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Abundance analysis of the bulge globular clusters NGC 6553 and NGC 6528

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Abstract. A detailed abundance analysis of 5 giants of the metal-rich bulge globular cluster NGC 6553 was carried out using high resolution infrared spectra in the H band, obtained at the Gemini-South 8m telescope. High resolution spectra of 3 stars in the bulge globular cluster NGC 6528 were obtained at the 8m VLT UT2-Kueyen telescope with the UVES spectrograph.
The present analysis provides a metallicity [Fe/H] = -0.15 ± 0.2 and [α/Fe] $\approx +0.2$ for NGC 6528, and [Fe/H] = -0.20 ± 0.10 and an oxygen overabundance of [O/Fe] = +0.20 for NGC 6553, resulting in an overall metallicity $Z \approx Z_{\odot}$ for both clusters

Key words. Stellar abundances, globular clusters, Galactic bulge

1. Introduction

Ortolani et al. (1990, 1992, 1995) have shown the turnover of the Red Giant Branch (RGB), due to the presence of TiO bands, in Colour-Magnitude Diagrams (CMD) of NGC 6528 and NGC 6553. This RGB morphology indicates that these clusters are more metal-rich than the halo cluster 47 Tucanae (Ortolani et al. 1995; Momany et al. 2003). NGC 6553 and NGC 6528 are also shown to have a metallicity and an age comparable with the bulk of Baade's Window stellar population (Ortolani et al. 1995; Zoccali et al. 2003). Due to their high metallicities, NGC 6528, NGC 6553 and NGC 6440 were adopted by Bica (1988) as templates to reproduce the spectra of the more metal-rich elliptical galaxies.

In this work we present detailed abundance analysis of three stars in NGC 6528 using high resolution échelle spectra obtained with UVES at the ESO VLT-UT2 8m telescope, using higher spectral resolution (R$\sim$50 000) relative to previous studies, and 5 giants of NGC

Table 1. Abundances in NGC 6553 and NGC 6528, derived in Meléndez et al. (2003) and Zoccali et al. (2004)

	NGC 6553	NGC 6528
[Fe/H]	–0.20	–0.15
[O/Fe]	+0.20	+0.15
[Mg/Fe]	–	+0.10

6553, using high resolution (R ~ 50 000) H band spectra obtained with the Phoenix spectrograph at the Gemini-South 8m telescope.

2. The sample stars

V and I photometry of the central regions of NGC 6528 and NGC 6553 was obtained using two sets of WFPC2 observations with the Hubble Space Telescope (HST), (GO5436: Ortolani et al. 1995, and GO8696: Feltzing and Johnson 2002). Infrared J, H, K_s observations were obtained with the SOFI infrared camera of the ESO New Technology Telescope (NTT) (Momany et al. 2003).

3. Results and Discussion

Abundances derived are given in Table 1.

We have determined a metallicity of [Fe/H] = –0.20±0.10 for NGC 6553, and oxygen is enhanced by [O/Fe] ≈ +0.20. Cohen et al. (1999) found enhancements of other α-elements, with [Mg/Fe] = +0.4, [Si/Fe] = +0.14, [Ca/Fe] = +0.26, and [Ti/Fe] = +0.19, and a mean of [α/Fe] = 0.25. These results altogether point to an enhancement of α elements in stars of NGC 6553. For NGC 6528, [Fe/H] = –0.15 is found and the α-elements O and Mg are enhanced by small amounts [O/Fe] ≈ [Mg/Fe] ≈ +0.1. The α-element Ca is slightly deficient relative to Fe. The lower relative abundance of Ca relative to the other α-elements was also found by McWilliam & Rich (1994). Combining the present abundance ratios with those of Carretta et al. (2001), there is some evidence for excess of α-elements in NGC 6528. The α-element overabundance of oxygen and magnesium relative to iron can be interpreted as evidence of fast chemical enrichment, as demonstrated by Matteucci & Brocato (1990) and Matteucci et al. (1999), due to enrichment predominantly by Type II SNae.

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