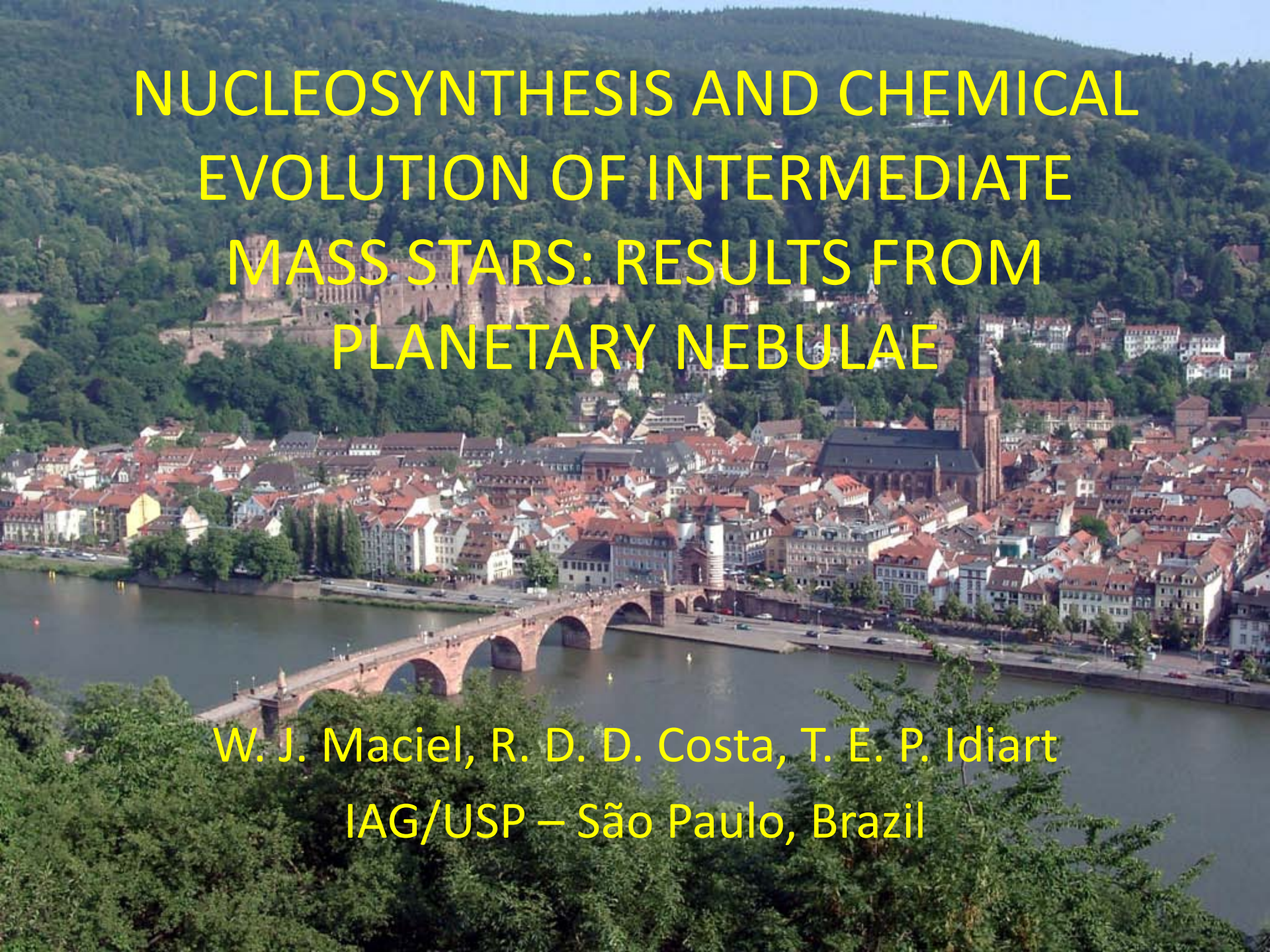


NUCLEOSYNTHESIS AND CHEMICAL EVOLUTION OF INTERMEDIATE MASS STARS: RESULTS FROM PLANETARY NEBULAE

W. J. Maciel, R. D. D. Costa, T. E. P. Idiart

IAG/USP – São Paulo, Brazil

- INTRODUCTION
- THE PN SAMPLE
- AVERAGE ABUNDANCES AND DISTRIBUTIONS
- ABUNDANCE CORRELATIONS

▶ INTRODUCTION

WHY PLANETARY NEBULAE?

Accurate abundances of elements that are not produced by the progenitor stars (O, S, Ne)

➔ Chemical evolution of the host galaxies

Accurate abundances of elements that are produced by the progenitor stars (He, N, C)

➔ Intermediate mass star nucleosynthesis

Accurate abundances of elements that are difficult to study in stars

➔ Comparison with stellar data

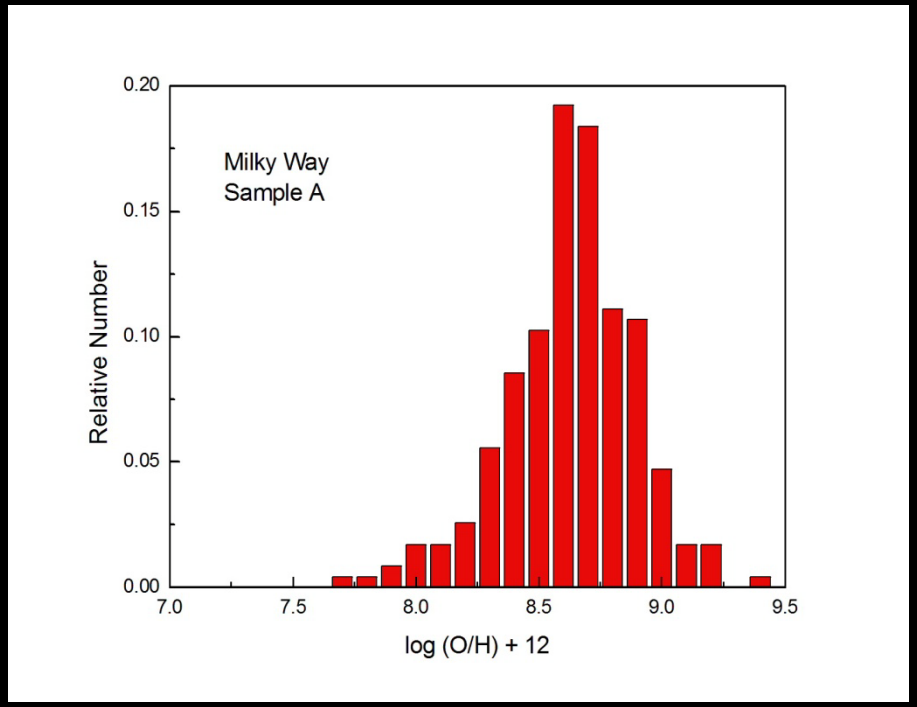
THE PN SAMPLE

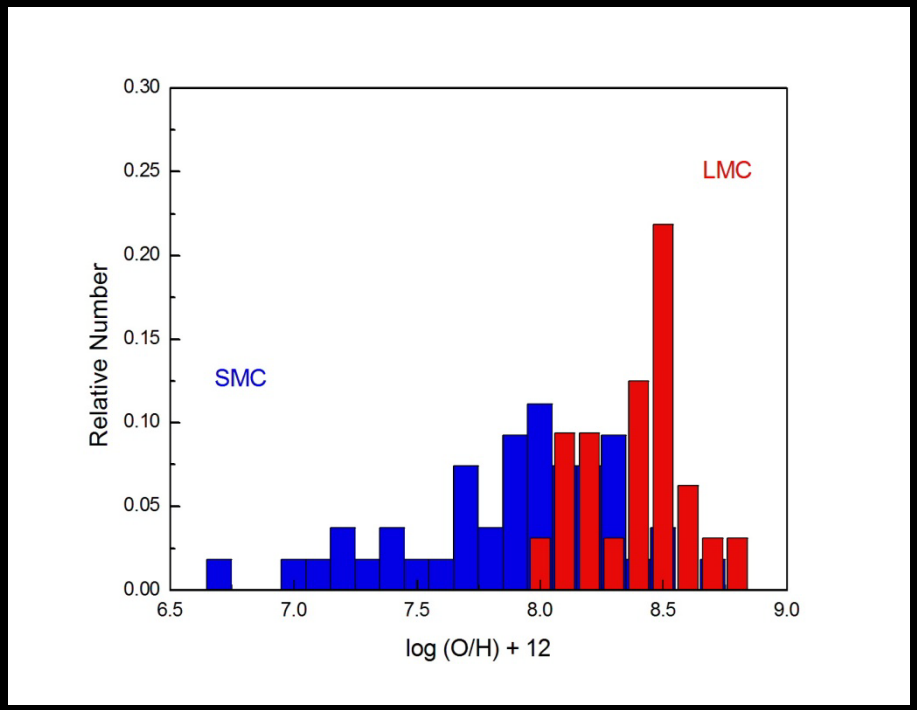
System	Number of PN	Source
MW Disk	84	IAG
MW Bulge	188 +84	IAG + SRM
Sample A (MW)	234	MC 2010
Sample B (MW)	372	MC 2010
LMC	23 + 106 + 120	IAG + SRM + LD
SMC	45 +48 +36	IAG + SRM + LD

IAG – Maciel & Costa (2010), Maciel et al. (2009)
SRM – Stasińska et al. (1998)
LD – Leisy & Dennefeld (2006)

AVERAGE ABUNDANCES AND DISTRIBUTIONS

System	He	O	S	Ar	N	Ne	C
MW Sample A	0.115	8.63	6.88	6.39	8.14	7.96	8.67
MW Sample B	0.113	8.59	6.87	6.37	8.10	7.94	8.66
MW Average	0.115	8.61	6.88	6.38	8.12	7.95	8.67
LMC	0.105	8.25	6.99	6.00	7.74	7.45	
SMC	0.095	7.88	6.92	5.58	7.40	7.13	


Milky Way
Sample A
Relative Number
log (O/H) + 12
0.00
0.05
0.10
0.15
0.20
7.0
7.5
8.0
8.5
9.0
9.5


LMC
SMC
Relative Number
log (O/H) + 12
0.00
0.05
0.10
0.15
0.20
0.25
0.30
6.5
7.0
7.5
8.0
8.5
9.0

▶ ABUNDANCE CORRELATIONS

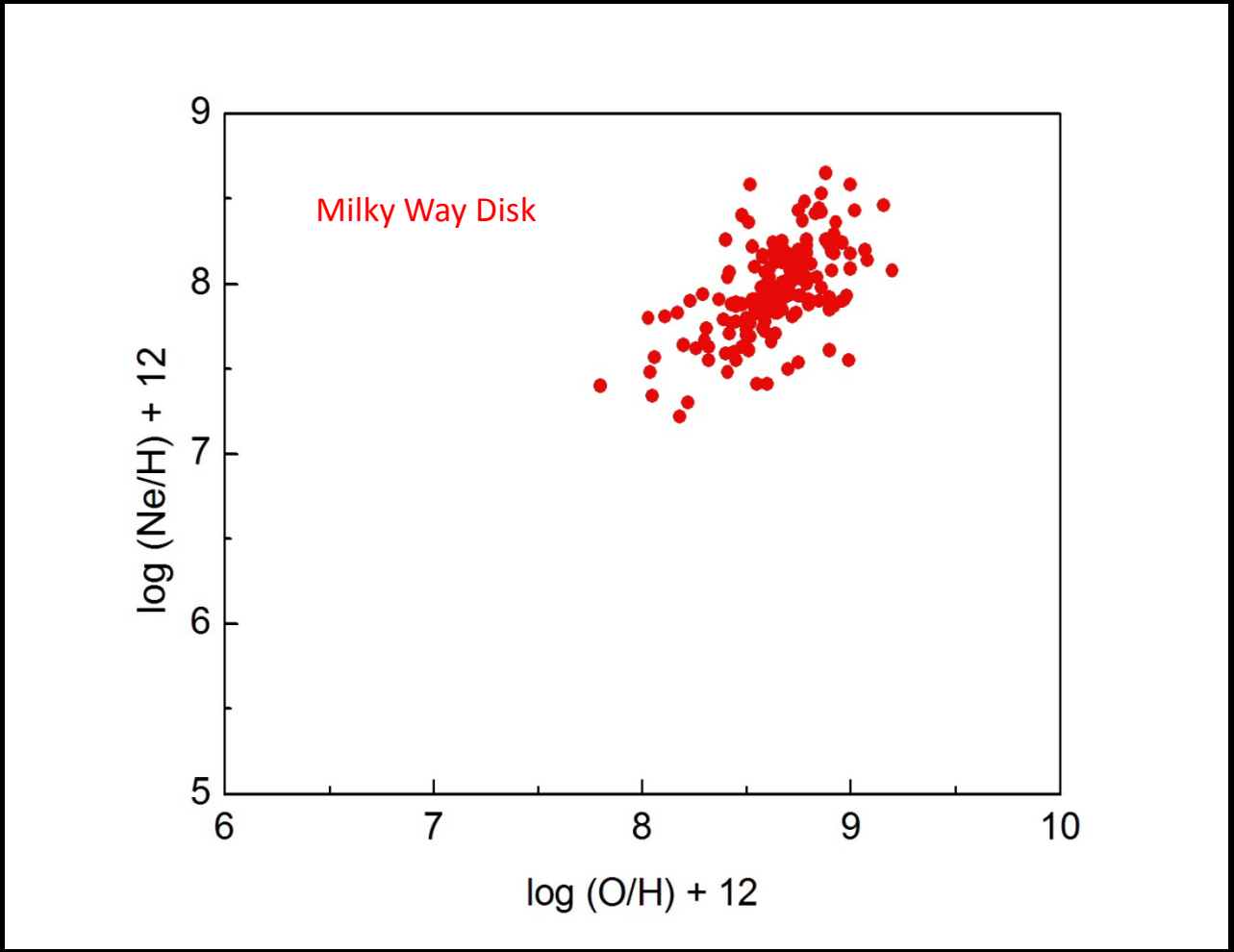
➔ Distance independent

➔ Elements that <u>are not</u> produced by the progenitor stars (O, S, Ne)

➔ Elements that <u>are</u> produced by the progenitor stars (He, N, C)

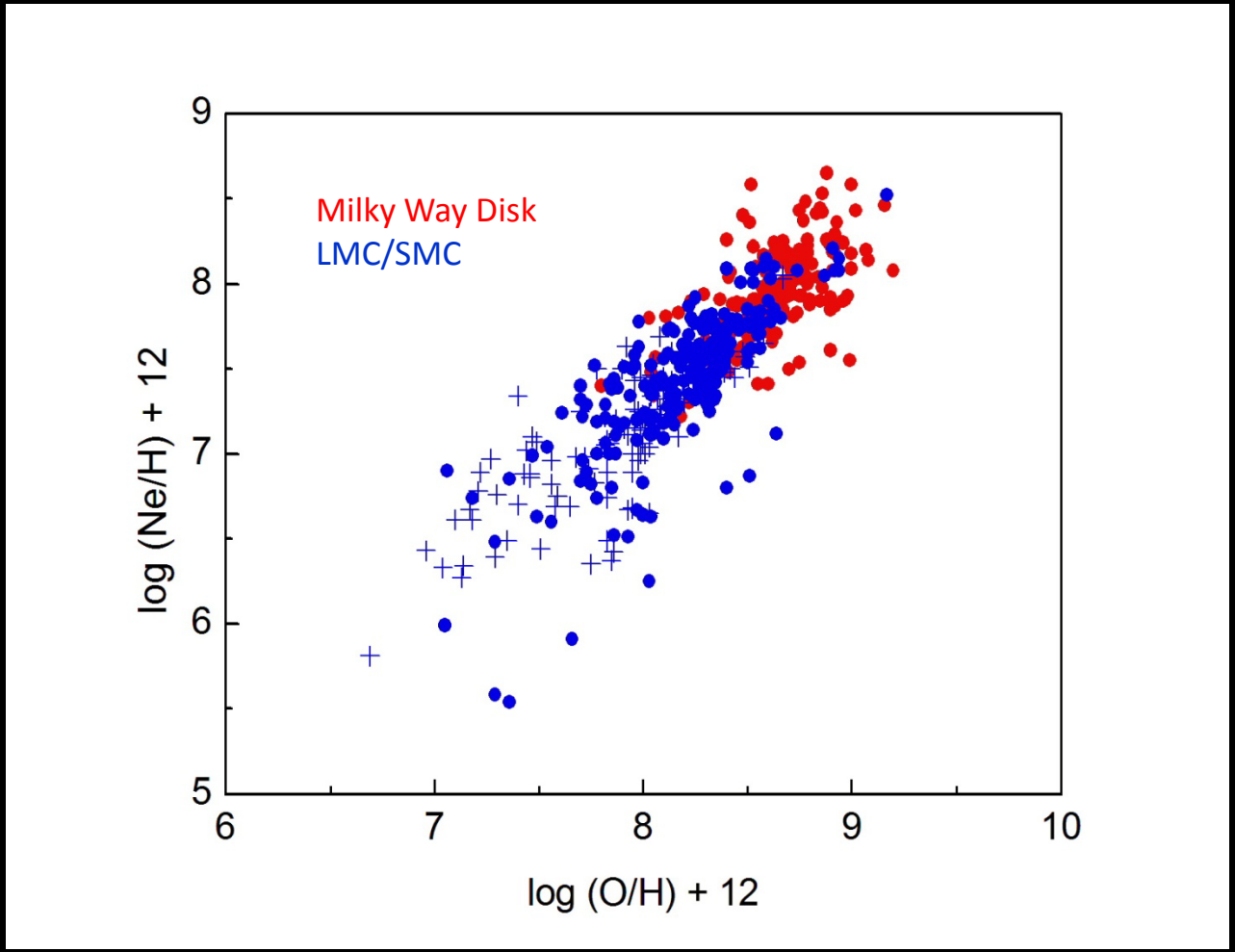
Abundances relative to H

Ne, Ar, S:
in lockstep with Oxygen



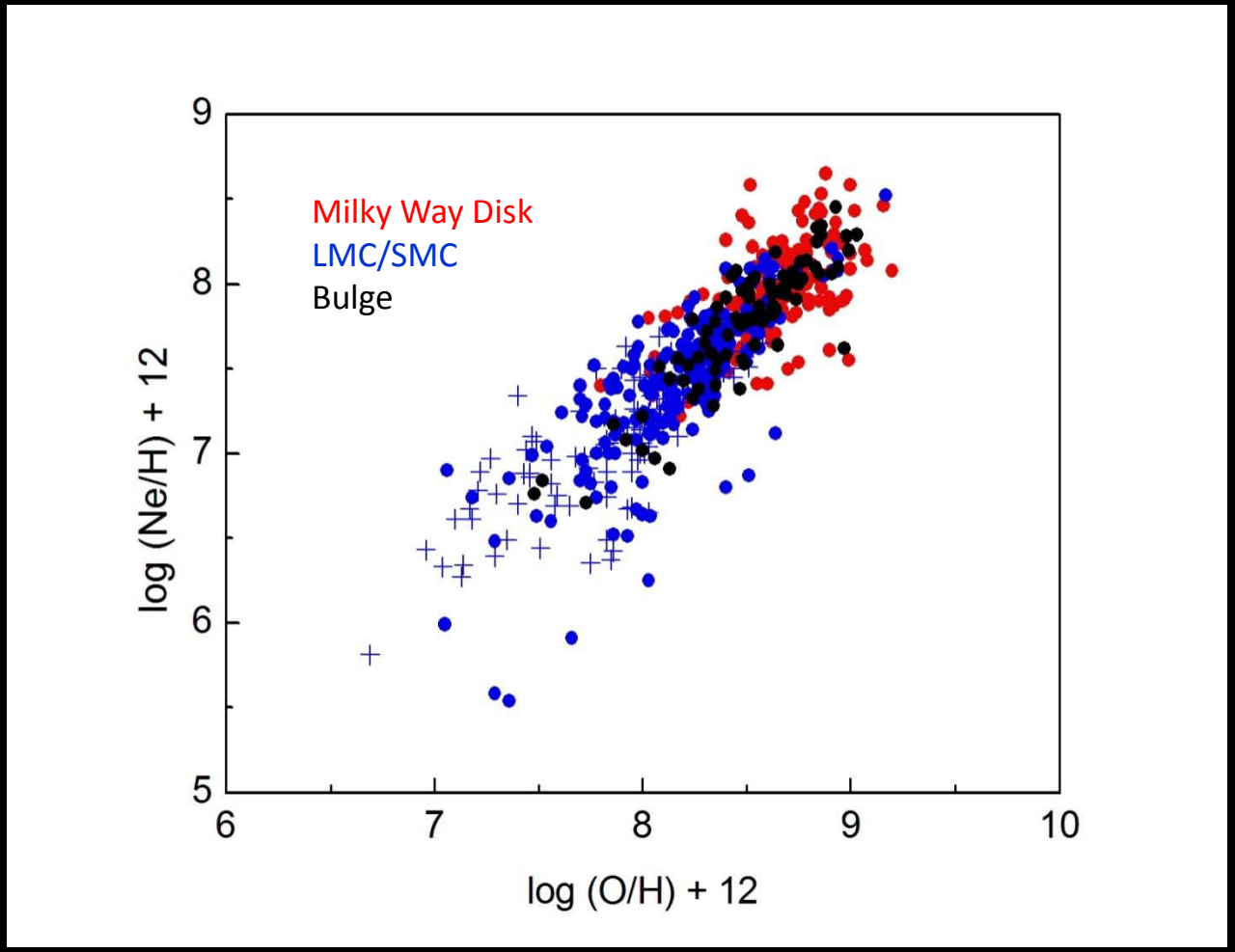
Abundances relative to H

Ne, Ar, S:
in lockstep with Oxygen



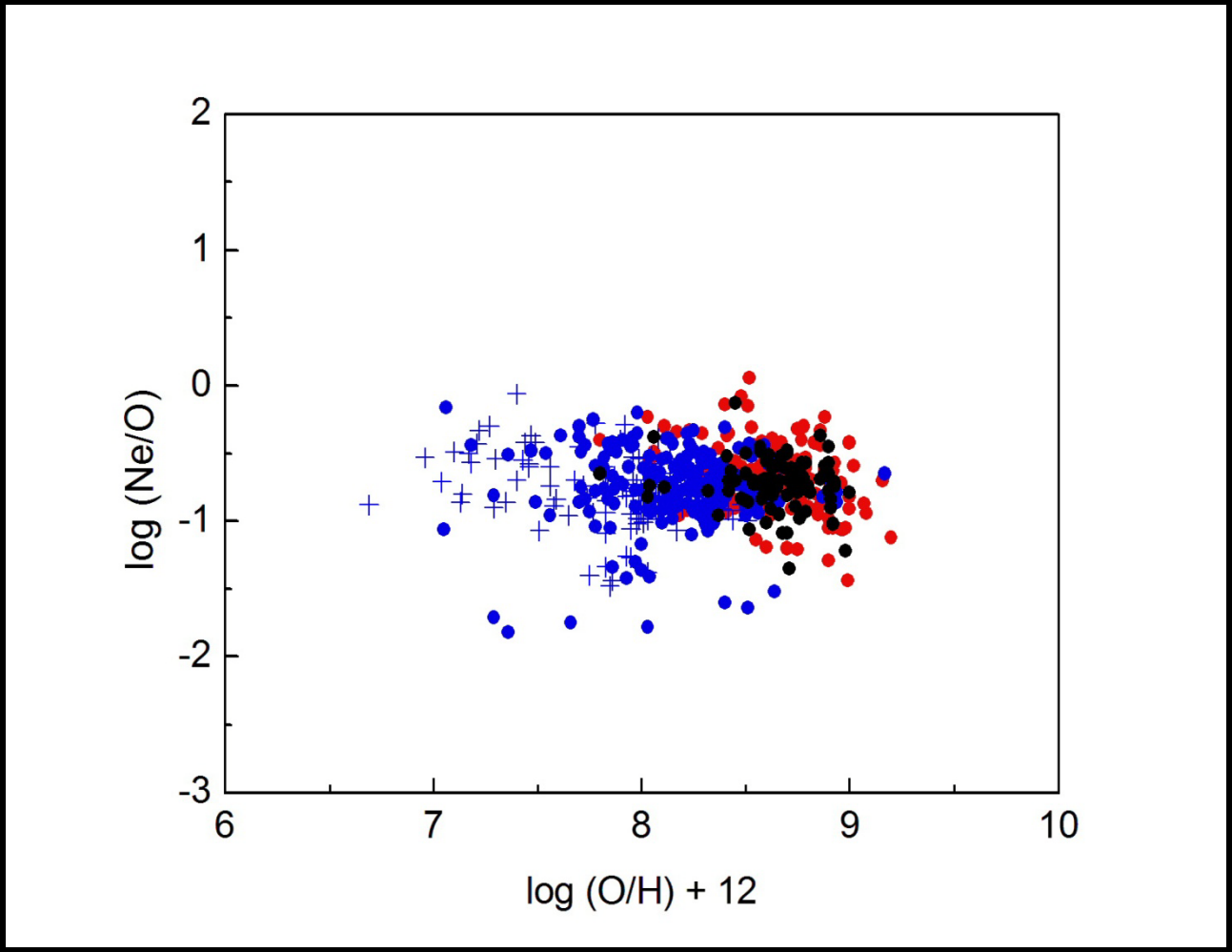
Abundances relative to H

Ne, Ar, S:
in lockstep with Oxygen



Abundances relative to O

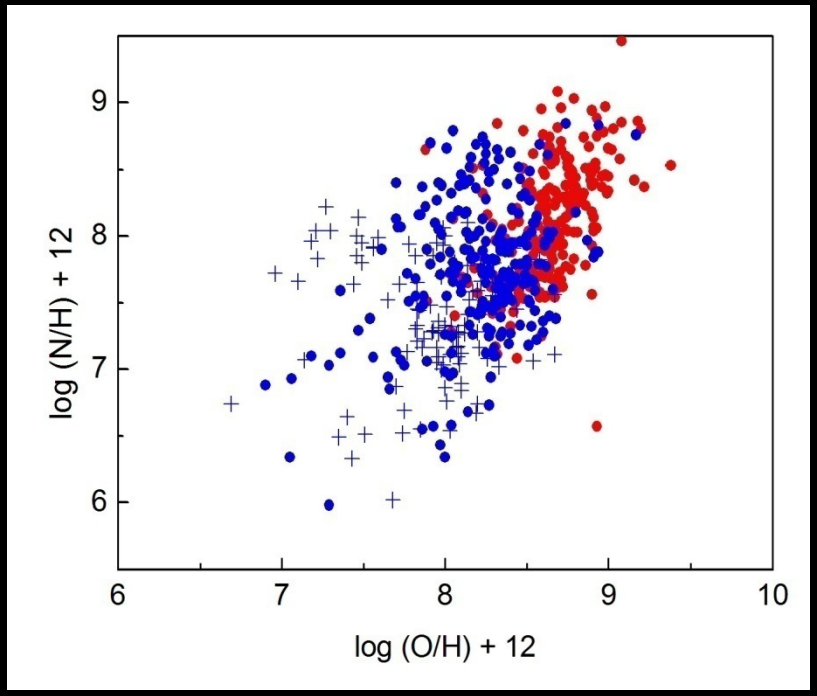
Ne, Ar, S:
in lockstep with Oxygen

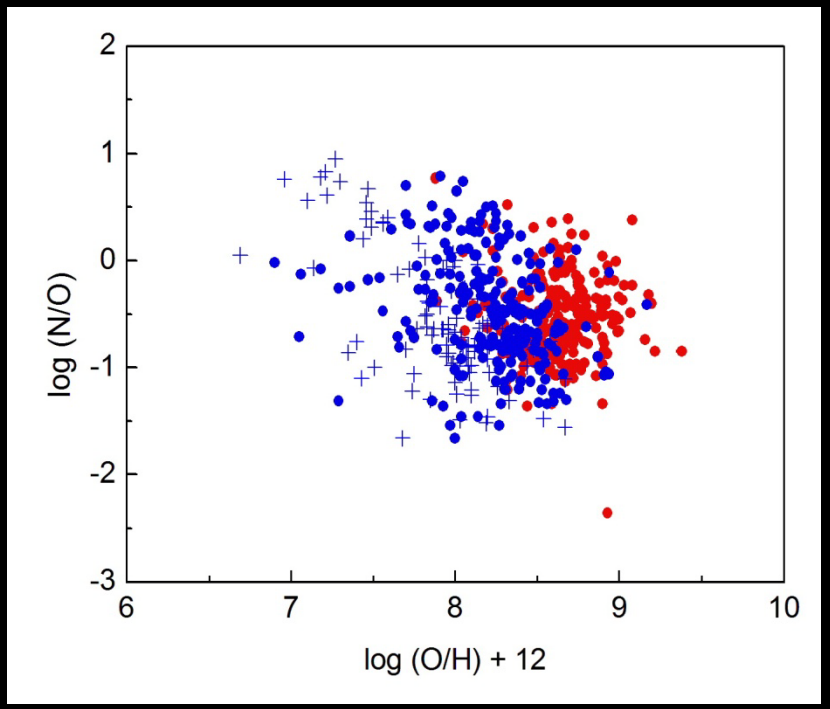


Abundances relative to H

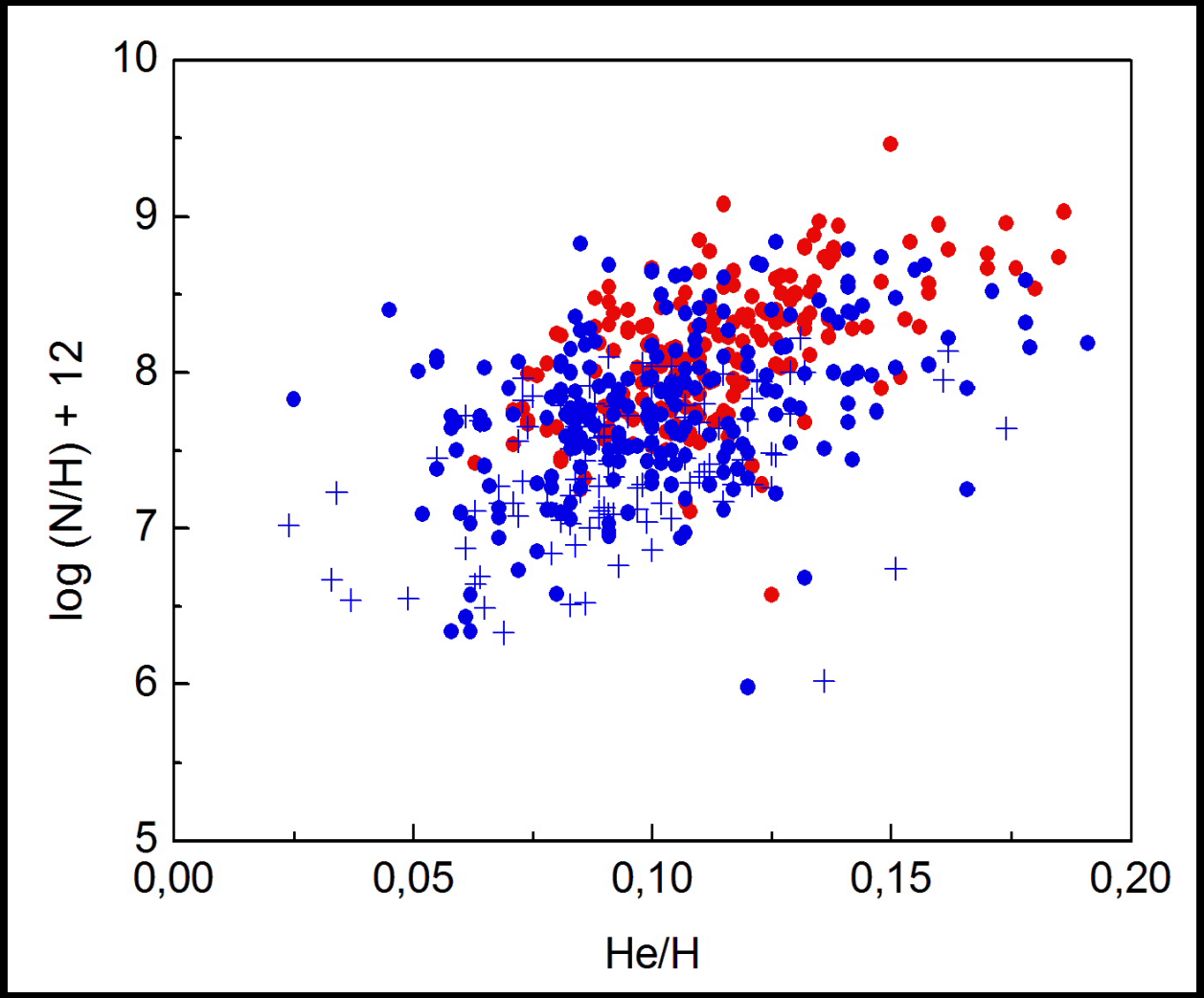
Interstellar N
Dredged-up N

Abundances relative to O





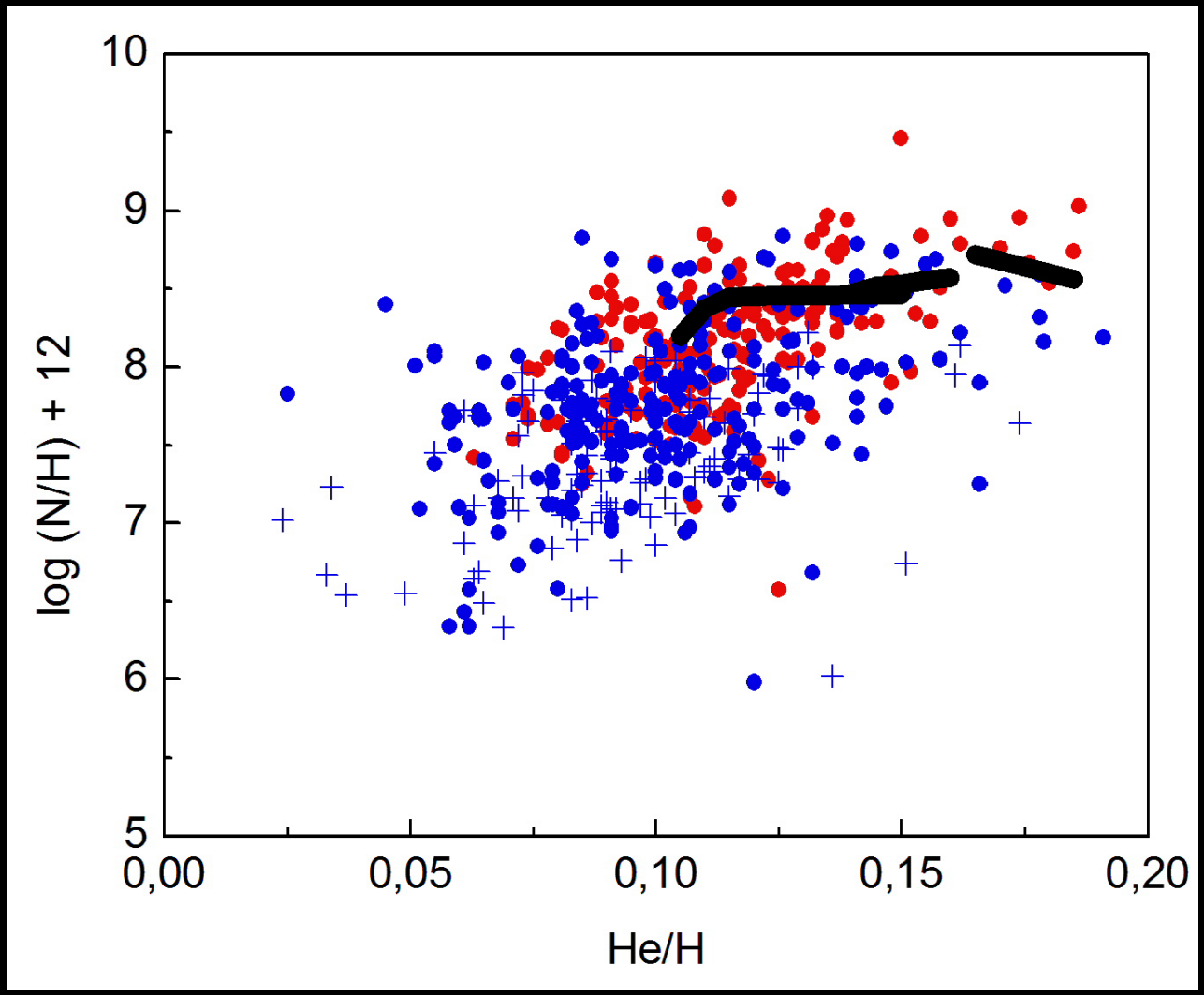
Abundances as functions of He/H



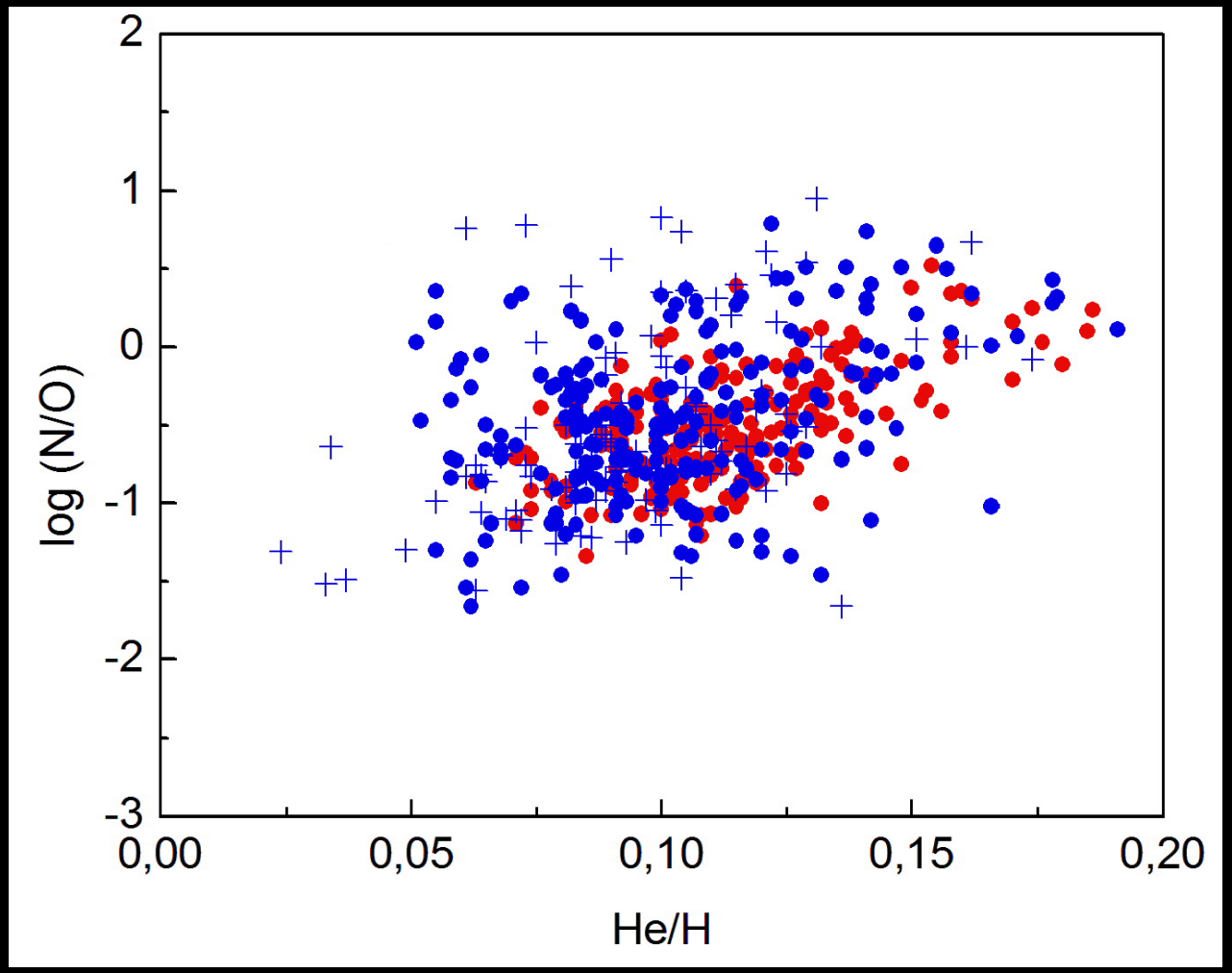
Abundances as functions of He/H

Comparison with theoretical models

Marigo (2003)



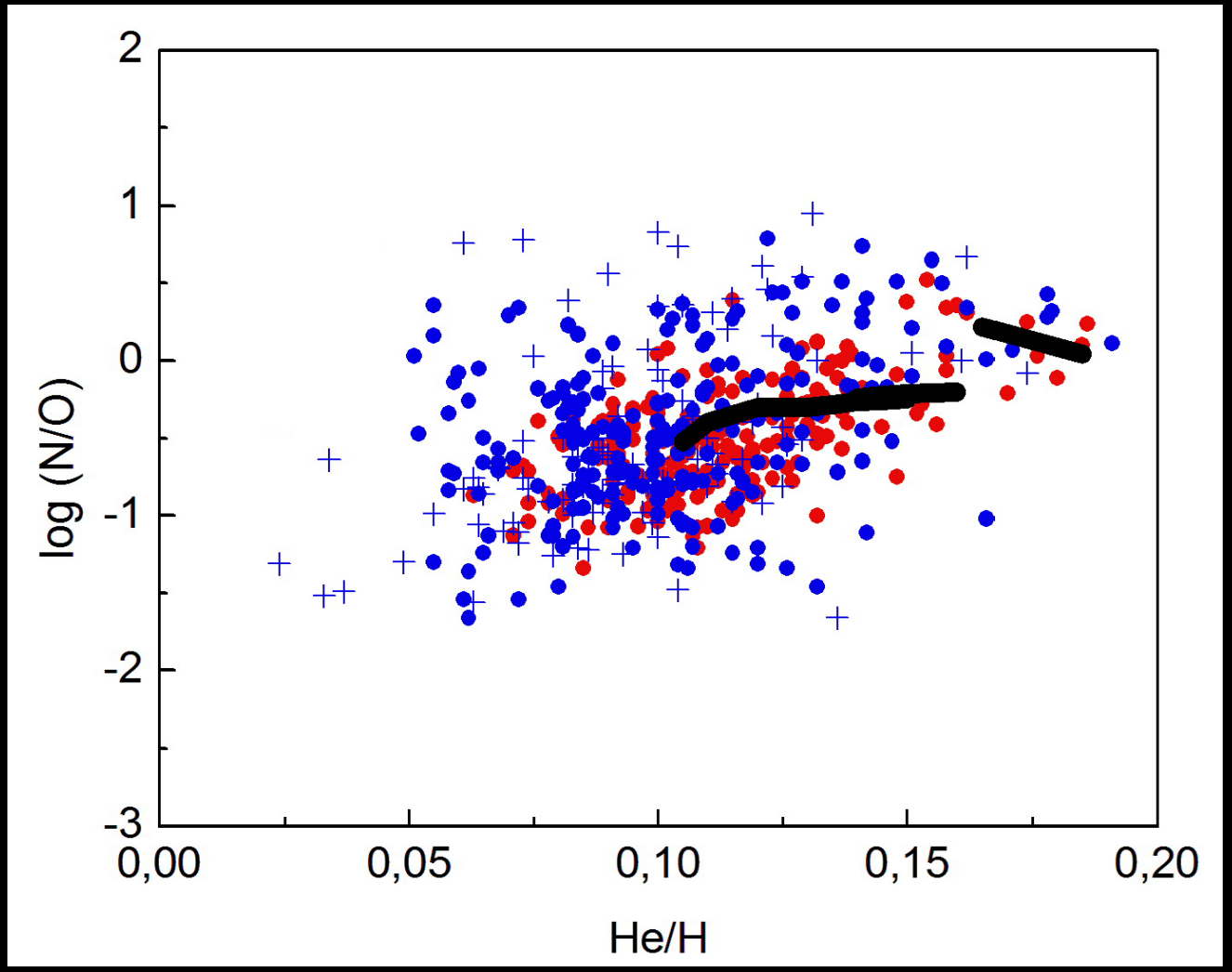
Abundances as functions of He/H



Abundances as functions of He/H

Comparison with theoretical models

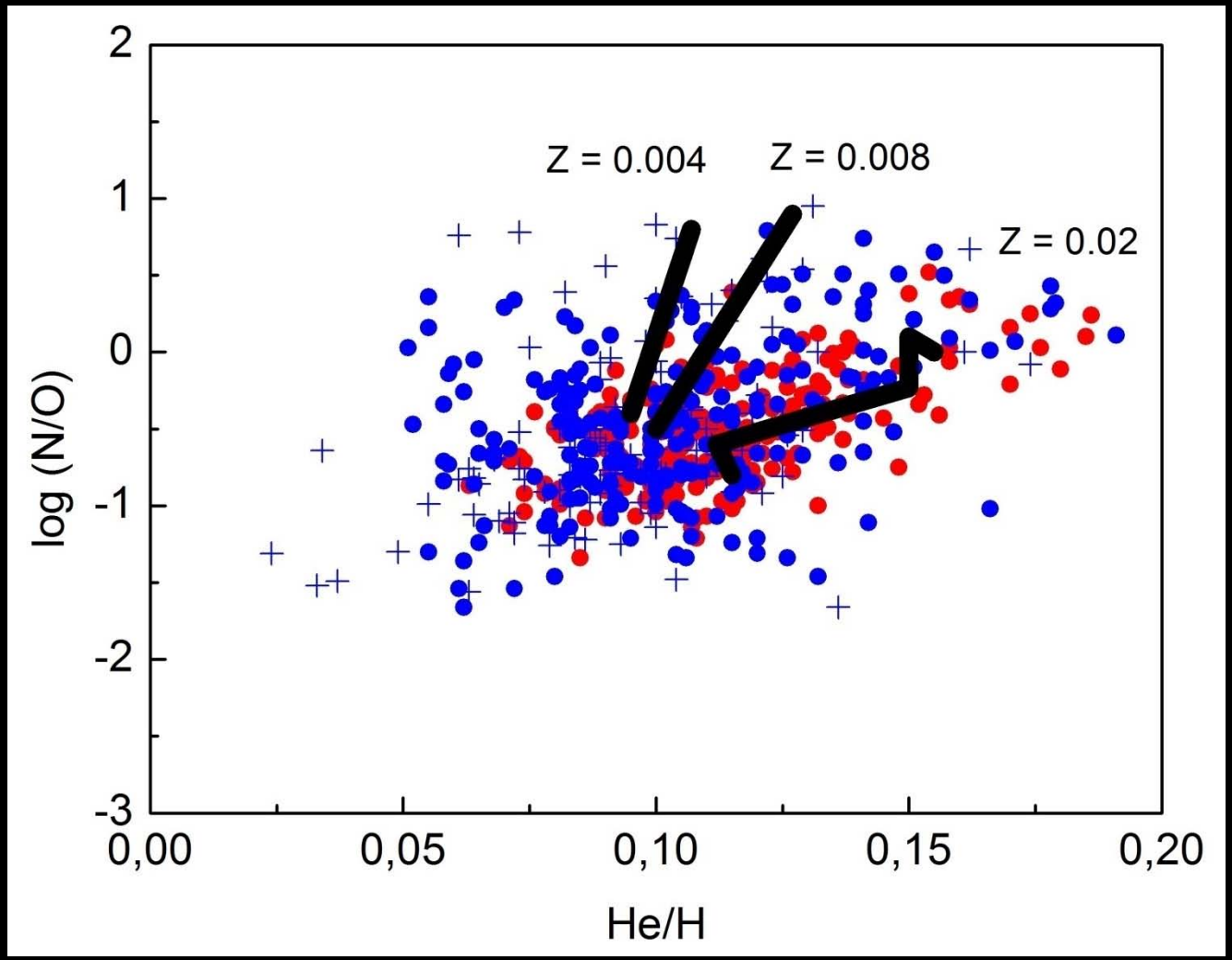
Marigo (2003)



Abundances as functions of He/H

Comparison with theoretical models

Karakas (2003)



CONCLUSIONS

- PN are useful to check abundances predicted by theoretical models.
- Important differences are observed between abundances relative to hydrogen or oxygen.
- Correlations of N abundances with He/H can be used to estimate the massas and metallicities of observed CSPN progenitors.
- Agreement with theoretical models is fair, but abundance determinations should be improved and expanded.