Mem. S.A.It. Vol. 75, 386

Memorie della

Abundance anomalies and lithium in Globular Clusters

P. Bonifacio

Istituto Nazionale di Astrofisica – Osservatorio Astronomico di Trieste, Via Tiepolo 11, I-34131 Trieste, Italy e-mail: bonifaci@ts.astro.it

Abstract. Since Li is destroyed at temperatures above 2.5×10^6K its abundance may be a useful diagnostic for the nuclear history of the material observed in a stellar atmosphere. It is therefore interesting to note what are the correlations (if any) between Li abundances and abundance anomalies.

Key words. Stars: abundances – Stars: atmospheres – Stars: Population II – Galaxy: globular clusters – Galaxy: abundances – Cosmology: observations

1. Introduction

I will concentrate on observations of turn off (TO) stars. In Globular Cluster (GC) stars the Li becomes too weak to be measurable, with the available S/N, already on the subgiant branch (SGB). This leaves us with three GCs with published Li observations: NGC 6397, M92, and 47 Tuc. NGC 6397 is a chemically very homogeneous cluster both for Li (Bonifacio et al. 2002) and for other elements (Gratton et al. 2001), and there is nothing to speak about in this context. I will therefore deal with M 92 and 47 Tuc.

2. M 92

For the purpose of the present discussion let us forget the issue of the reality of a dispersion in Li abundances (Boesgaard et al. 1998; Bonifacio 2002) and of the errors in abundance determinations and let us take all the abundances at face value. The abundances derived by King et al. (1998), using the equivalent widths of Boesgaard et al. (1998) are indeed “surprising” as stated in the title of the paper. What I find particularly striking is [Mg/Fe]=−0.15 and [Ca/Fe]=+0.33 with [Fe/H]= −2.52 (King et al. 1998). Since these authors provide a “mean” abundance for the cluster I computed the abundances using the WIDTH code (Kurucz 1997), from the equivalent widths of Boesgaard et al. (1998), using the atmospheric parameters of Bonifacio (2002). I did not compute sodium abundances

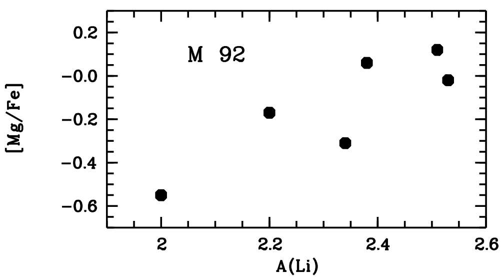

Fig. 1. The [Mg/Fe] ratio as a function of A(Li) for TO stars in M92

Send offprint requests to: P. Bonifacio

Table 1. Abundances for TO stars in M 92

Star #	[Fe/H]	σ	[Mg/Fe]	[Ca/Fe]	[Ti/Fe]	[Cr/Fe]	[Ba/Fe]
18	−2.63	0.22	−0.02	+0.21	+0.28	−0.29	+0.11
21	−2.57	0.27	−0.55	+0.17	+0.44	−0.22	−0.18
34	−2.58	0.24	+0.06	+0.04	+0.40	–	−0.05
46	−2.38	0.22	−0.31	+0.22	+0.17	−0.27	−0.28
60	−2.54	0.30	+0.12	+0.43	+0.44	−0.06	+0.39
350	−2.37	0.30	−0.17	+0.37	+0.34	–	–

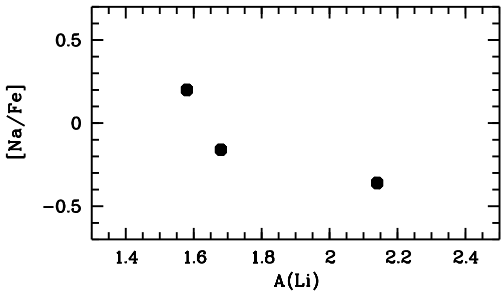

Fig. 2. The [Na/Fe] ratio as a function of A(Li) for TO stars in 47 Tuc

because the equivalent widths for sodium lines are not given in Boesgaard et al. (1998). These abundances are given in Table 1. The only two elements whose abundance shows any hint of correlation with A(Li) are Mg and Ba, [Mg/Fe] as a function of A(Li) is shown in Fig. 1. However none of the suggested correlations is statistically significant. A non parametric test with Kendall's τ for [Mg/Fe] and A(Li) provides a probability of 0.29, far too high to claim the reality of such a correlation. The bottom line is that higher quality observations are needed to verify the reality of the abundance scatter and possible trends.

3. 47 Tuc

The LP team led by R. Gratton is still working on the data of this cluster and so far only for 3 TO stars the analysis is complete. Three stars is really very few to study possible correlations. However in Fig. 2 I show the [Na/Fe] as a function of A(Li) and there appears to be a hint of an anti-correlation. In a similar way there is a hint of correlation of [O/Fe] with A(Li). A larger number of stars is necessary in order to make meaningful statistical tests of the reality of these correlations.

4. Conclusion

The data is too scarce to have a grip on the relationship (if any) between abundance anomalies and Li abundances in GCs. From the available data however emerge two lines of investigation which are likely to prove useful: 1) investigation of a larger number of stars in relatively metal-rich GCs, such as 47 Tuc, Ter 7, Ruprecht 106 ; 2) investigation with higher sensitivity of Li along the SGB in order to follow its dilution/destruction as the stars evolve.

Acknowledgements. I am grateful to R. Cayrel, for suggesting the topic of correlations between Li and other abundances.

References

Boesgaard, A. M., et al. 1998 ApJ, 493, 206
Bonifacio, P. 2002, A&A, 395, 515
Bonifacio, P. et al. 2002, A&A, 390, 91
Gratton, R. G. et al. 2001, A&A, 369, 87
King, J. R. et al. 1998, AJ, 115, 666
Kurucz, R. L. 1993, CD-ROM 13, 18