# NEW ELEMENT ABUNDANCES IN NGC 330*

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ABSTRACT. We present element abundances based on high dispersion spectra of four stars in the SMC cluster NGC 330. The metallicities range from -0.8 to -1.1 dex, depending on the reddening.

## 1. Introduction: What is so interesting about NGC 330?

NGC 330 is the most prominent young globular cluster in the SMC. It has developed into a kind of "key object" on the scenery of chemical evolution in the Cloud. While it appears to be well established that the overall enrichment of the young SMC population can be characterised by a metal deficiency of about -0.6 dex (Spite *et al.* 1989, Russell & Bessell 1989), NGC 330 emerged as metal poorer in all previous photometric and spectroscopic studies, despite its young age (Spite *et al.* 1986 and refs therein). However, high-dispersion abundance studies of NGC 330 rest so far on the investigation of one red supergiant (Spite *et al.* 1986) and one B-star (Reitermann *et al.*1990). The elements considered are mostly disjunct which makes comparison difficult. Furthermore, there are error sources like the extrpolation of existing model atmospheres or uncertain temperatures. To help prove or disprove the strange behaviour of NGC 330 with respect to overall enrichment, we observed three new stars in NGC 330 and obtained additional data for a star already investigated.

## 2. Observations, reductions and analysis

The spectra were obtained in the period 1989 Dec. 11-13, at ESO, La Silla with the 3.6m telescope and the CASPEC-spectrograph. The spectral resolution is about 0.3Å and S/N $\simeq$ 100. Our program stars were A7,A19,B38 and B40 from the photometry of Robertson (1974). A7 and B40 are K-supergiants, and A19 and B38 are A-stars. The spectra have been reduced using our software at Meudon. For the "hot" stars, analysis was based on LTE-models by Kurucz (1979), and for cool stars, on LTE-models by Gustafssson *et al.* (1975). Temperatures were derived from B-V-photometry for the A-stars, adopting Canopus as zero-point of the temperature scale. For B40 we adopted the temperature by McGregor & Hyland (1984) and derived the temperature of A7 differentially by B-V colours. Log g-values of the model atmospheres were obtained by having the abundances of FeI and FeII in fair agreement. (See our previous papers for details of analysis procedure.)

## 3. Results and discussion

Since the low reddening of NGC 330 has been questioned recently by Bessell (pers. comm.), we give for each element in Table 1 two abundance values for $E_{B-V}$=0.03 (upper value) and $E_{B-}$

* The data have been obtained within the ESO MC key-project



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$_V$=0.12 (lower value). It can be seen that the hot stars are much more strongly affected, and so in the case of $E_{B-V}$=0.12, no real consistency can be achieved between hot and cool stars. We note that the star A19 shows a radial velocity 10km $s^{-1}$ lower than the other stars, and so its membership may be in doubt.

**Table 1.** Element abundances of four stars in NGC330. All values are in dex. The upper and lower values for each element refer to $E_{B-V}$=0.12 and 0.12, respectively.

| | $T_{eff}$(K) | OI | NaI | CaI | TiI | TiII | FeI | FeII |
|---|---|---|---|---|---|---|---|---|
| A 19 | 7100 | | | -0.94 | | | -0.78 | -0.77 |
| | 7500 | | | -0.64 | | | -0.51 | -0.56 |
| B 38 | 7500 | | | | | -0.97 | -0.90 | -0.79 |
| | 7950 | | | | | -0.64 | -0.61 | -0.54 |
| A 7 | 3900 | -1.3 | -0.37 | -0.96 | -1.05 | -1.10 | -1.18 | -0.95 |
| | 4000 | -1.2 | -0.33 | -0.90 | -0.95 | -1.05 | -1.12 | -0.95 |
| B 40 | 4000 | -1.3 | -1.10 | -0.96 | -0.92 | -1.11 | -1.09 | -1.05 |
| | 4150 | -1.1 | -1.09 | -0.90 | -0.80 | -0.94 | -1.01 | -0.92 |

We emphasise that a metal deficiency of roughly 1/10 solar is also found by Reitermann *et al.* (1990) for a B-star near the main sequence of NGC 330. So we conclude that NGC 330 is metal poorer than the young SMC field population by about 0.4 dex. Remarkably we find the same phenomenon in NGC 1818 in the LMC (Richtler *et al.* 1989, Reitermann *et al.* 1990), where the metallicity difference between a globular cluster and a field population of comparable age is even more pronounced. One might speculate that this is analogous to the situation in the Fornax dwarf galaxy, where globular cluster colours hint of a metallicity difference of 0.4 dex between cluster and field population (Da Costa 1988). If globular clusters form preferably from metal-poor material (Richtler & Seggewiss 1988), then they are of course not good tracers for chemical evolution. Whatever the correct interpretation, our results show that more high-dispersion analysis must be done in clusters in the field of the MCs, as we plan to do in the ESO MC key-project.

## 5. References


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