CARBON AND NITROGEN IN THE COOL SUPERGIANT A7 OF THE YOUNG GLOBULAR CLUSTER NGC 330 IN THE SMC*

B. BARBUY, A. MILONE
Universidade de Sao Paulo, Depto. Astronomia
CP30627 Sao Paulo 01051
Brazil

M. SPITE, F. SPITE
Observatoire de Paris, Section d' Astrophysique
92195 Meudon Pl Cedex
France

ABSTRACT. C_2 and CN bands in the wavelength region λ 560 - 680 nm were used to obtain the carbon and nitrogen abundances in the supergiant star A7 of the young, metal-poor, globular cluster NGC 330 in the Small Magellanic Cloud (SMC).

1. Introduction

NGC 330 is a young cluster (age 1.2×10^7 yrs (Carney *et al.* 1985)) in the SMC, showing a low metal abundance, [Fe/H] ≈ -1 (where the standard notation [X] = log $X*/X_\odot$ is used). Spite *et al.* (1986) and Richtler *et al.* (1990) have made a detailed analysis of the red supergiant star A7 of this cluster, to determine its overall metal abundance, as well as the relative abundances of the other elements. They conclude that NGC 330:A7 shows elemental ratios characteristic of an old population cluster. It has been found for the F field supergiants that the abundance of carbon is "normal" (i.e. that the ratio C/Fe is the same in the Magellanic Clouds as in the Galaxy, see for example Spite and Spite (1990), whereas in the HII regions the carbon abundance seems to be low by about 0.6 dex.

In the present work, we derive the carbon (C) and nitrogen (N) abundances in the cool supergiant A7 of NGC330, which should reflect another step of the chemical evolution of the Clouds (i.e. as a sample of little evolved material). To our knowledge, this is the first detailed determination of the C and N abundances in the Clouds from molecular bands.

2. Observations

High resolution spectra in the wavelength region λ 560 - 680 nm were obtained at the 3.6m telescope of the European Southern Observatory (ESO), La Silla, Chile, using the échelle spectrograph CASPEC and a RCA CCD of 512x512 pixels.

* Observations at the European Southern Observatory ESO (Chile)

R. Haynes and D. Milne (eds.), The Magellanic Clouds, 370–371.

3. Calculations

Synthetic spectra calculations were made in the regions containing bandheads of C_2 and CN molecular lines. These bandheads correspond to the vibrational transitions (v',v") = (0,1), (3,5), (2,5), (5,8) and (1,4) of the C_2 $A^3\Pi - X^3\Pi$ Swan system, and the transitions (8,3), (5,1) and (8,4) of the CN $A^2\Pi - X^2\Sigma$ red system. In Figure 1 the (2,5) C_2 band is shown. The stellar parameters employed are those given by Richtler *et al.* (1990): (T_{eff}, log *g*, [M/H], v_t) = (3900, -0.2, -1.05, 4.5 km s^{-1}) or (4000, 0.0, -1.0, 4.5) corresponding to reddenings E(*B-V*) = 0.03 and 0.12 respectively; the model atmosphere was obtained by an interpolation in the grid of models by Gustafsson *et al.* (1975).

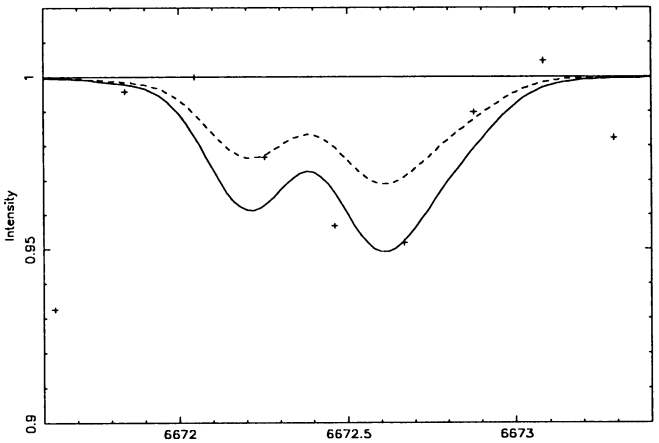

Figure 1. Observed spectra (crosses) and synthetic spectra of C_2(2,5) band for [C/Fe] = +0.1 (dashed line) and [C/Fe] = +0.2 (full line). The best fit was obtained for [C/Fe] ≈ 0.15.

4 Results and conclusions

The best fits were found for [C/Fe] ≈ 0.15 and [N/Fe] ≈ 0.0, and therefore no carbon underabundance is seen, in disagreement with data from HII regions. The same result has already been found for field SMC stars by Spite *et al.* (1989), Russell & Bessell (1989) and Spite & Spite (1990).

5. References

Carney, B.W., Janes, K.A., Flower, P.J. (1985), *Astron. J.* **90**, 1196.
Gustafsson, B., Bell, R.A., Eriksson, K., Nordlund, Å. (1975), *Astron. Astrophys.* **42**, 407.
Richtler, T., Spite, M., Spite, F. (1990), these proceedings.
Russell, S.C., Bessell, M.S. (1989), *Astrophys. J. Suppl.* **70**, 865.
Spite, M., Spite, F. (1990), these proceedings.
Spite, M., Barbuy, B., Spite, F. (1989), *Astron. Astrophys.* **222**, 35
Spite, M., Cayrel, R., François, P., Richtler, T., Spite, F. (1986), *Astron. Astrophys.* **168**, 197.