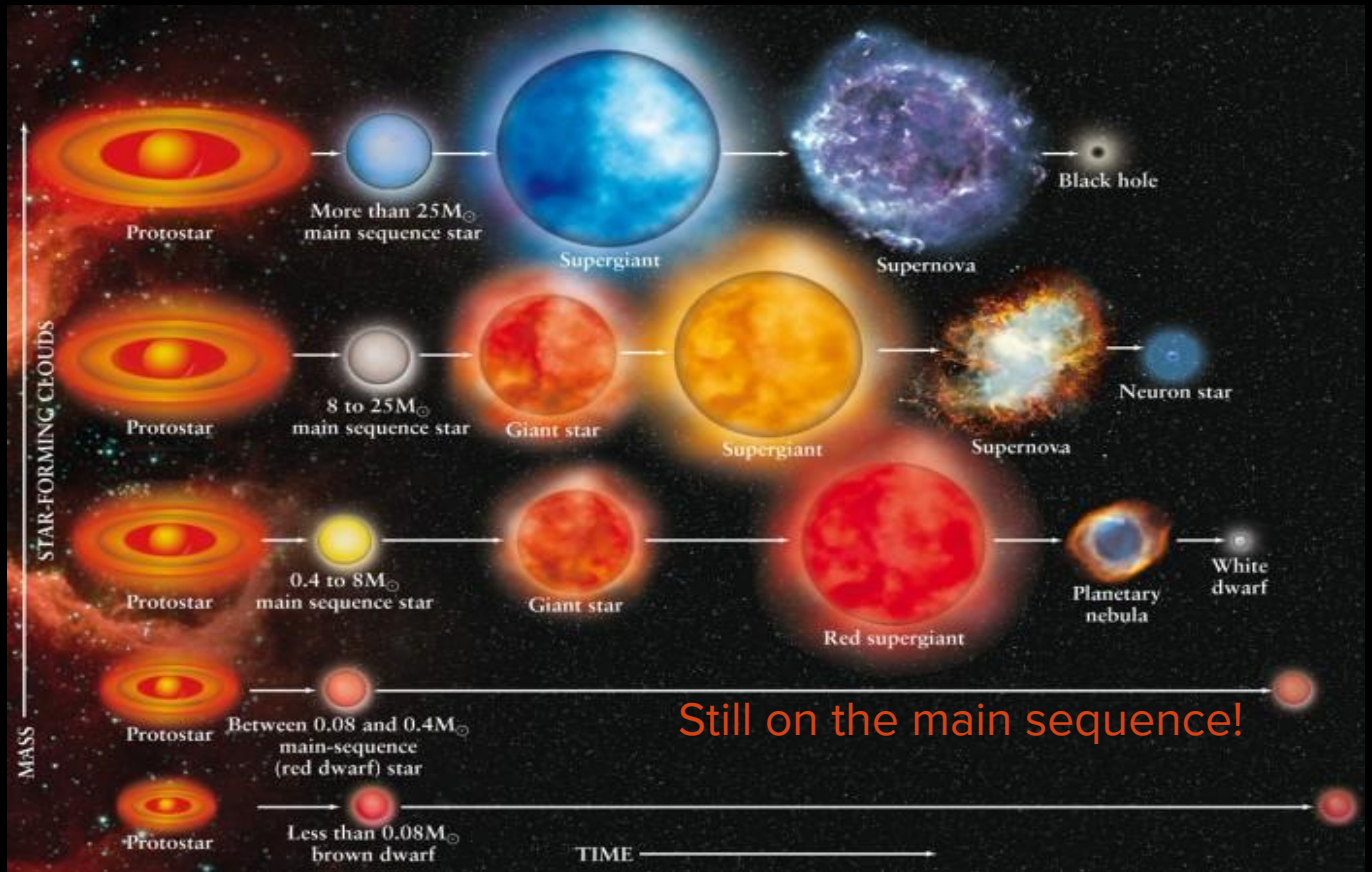
What's the nature of sdAs?

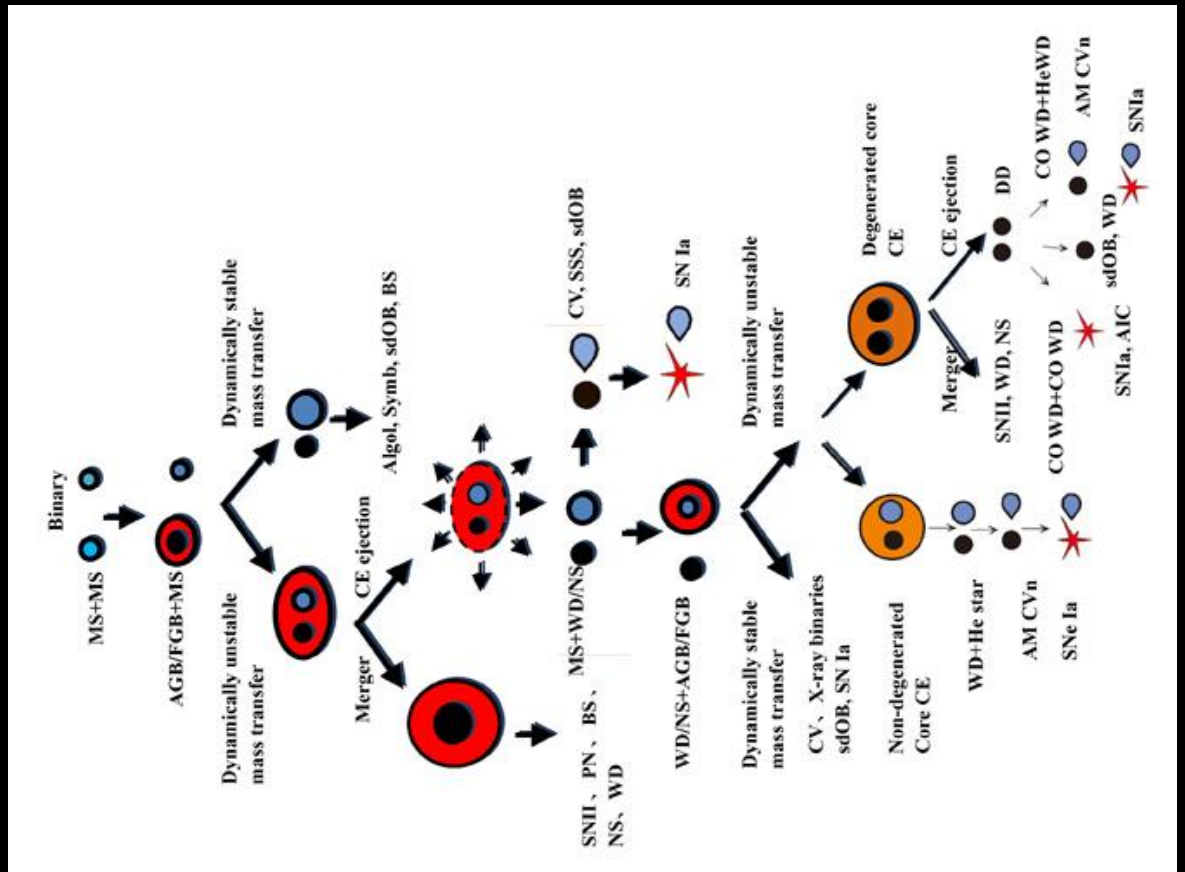
Ingrid Pelisoli,
S. O. Kepler, D. Koester

Precision Spectroscopy 2016

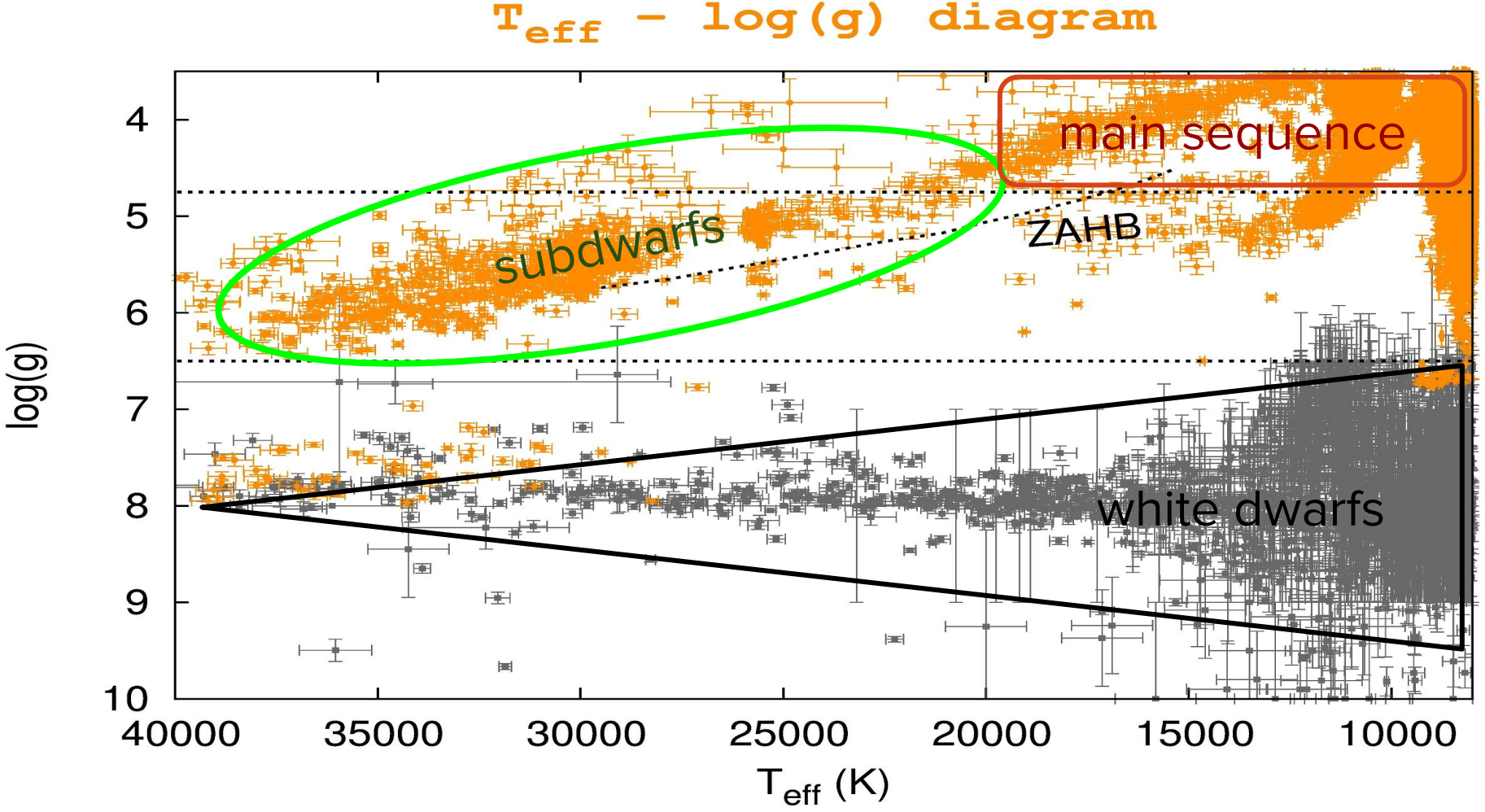
Stellar evolution: single stars

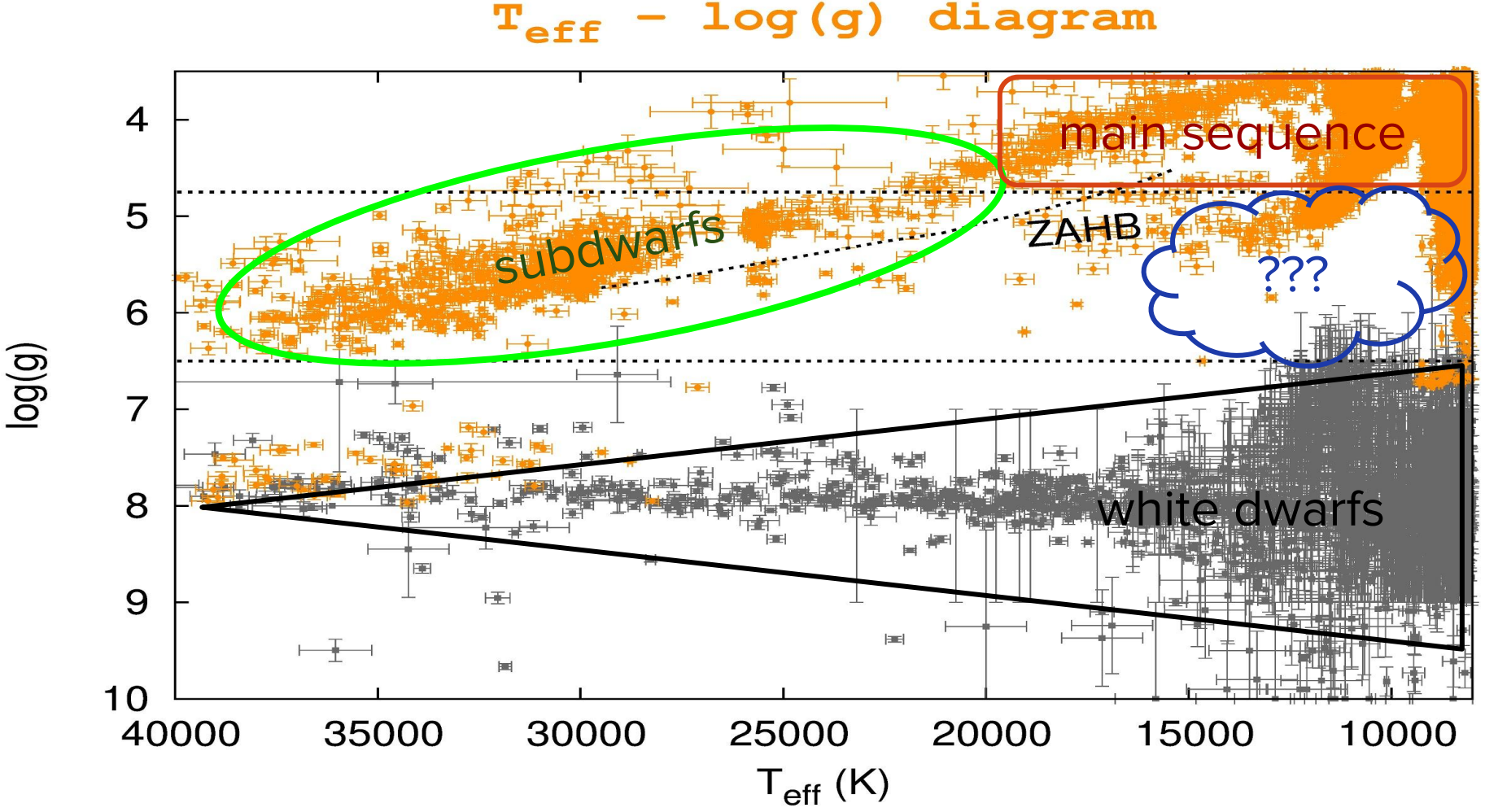


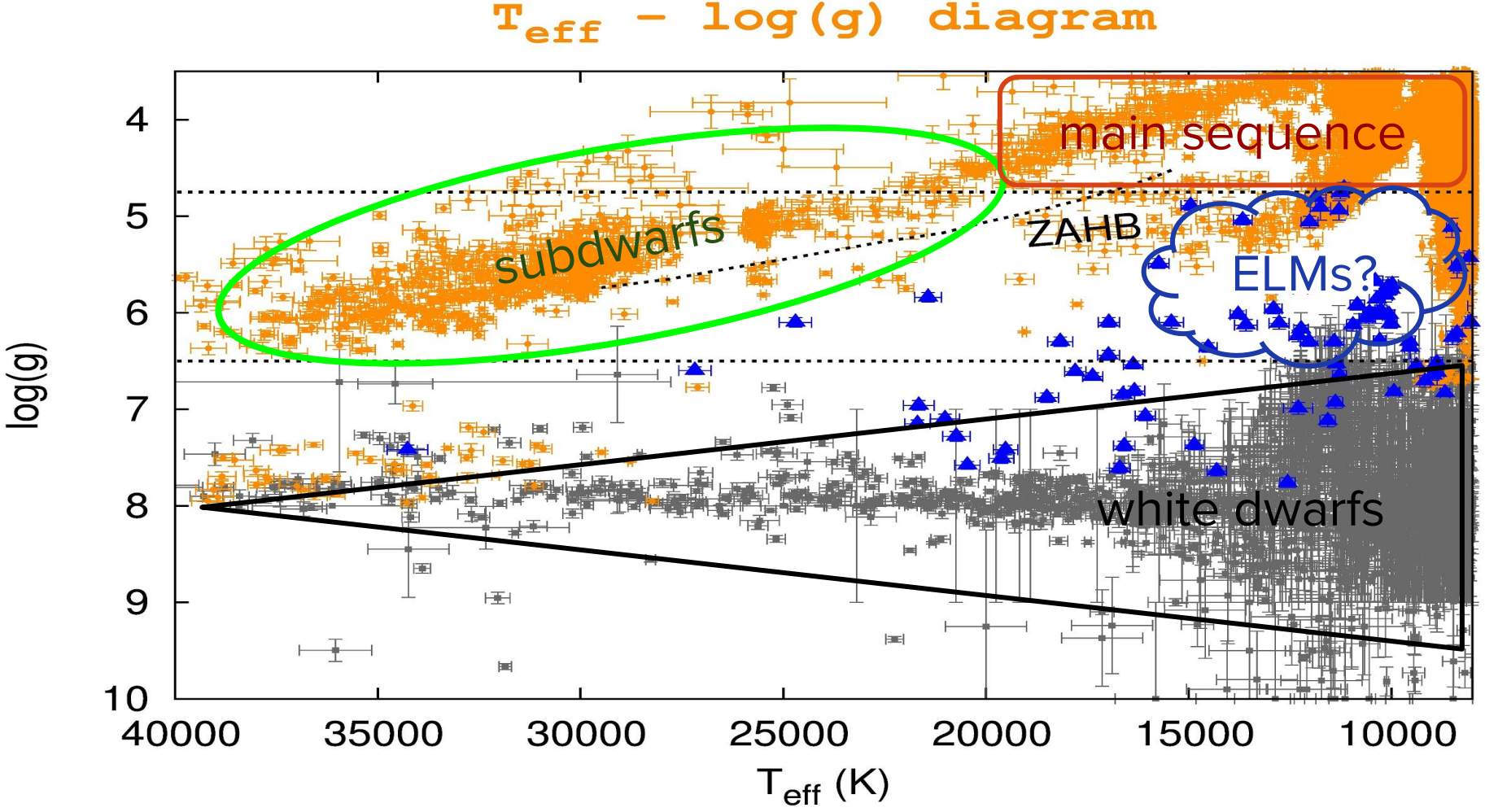
Stellar evolution: binary stars

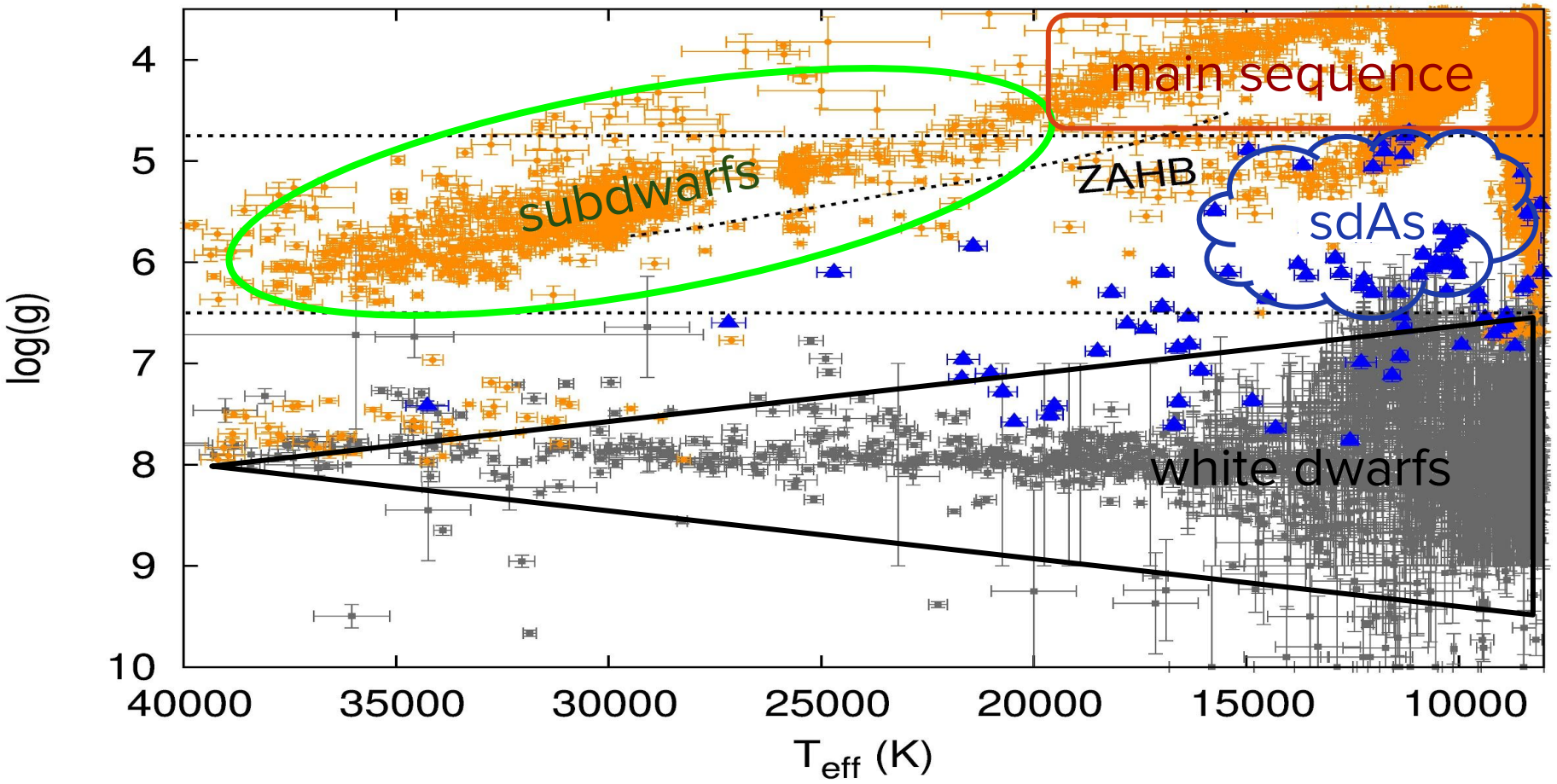


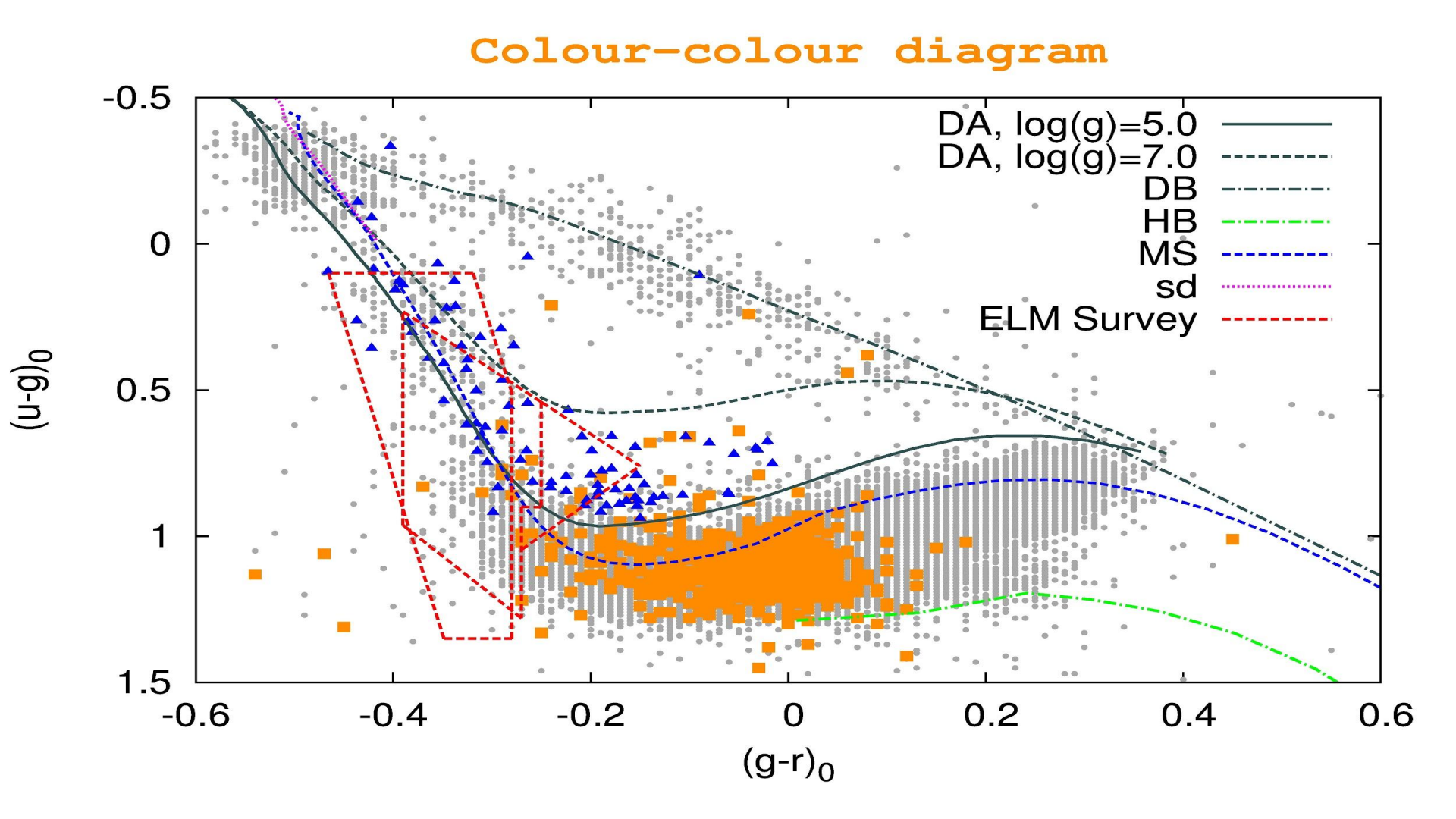
Many possible outcomes!

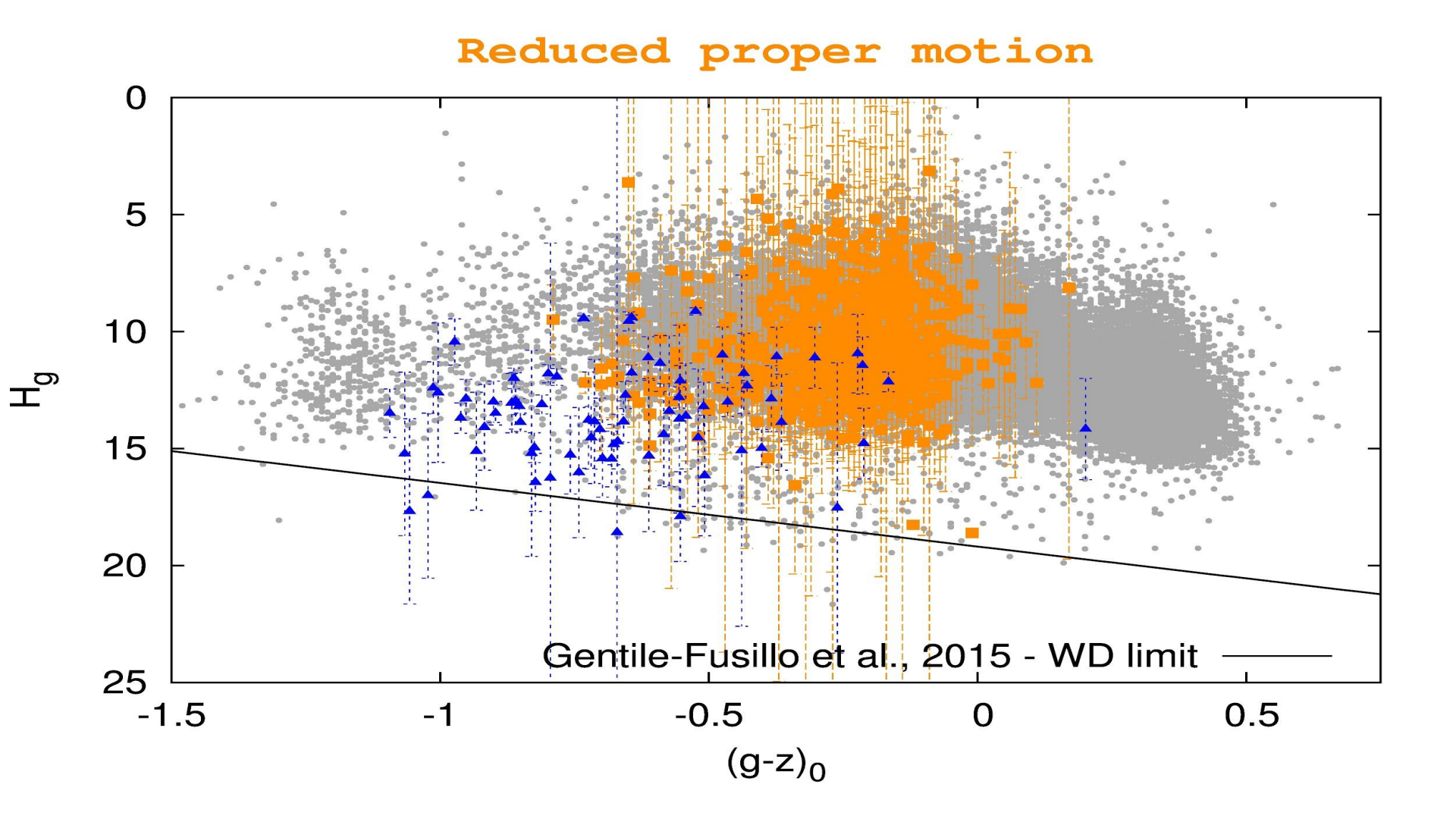

T_eff – log(g) diagram
main sequence
subdwarfs
ZAHB
white dwarfs
log(g)
T_eff (K)
4
5
6
7
8
9
10
40000
35000
30000
25000
20000
15000
10000

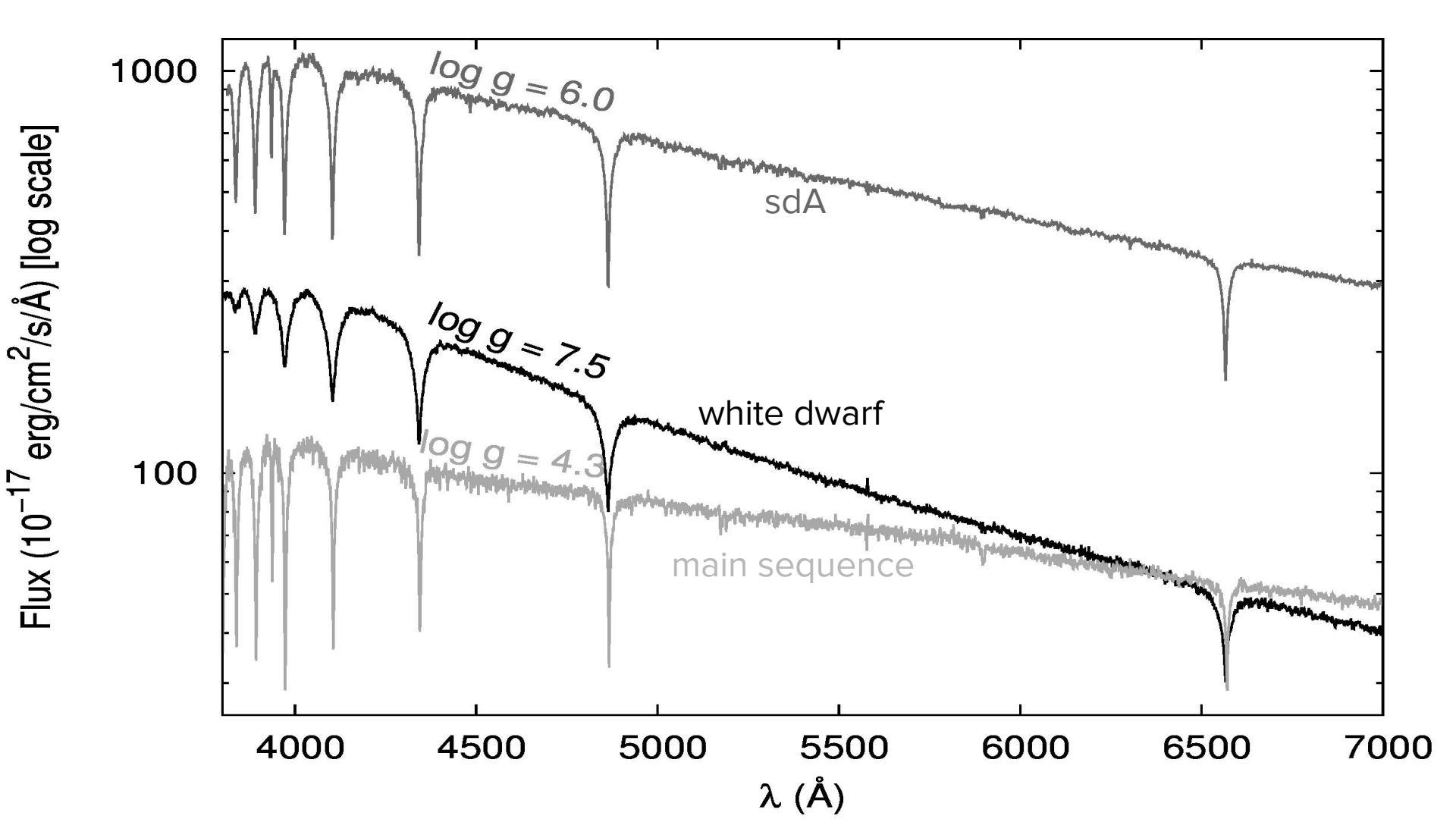

T_eff – log(g) diagram
main sequence
subdwarfs
ZAHB
???
white dwarfs
log(g)
T_eff (K)
4
5
6
7
8
9
10
40000
35000
30000
25000
20000
15000
10000


T_eff – log(g) diagram
main sequence
subdwarfs
ZAHB
ELMs?
white dwarfs
log(g)
T_eff (K)
4
5
6
7
8
9
10
40000
35000
30000
25000
20000
15000
10000

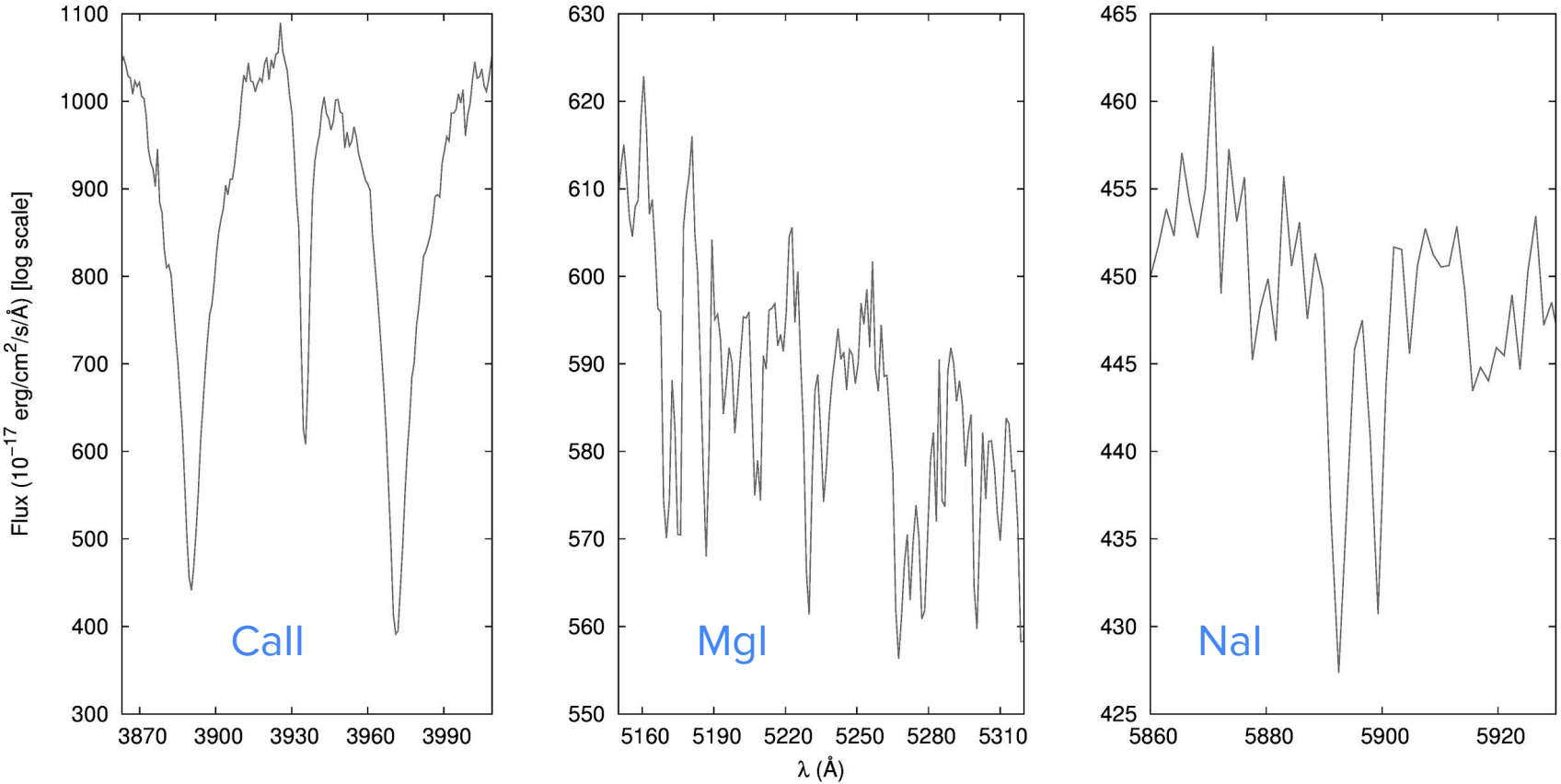

T_eff – log(g) diagram
main sequence
subdwarfs
ZAHB
sdAs
white dwarfs
log(g)
T_eff (K)
4
5
6
7
8
9
10
40000
35000
30000
25000
20000
15000
10000

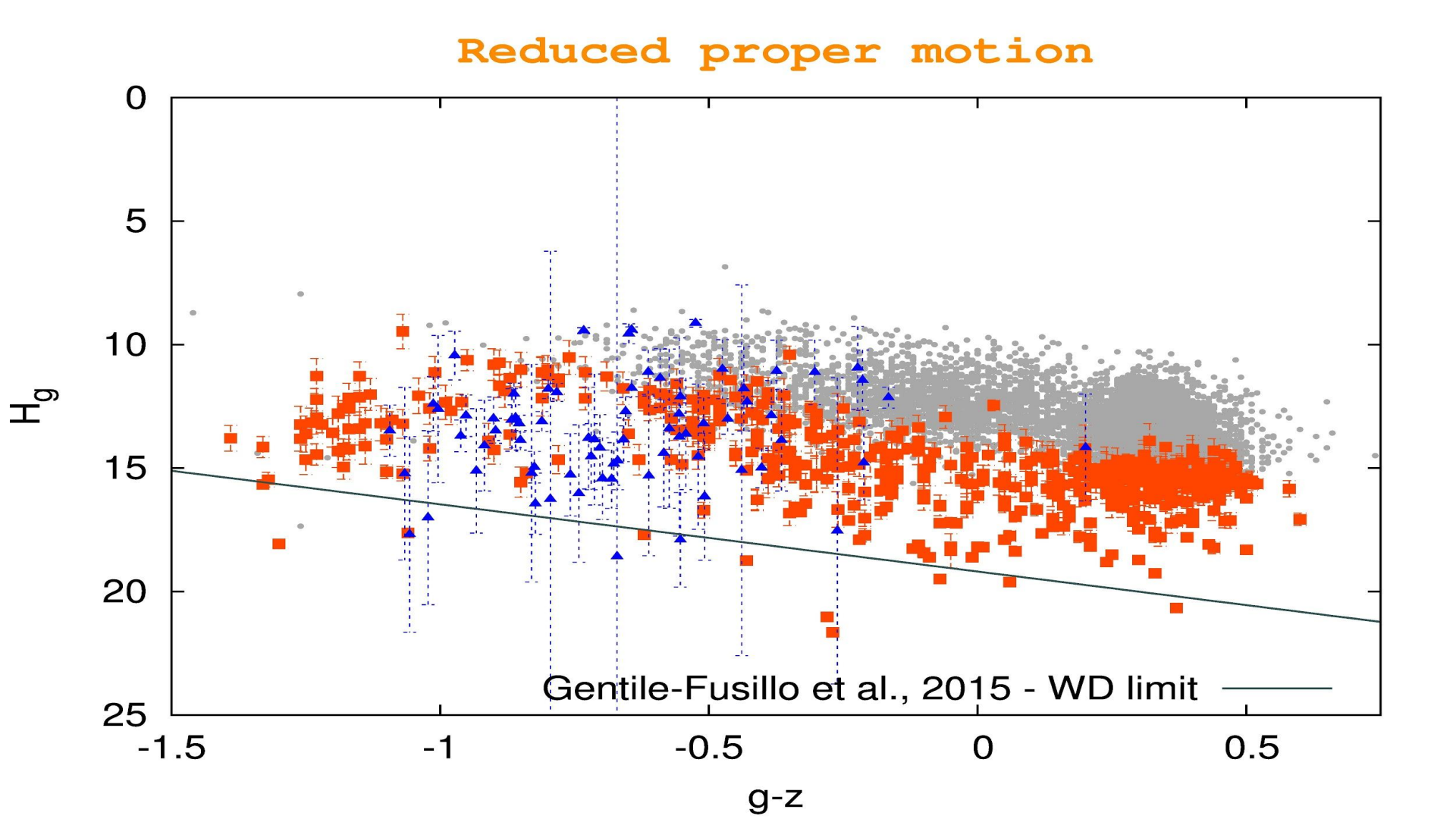

Colour–colour diagram
DA, log(g)=5.0
DA, log(g)=7.0
DB
HB
MS
sd
ELM Survey
(u-g)0
(g-r)0
-0.5
0
0.5
1
1.5
-0.6
-0.4
-0.2
0
0.2
0.4
0.6

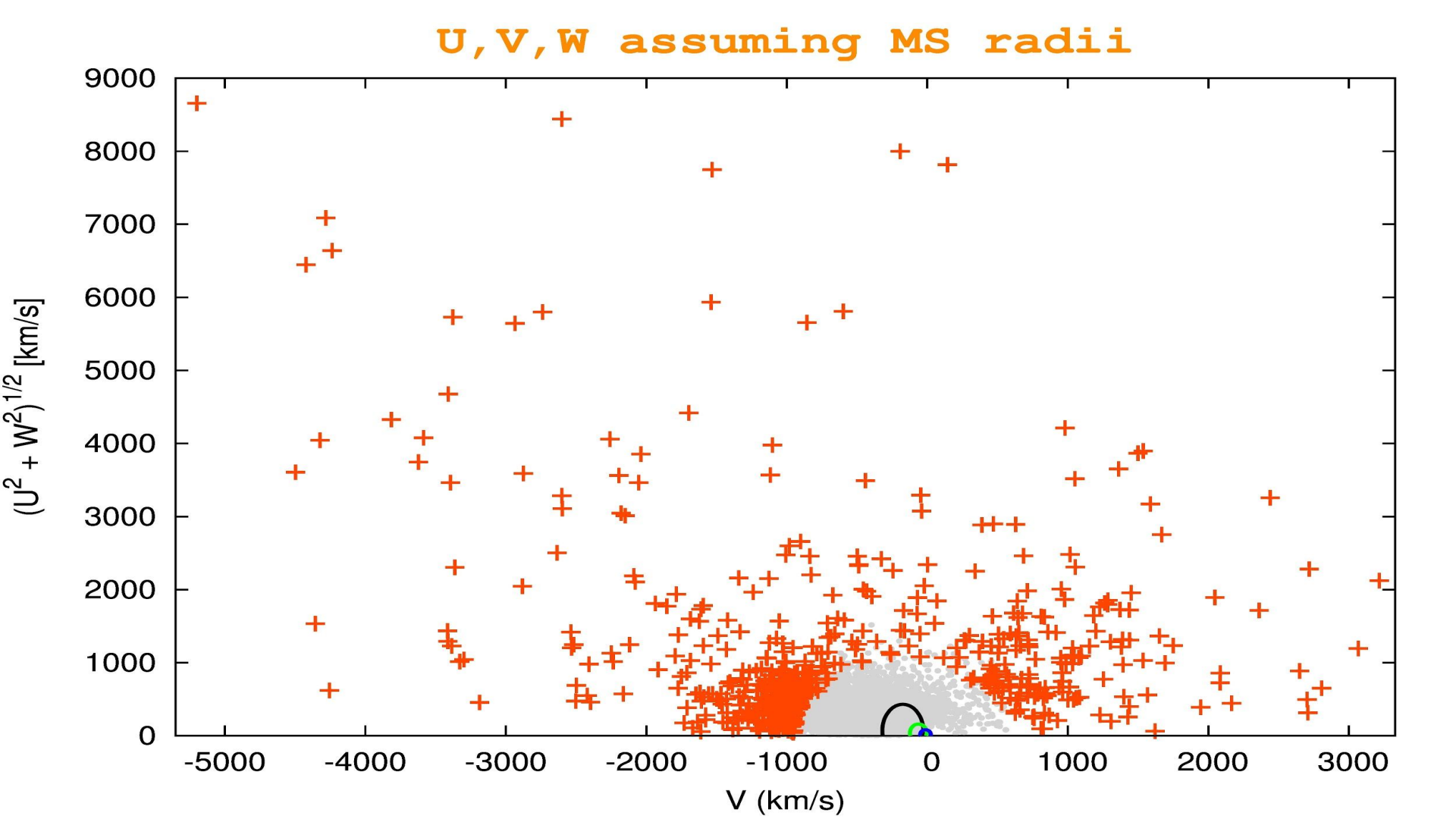

Reduced proper motion
0
5
10
15
20
25
H_g
-1.5
-1
-0.5
0
0.5
$(g-z)_0$
Gentile-Fusillo et al., 2015 - WD limit

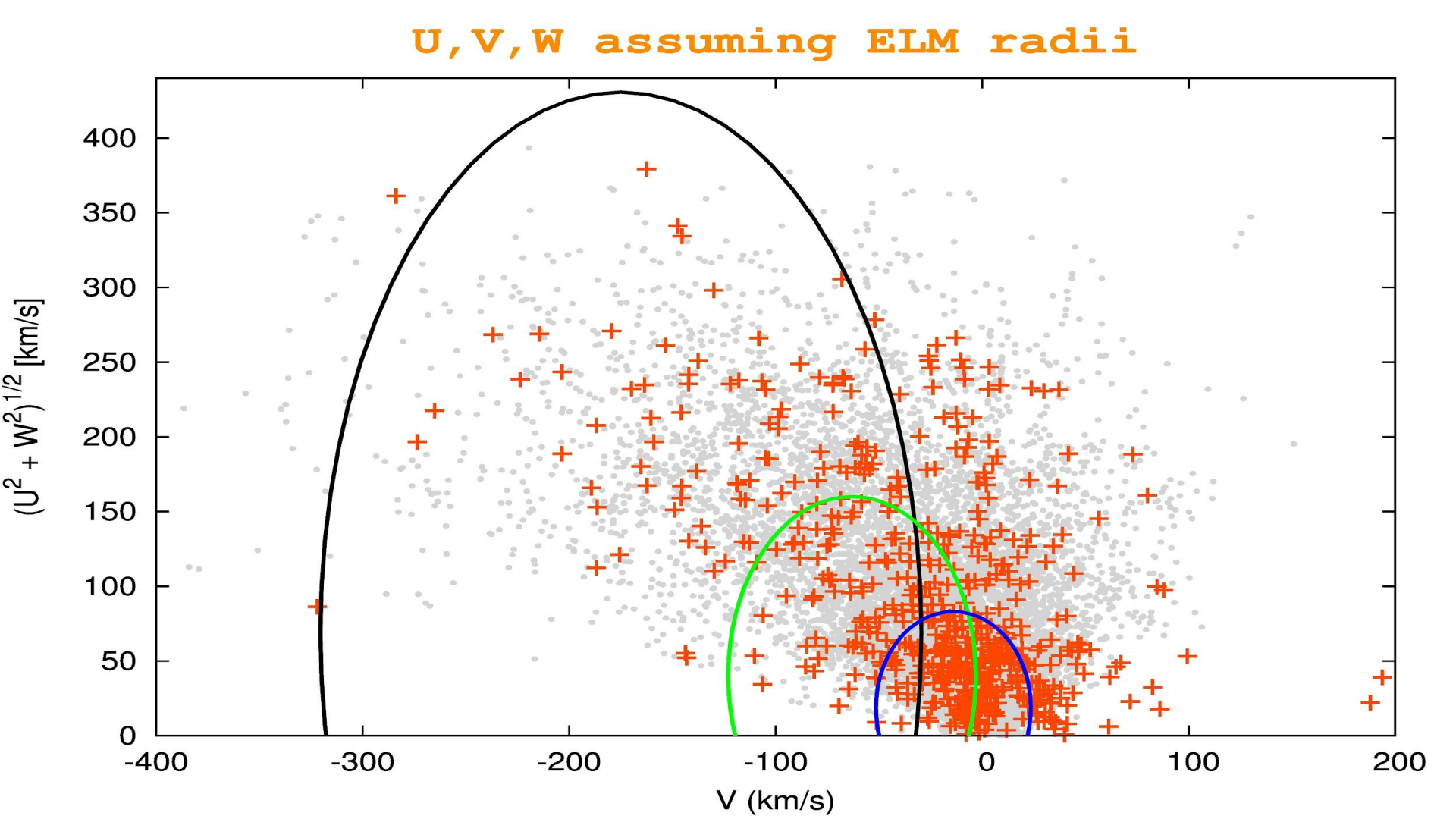

1000
100
Flux (10^{-17} erg/cm^2/s/Å) [log scale]
log g = 6.0
sdA
log g = 7.5
white dwarf
log g = 4.3
main sequence
4000
4500
5000
5500
6000
6500
7000
λ (Å)

Metals in the spectra




Reduced proper motion
0
5
10
15
20
25
H_g
-1.5
-1
-0.5
0
0.5
g-z
Gentile-Fusillo et al., 2015 - WD limit


U,V,W assuming MS radii
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
(U2 + W2)1/2 [km/s]
-5000
-4000
-3000
-2000
-1000
0
1000
2000
3000
V (km/s)


U,V,W assuming ELM radii
$(U^2 + W^2)^{1/2}$ [km/s]
V (km/s)
400
350
300
250
200
150
100
50
0
-400
-300
-200
-100
0
100
200

Summary and Perspectives

- sdAs remain a mystery: they don’t fit in any class.
  - Proper motion seems too low for ELMs;
  - Too cool for subdwarfs;
  - Too high g for A stars --- is it overestimated? We need more adequate models!
- How can we explain high U, V, W objects? ELMs?
- Observational effort is needed to get better data.
  - 61 h @ SOAR
  - 8.3 h + 9.1 h @ Gemini South
  - 3 h @ Gemini North
  - 14 h @ ESO VLT
- GAIA DR2 is eagerly expected!

Thanks!

Acknowledgements:

CNPq
Conselho Nacional de Desenvolvimento Científico e Tecnológico

Juan Valdez Café