SPECTRAL RESPONSE OF THE HR

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Some nice things about the HRC-I

large field of view (~ 30' x 30')

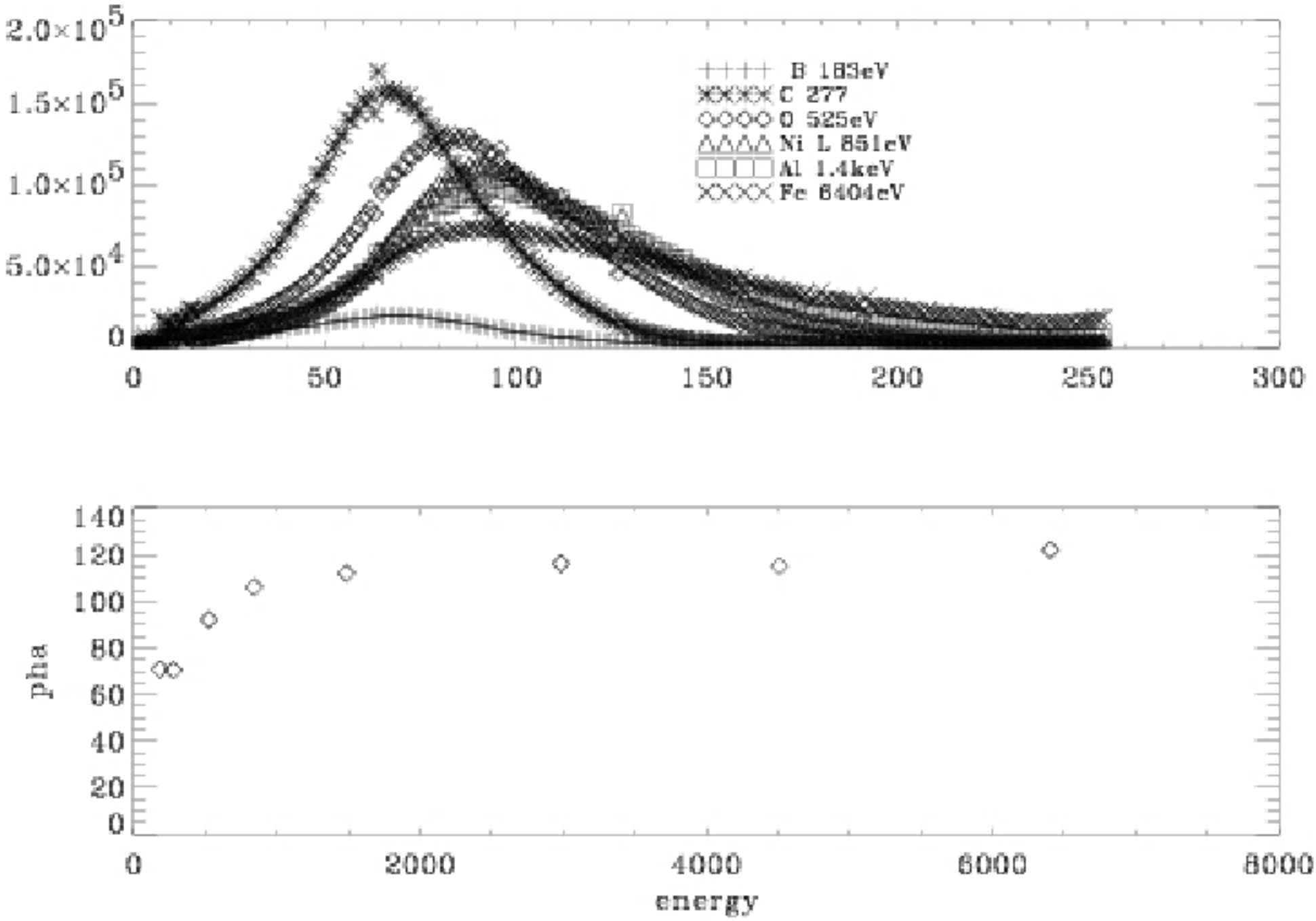
high spatial resolution (0.13175 arcsec/pix)

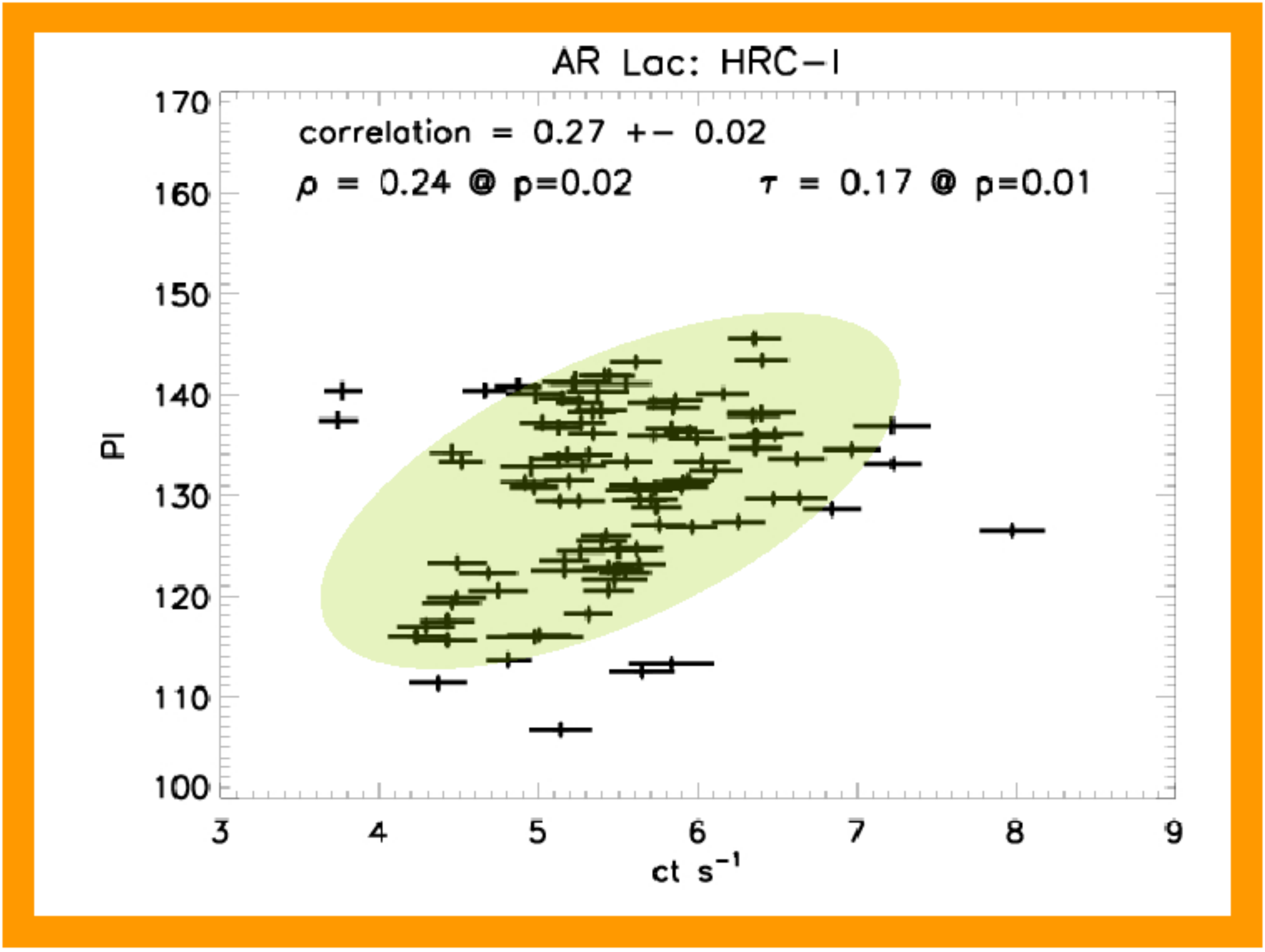
low background (9 ct/Ms/arcsec^2)

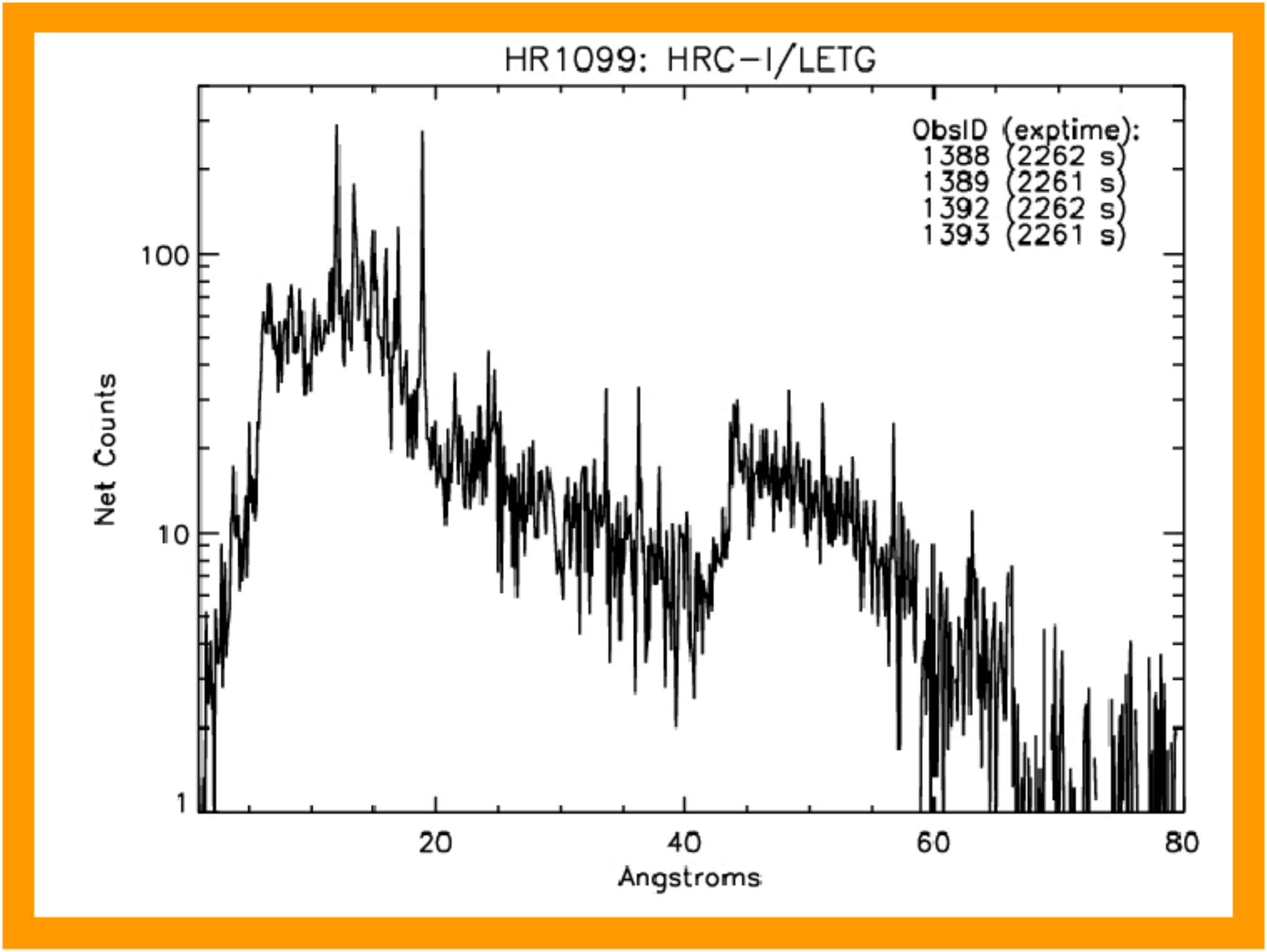
excellent instrument for surveys

except that it is colorblind – NOT!

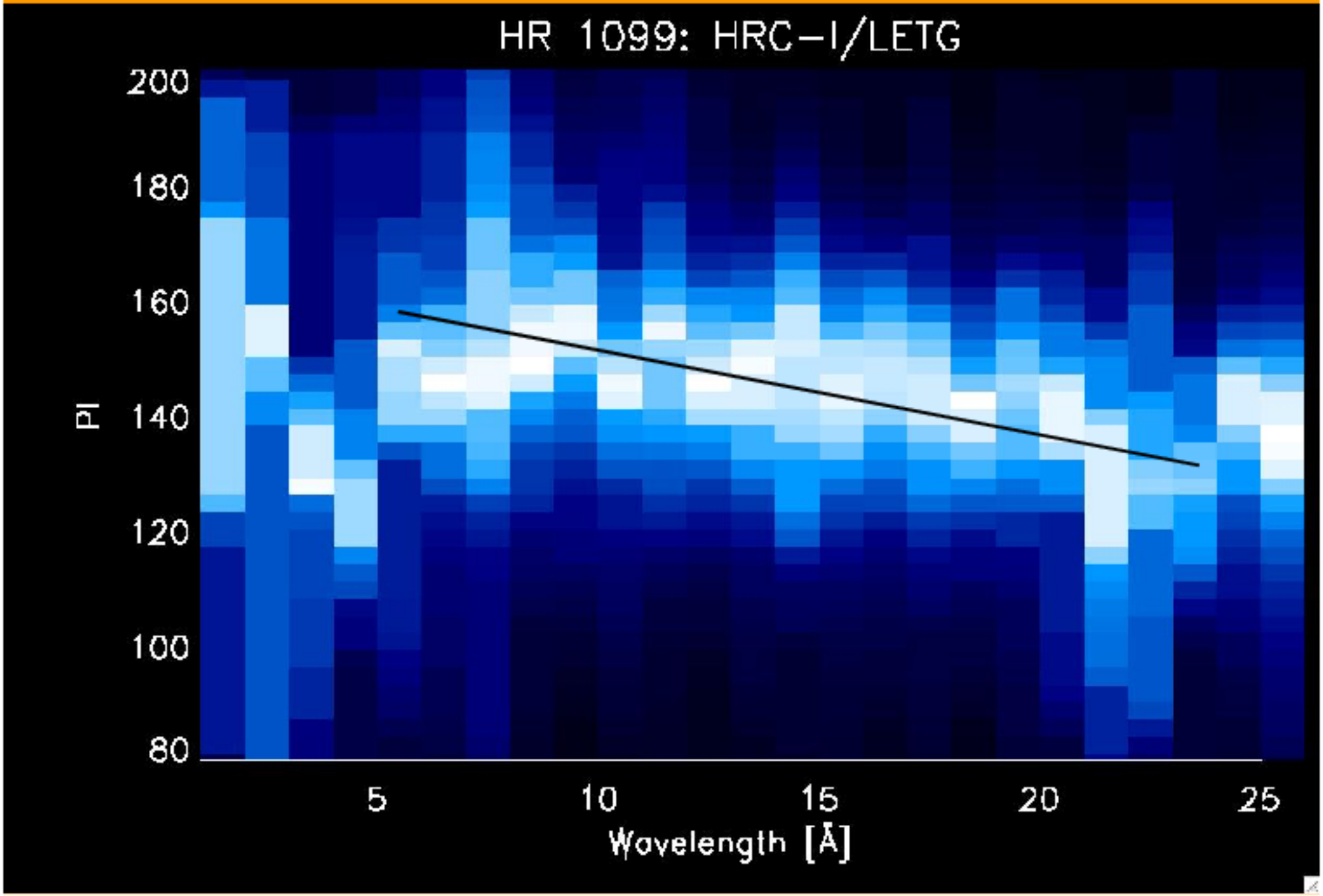
POG Fig 7.7: lab data for HRC-I



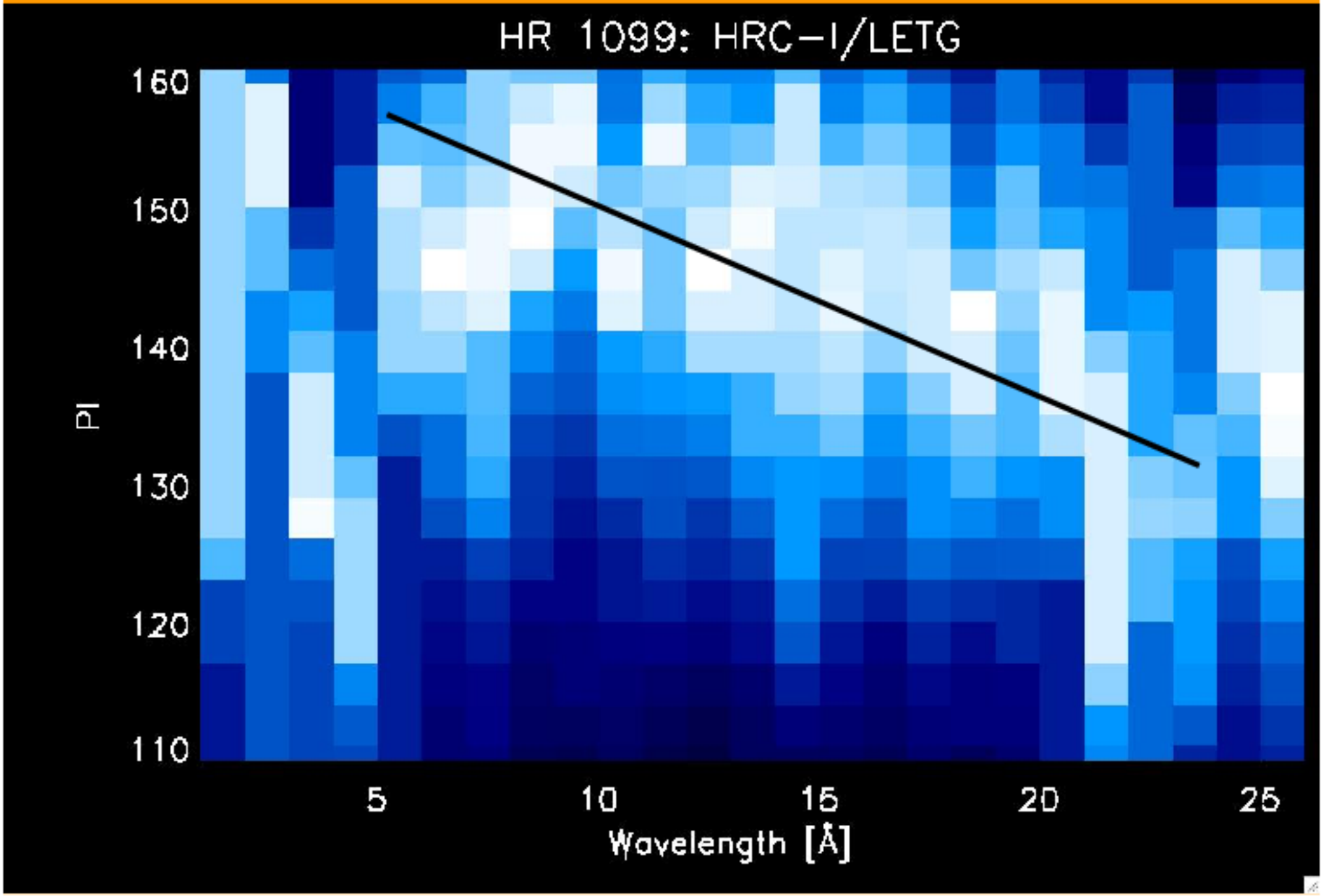

AR Lac: HRC−I
correlation = 0.27 +− 0.02
ρ = 0.24 @ p=0.02
τ = 0.17 @ p=0.01
PI
170
160
150
140
130
120
110
100
3
4
5
6
7
8
9
ct s^{-1}

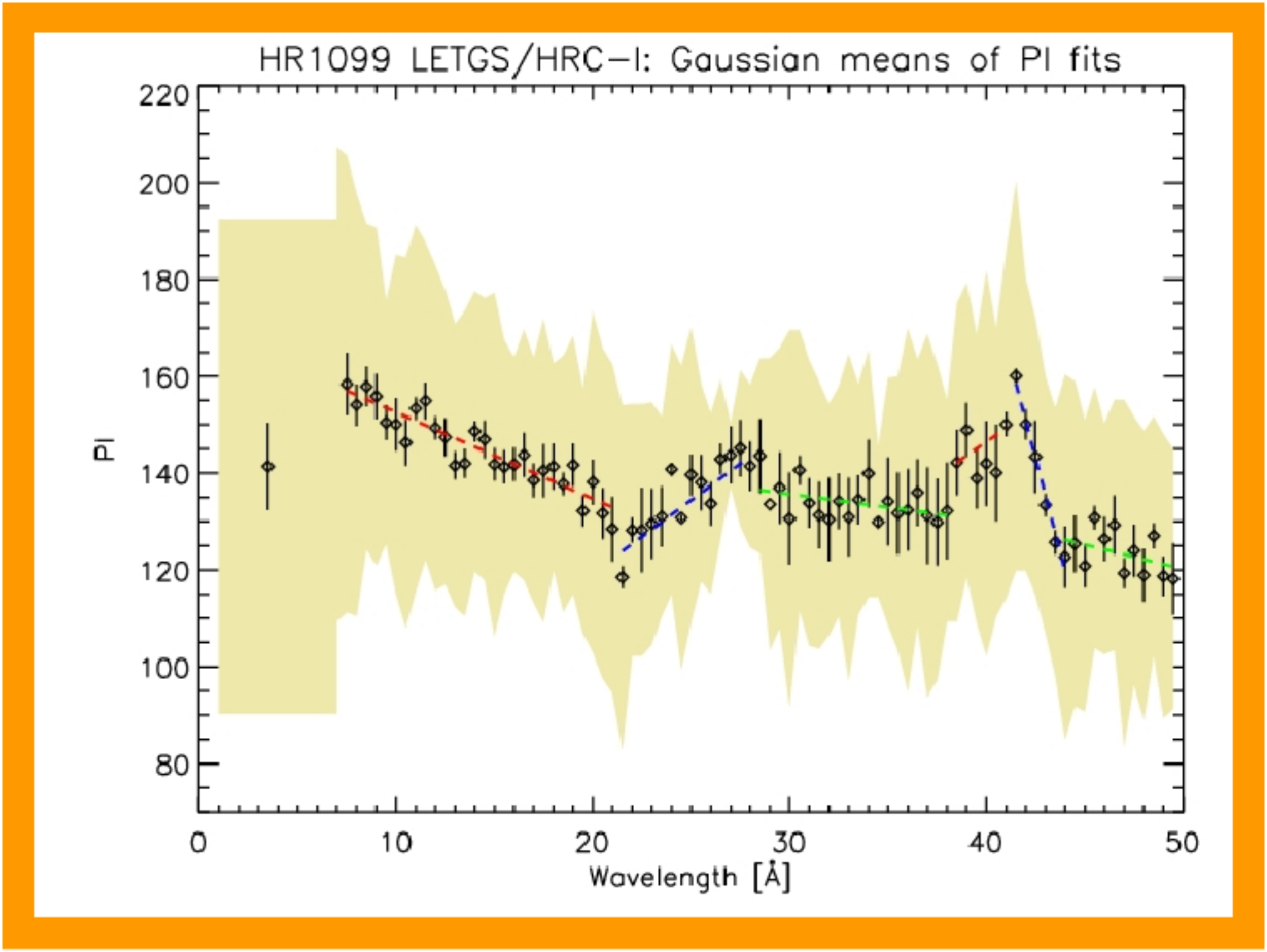

HR1099: HRC-I/LETG
ObsID (exptime):
1388 (2262 s)
1389 (2261 s)
1392 (2262 s)
1393 (2261 s)
100
10
1
Net Counts
20
40
60
80
Angstroms

Another way to look at a spectrum



This is an RMF.




HR1099 LETGS/HRC−I: Gaussian means of PI fits
PI
220
200
180
160
140
120
100
80
0
10
20
30
40
50
Wavelength [Å]

What can you use it for?

not for spectral fitting

hardness ratios

R1=S/M v/s R2=M/H

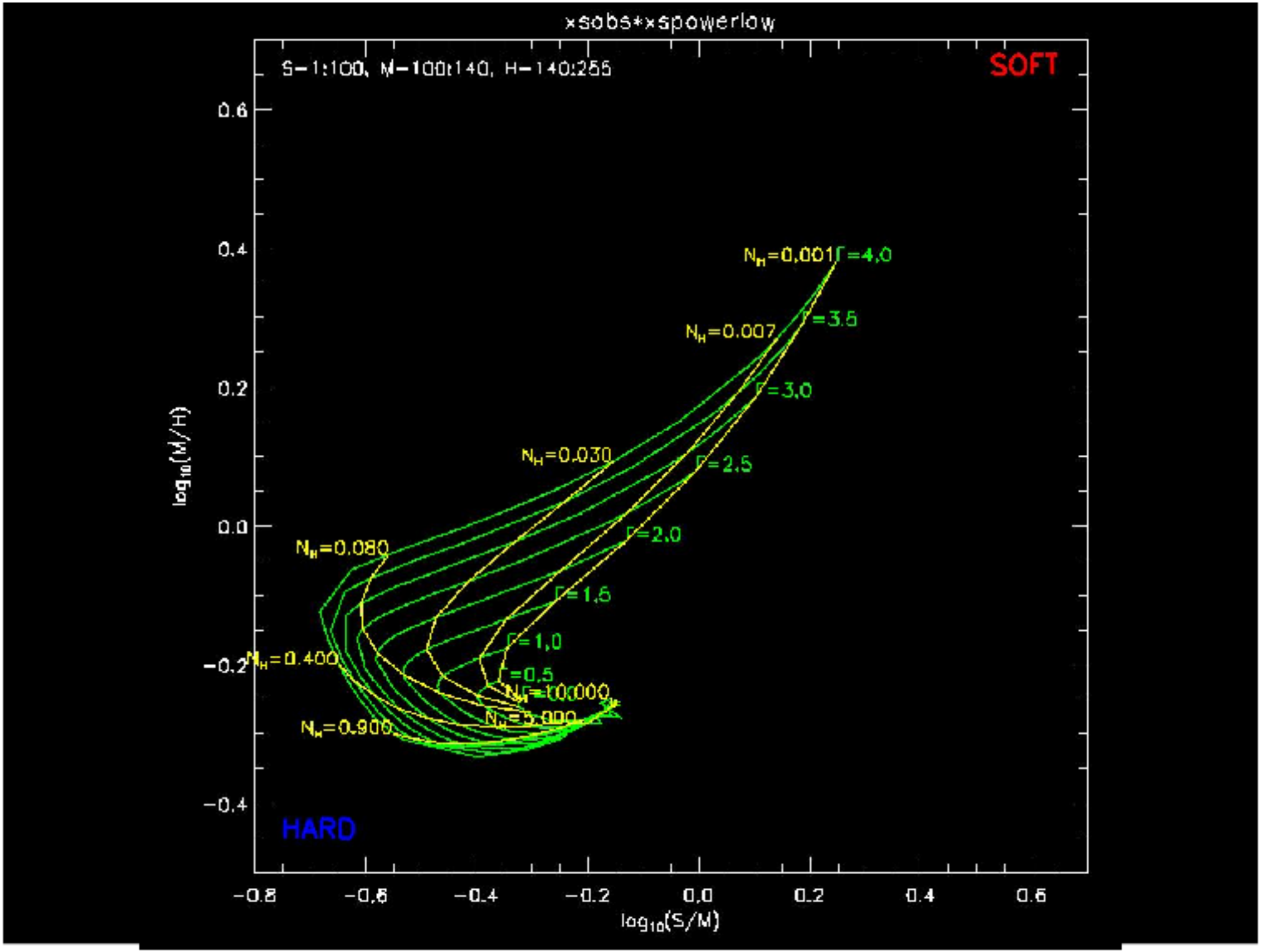
$C1=\log_{10}(S/M)$ v/s $C2=\log_{10}(M/H)$

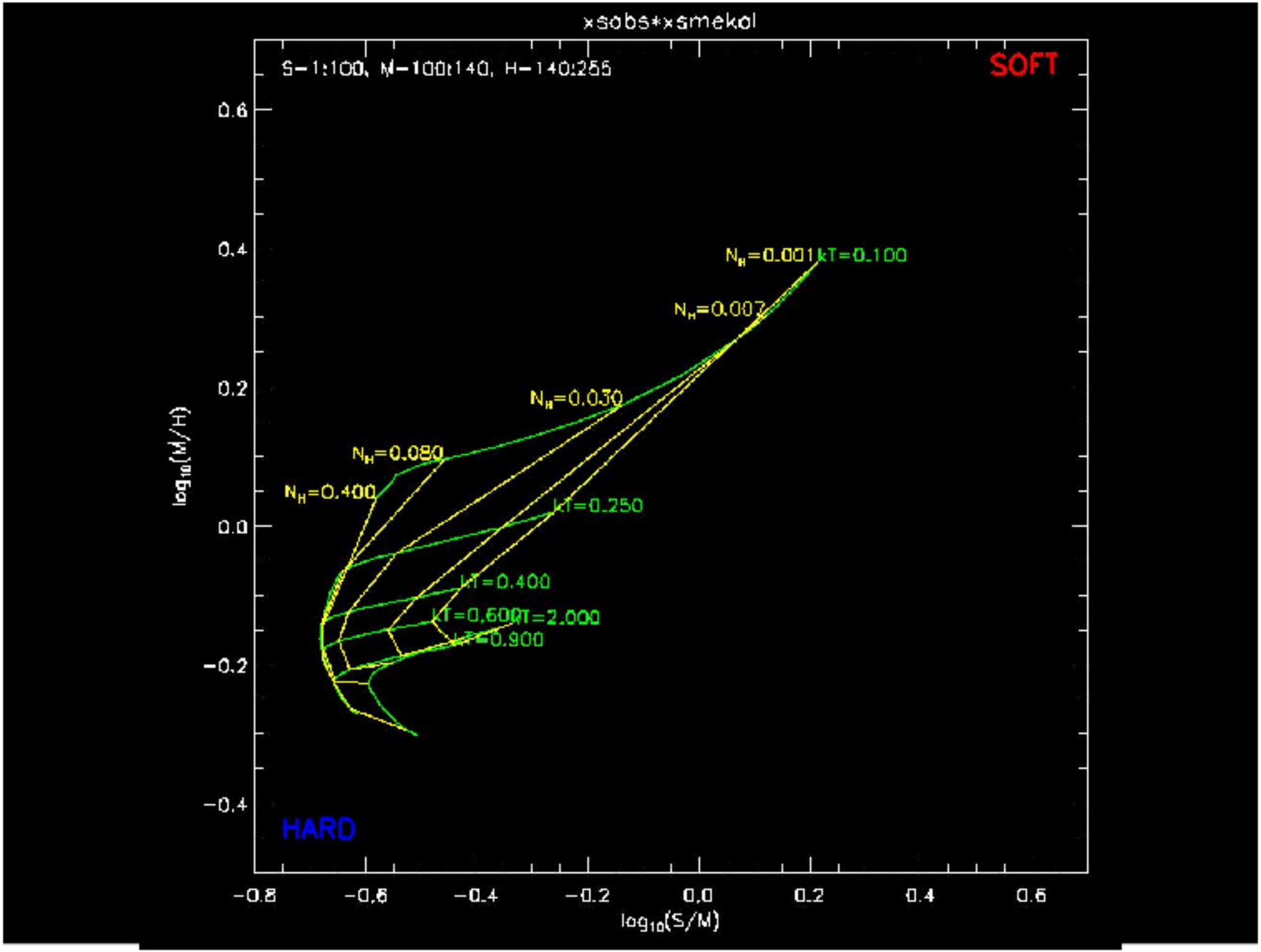
HR1=(S-M)/(S+M) v/s HR2=(M-H)/(M+H)

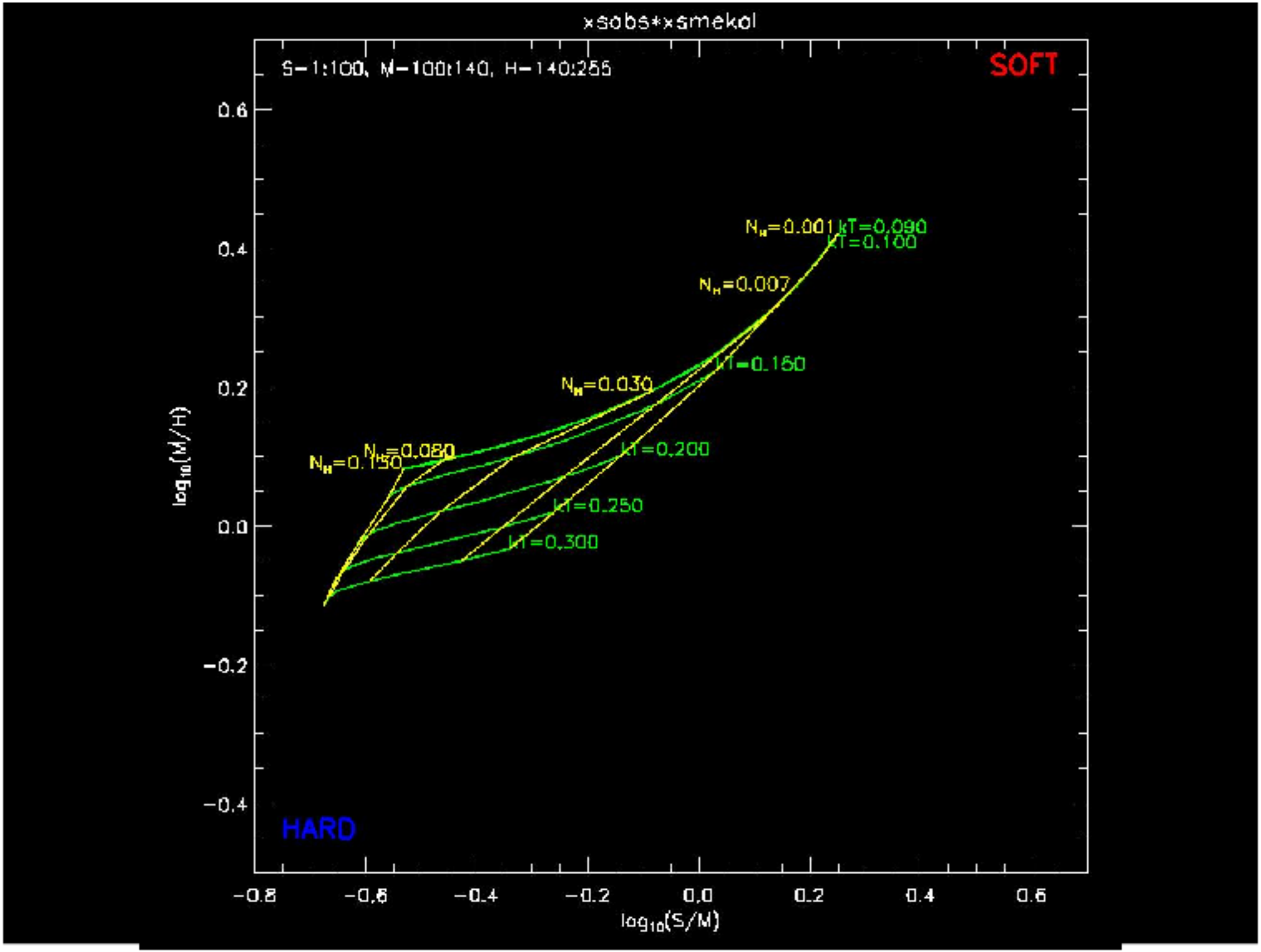
quantile color-color diagrams

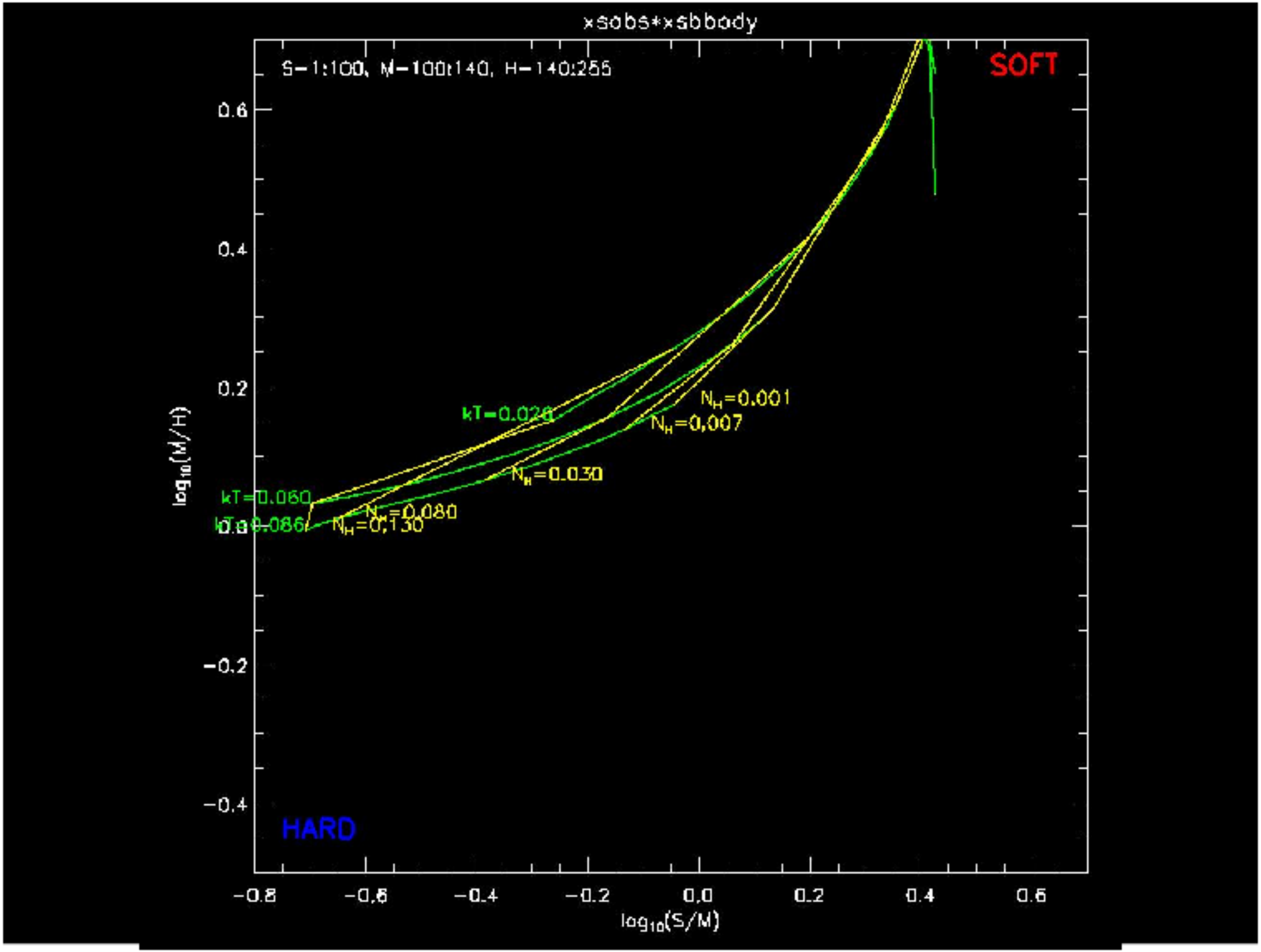
E_{25}, E_{50}, E_{75}

$3(E_{25}/E_{75})$ v/s $m=E_{50}/(E_{min}-E_{max})$

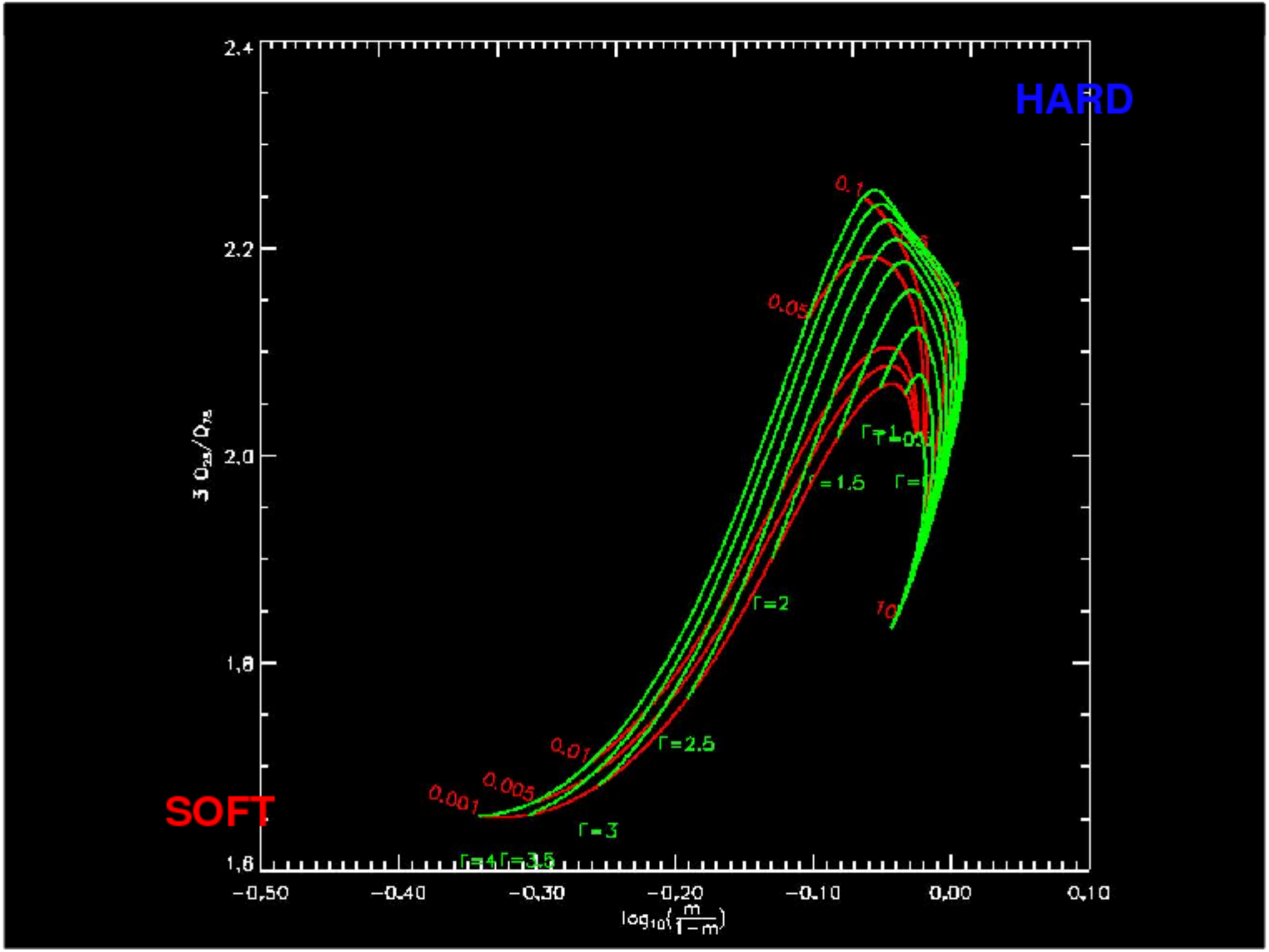

×sobs*×spowerlow
S=1:100, M=100:140, H=140:255
SOFT
HARD
N_H=0.001
N_H=0.007
N_H=0.030
N_H=0.080
N_H=0.400
N_H=0.900
N_H=10.000
N_H=5.000
Γ=4.0
Γ=3.5
Γ=3.0
Γ=2.5
Γ=2.0
Γ=1.5
Γ=1.0
Γ=0.5
$\log_{10}$(M/H)
$\log_{10}$(S/M)
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.8
−0.6
−0.4
−0.2
0.0
0.2
0.4
0.6

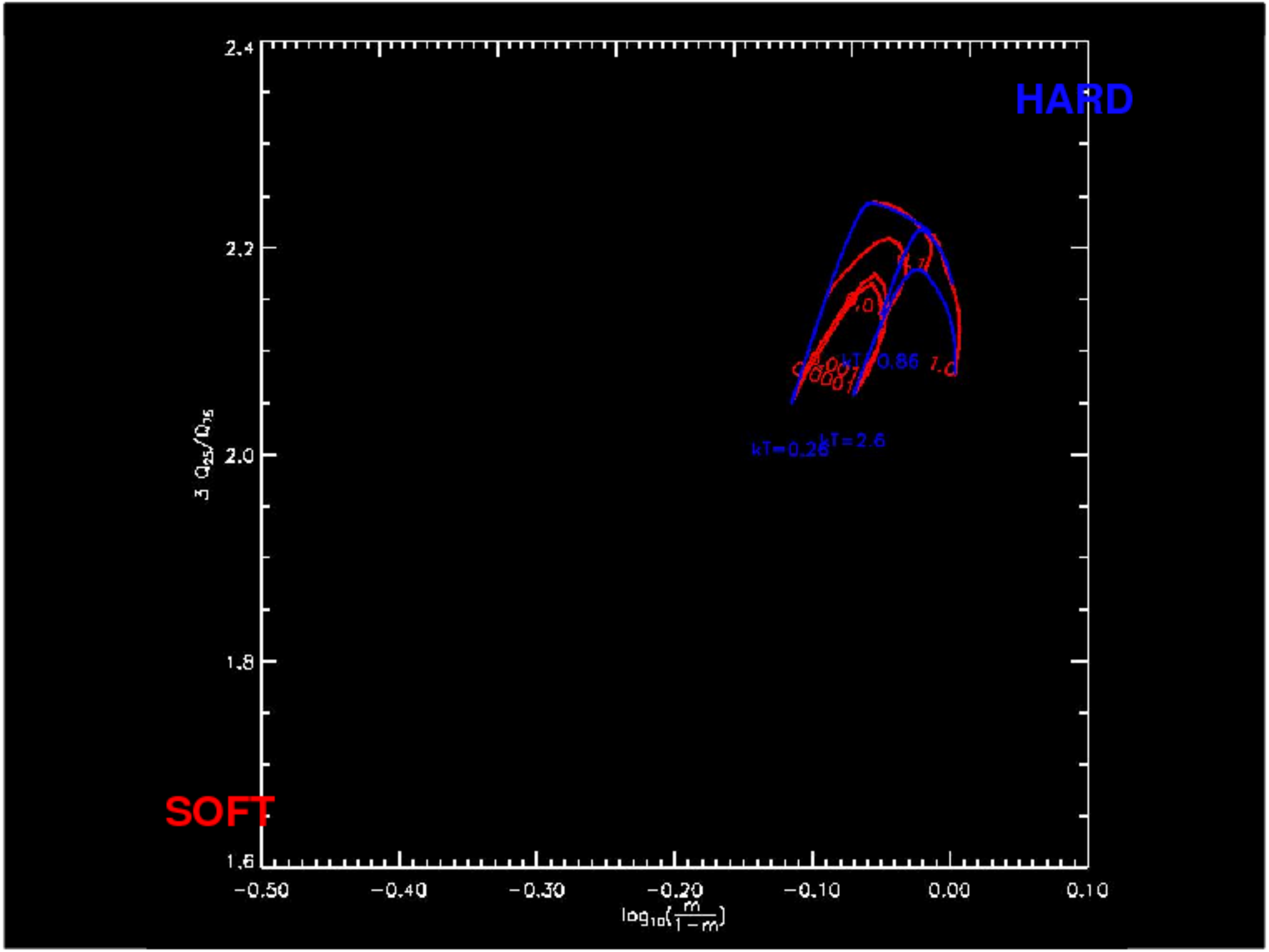

xsabs*xsmekal
S=1:100, M=100:140, H=140:255
SOFT
HARD
N_H=0.001
kT=0.100
N_H=0.007
N_H=0.030
N_H=0.080
N_H=0.400
kT=0.250
kT=0.400
kT=0.600
kT=2.000
kT=0.900
$\log_{10}$(M/H)
$\log_{10}$(S/M)
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.8
−0.6
−0.4
−0.2
0.0
0.2
0.4
0.6

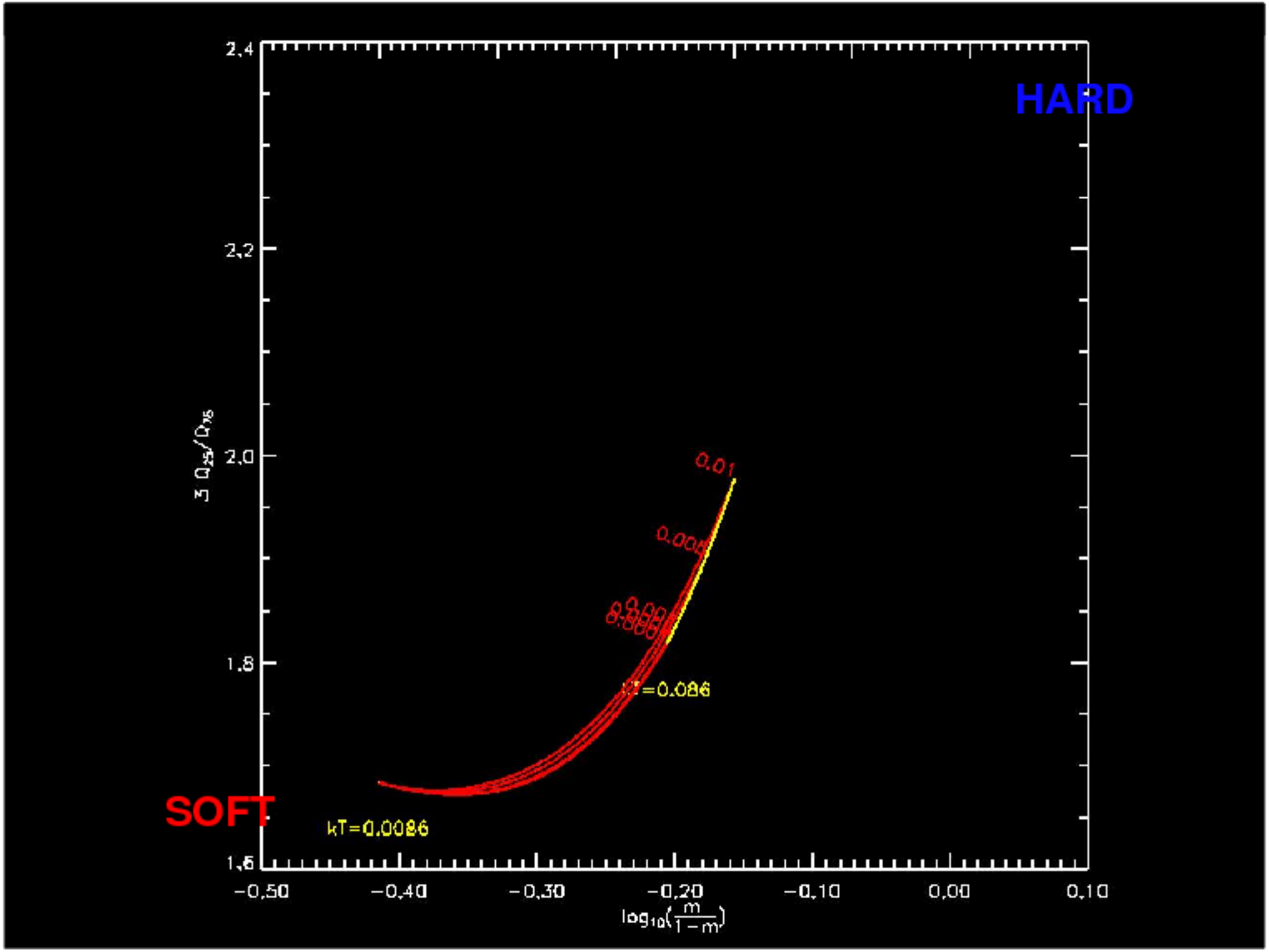

xsabs*xsmekal
S=1:100, M=100:140, H=140:255
SOFT
HARD
N_H=0.001
kT=0.090
kT=0.100
N_H=0.007
kT=0.150
N_H=0.030
N_H=0.080
N_H=0.150
kT=0.200
kT=0.250
kT=0.300
$\log_{10}$(M/H)
$\log_{10}$(S/M)
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.8
−0.6
−0.4
−0.2
0.0
0.2
0.4
0.6


xsabs*xsbbody
S=1:100, M=100:140, H=140:255
SOFT
HARD
0.6
0.4
0.2
−0.2
−0.4
−0.8
−0.6
−0.4
−0.2
0.0
0.2
0.4
0.6
log10(M/H)
log10(S/M)
kT=0.026
kT=0.060
kT=0.086
NH=0.001
NH=0.007
NH=0.030
NH=0.080
NH=0.130

quantiles


HARD
SOFT
2.4
2.2
2.0
1.8
1.6
3 Q25/Q75
−0.50
−0.40
−0.30
−0.20
−0.10
0.00
0.10
log10(m/(1−m))
0.1
0.05
0.01
0.005
0.001
Γ=1.5
Γ=2
Γ=2.5
Γ=3
Γ=4
Γ=3.5
10


HARD
SOFT
2.4
2.2
2.0
1.8
1.6
3 Q25/Q15
−0.50
−0.40
−0.30
−0.20
−0.10
0.00
0.10
log10(m/(1−m))
kT=0.26
kT=2.6
0.86
1.0


HARD
SOFT
2.4
2.2
2.0
1.8
1.6
3 Q25/Q16
0.01
0.004
0.0086
kT=0.086
kT=0.0086
−0.50
−0.40
−0.30
−0.20
−0.10
0.00
0.10
log10(m/(1−m))

The HRC-I RMF

v1 will be available in next CALDB release

A lot of scope for improvements:

- improved gain correction
- more resolution at high energies
- PI v/s SUMAMPS
- improved energy scale