129
J1411 (46min)
J1240 (37min)
(R-Halpha)
(B-R)
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
0
1
2
3
4
5
6
7
8


J0804 (40min)
J1552 (56min)
J1411 (46min)
J1208
J0926 (28min)
J0129
J1240 (37min)
E(B-V)=0.0
E(B-V)=1.0
E(B-V)=2.0
E(B-V)=3.0
E(B-V)=4.0
(R-He)
(B-R)
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
0
1
2
3
4
5
6
7
8

Conclusions for AM CVn Mini Survey :

- No clear R-He versus orbital period relation for this survey.
- Unreddened AM CVn candidates are selectable from the colour-colour planes, their position is outside the reddened main-sequence.
- The WFI858 He filter overlaps with the helium emission line of AM CVns.