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Chemical abundances in Terzan 7 ⋆

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Abstract. We present abundances for Mg, Si, Ca, Fe, and Ni for 3 giants in the sparse globular cluster Terzan 7, physically associated with the Sagittarius dwarf Spheroidal galaxy (Sgr dSph), which is presently being tidally disrupted by the Milky Way. The data, obtained with VLT-UVES, show a mean [Fe/H]= −0.57, a solar-scaled α content ([α/Fe]~0) and a significant Ni underabundance ([Ni/Fe]= −0.2). This enforces Ter 7's membership to the Sgr dSph system, which shows a similar chemical "signature".

Key words. Globular clusters: individual: Terzan 7 – galaxies: individual: Sgr dSph – stars: abundances – galaxies: abundances

1. Introduction

The globular cluster Terzan 7 (Buonanno et al. 1995) is a small, young and metal rich globular, physically associated with the Sgr dSph (Marconi et al. 1998). The closest neighbour of the Milky Way, the Sgr dSph is presently undergoing tidal disruption in the galactic halo. This study of three giants in Terzan 7 is part of our analysis of the Sgr dSph system Bonifacio et al. (2004), aimed to understand its chemical enrichment history as well as its contribution to the Galactic Halo buildup.

The stars were selected in the upper RGB of Terzan 7, in the sample of Buonanno et al. (1995), and observed with VLT-UVES in dichroic mode D1. The extracted spectra have a S/N ∼ 30 at 580 nm. Equivalent widths (EWs) have been measured for lines of Fe I, Fe II, Mg I, Si I, Ca I and Ni I. The effective temperatures have been derived from $(V-I)_0$ colors by using the calibration of Alonso et al. (1999). The analysis was performed with codes ATLAS9, WIDTH and SYNTHE (Kurucz 1993).

2. Results and interpretations

The derived [Fe/H] appear to be very similar for the three stars (see physical parameters and abundances in Table 1). Our derived metallicity is in agreement with the spectroscopic analysis of Wallerstein et al. (2002) ([Fe/H]= −0.61) but significantly higher than the photometric estimate of Buonanno et al. (1995) ([Fe/H]= −1.0). The ratios of α elements (Mg, Si and Ca) to iron are roughly solar. Although, considering errors, this may be marginally compatible with the ∼ 0.3 dex of overenhancement observed in the Milky Way at similar metallic-

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Star	V	(V-I)$_0$	T$_{eff}$	log g	[Fe/H]	[Mg/Fe]	[Si/Fe]	[Ca/Fe]	[Ni/Fe]
A	16.08	1.324	4168	1.30	−0.51	−0.08	+0.02	−0.27	−0.20
B	16.76	1.156	4436	1.80	−0.60	+0.00	+0.15	−0.03	−0.16
C	16.62	1.188	4385	1.60	−0.61	−0.04	−0.07	−0.01	−0.19

Table 1. Photometry, physical parameters and abundances for the three stars

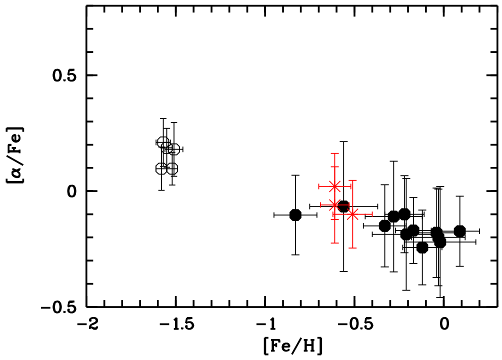

Fig. 1. [α/Fe] vs. [Fe/H] for Sgr dSph sample of Bonifacio et al. (2004) (filled circles), M54 from Brown et al. (1999) (open circles) and Terzan 7 (asterisks).

ity (Gratton et al. 2003), we are inclined to believe that we are observing a true chemical difference between Sgr and the Milky Way. The α-element content found by Wallerstein et al. (2002) is ([α/Fe]=+0.23), thus more data is needed to clarify this issue. We found a slight Ni underabundance with respect to iron of [Ni/Fe]= −0.2 in agreement with Wallerstein et al. (2002) ([Ni/Fe]= −0.16). Deviations from [Ni/Fe]=0 are not observed in our Galaxy at any metallicity (Cayrel et al. 2003). In Fig. 1 we put our results in the wider scenario of the Sgr dSph system. We plot [α/Fe] vs. [Fe/H] for the sample of 12 Sgr dSph giants in Bonifacio et al. (2004) and 5 M 54 giants from Brown et al. (1999). A clear trend can be seen in α content with metallicity. The Ter 7 stars appear to follow the trend defined by the field stars. This reinforces the presence of an evolutionary link between Ter 7 and the Sgr dSph (M 54 is suspected to be, in fact, the nucleus of Sgr dSph).

The low Ni content together with low [α/Fe] is difficult to explain by means of the usual chemical evolution models, and may be considered just another hint of a peculiar chemical evolution in the Sgr dSph system, or more generally in the dwarf galaxies. It is interesting to note that the two stars in the Sgr dSph sample with measured Ni abundance (Bonifacio et al. 2000) show an even larger underabundance, similar to what found in Ruprecht 106 (Brown et al. 1997).

This “chemical signature” potentially constitutes a tool to discriminate the “true” Halo globulars from the “satellite accreted GCs” contributed by Sgr or other dwarfs. An important corollary of the existence of chemical signatures of Sgr is that Sgr and similar dSphs cannot have been the basic building blocks out of which the Galactic Halo was formed.

References

Alonso, A., Arribas, S. & Martinez-Rogers, C. 1999, A&AS, 140, 261
Bonifacio P., et al. 2000, A&A 359, 663
Bonifacio, P., Sbordone, L., Marconi, G., Pasquini, L., & Hill, V. 2004, A&A, 414, 503
Cayrel, R., et al., 2004, A&A, in press
Brown, J. A., Wallerstein, G., & Zucker, D. 1997, AJ, 114, 180
Brown J. A., Wallerstein G., & Gonzalez G., 1999, AJ 118, 1245
Buonanno, R., et al. 1995, AJ 109, 663
Gratton, R. G., et al. 2003, A&A, 406, 131
Kurucz, R. L., 1993, CDROM 13, 18
Marconi, G. et al. 1998, A&A 330, 453
Wallerstein, G., Gonzalez, G., & Geisler, D., 2002, IAUSS 207, 171