STELLAR CHEMICAL-ABUNDANCE GRADIENT IN THE DIRECTION OF THE SOUTH GALACTIC POLE - PRELIMINARY RESULTS

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ABSTRACT

Using the Walraven VBLUW photometric system, we have studied the metal content of 89 F and G stars in the Galactic South Pole field SA141. Our sample is based on the Basel survey of RGU photometry in Selected Areas, and it contains all stars in SA141 with $V_J < 14^m.5$ and $(G-R) < 1^m.15$ (spectral types earlier than about G7). The observations were made with the VBLUW photometer and the 90-cm Dutch Telescope at ESO, La Silla.

For unreddened intermediate-type stars the VBLUW photometry enables us to separate the effects of temperature, gravity, and metallicity (cf. Lub and Pel, 1977). Since reddening is negligible in SA141, we can therefore determine these three parameters for each program star once the photometric indices are calibrated in terms of T_{eff}, log g, and [Fe/H]. The latter calibration was made in a semi-empirical way, using VBLUW observations of stars with spectroscopic analyses in combination with theoretical colors based on the model spectra by Kurucz (1979). We used the Hyades main-sequence as a zeropoint, adopting [Fe/H]= +0.15 for this cluster.

The results in the (V-B)-(B-L) diagram are shown in Fig.1. This diagram is very sensitive to metallicity, but almost gravity-independent. Fig.1 indicates that most program stars have metallicities in the range $-1 \leqq [Fe/H] \leqq 0$. The distribution of the program stars in the gravity-sensitive (V-B)-(L-U) diagram is very narrow, log g =4.2 ± 0.3, which means that these stars are probably all dwarfs, with only very few possible subgiants.

The absolute-magnitude calibration was derived by using the data of Cayrel de Strobel et al. (1980) and of Cayrel de Strobel and Bentolila (1983). From their [Fe/H]-catalogue we took all stars with known distances, and within the parameter range of our program stars, to construct an empirical $M_V - T_{eff}$ relation. This relation was used to derive distances for the stars in SA141.

These distances are plotted against [Fe/H] in Fig.2. The diagram clearly shows the correlation between distance and metallicity, suggesting for this particular sample a gradient of -0.6 in [Fe/H] over the first 500 pc. Similar values were found in the Basel RGU program (cf.Trefzger, 1981) and by Blaauw and Garmany (1975).

H. van Woerden et al. (eds.), The Milky Way Galaxy, 151–152.

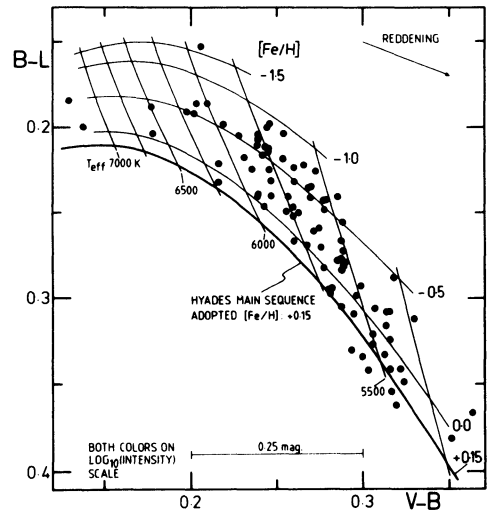

Fig.1. The program stars in the (V-B)-(B-L) diagram. The temperature-metallicity calibration is indicated. Gravity effects are very small in this diagram.

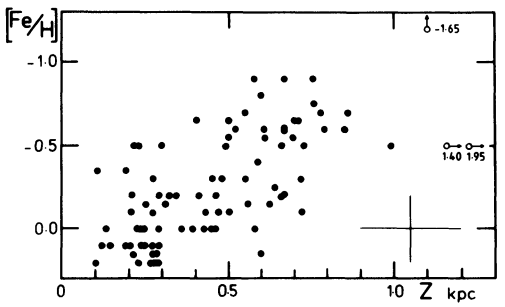

Fig.2. [Fe/H] versus distance from the galactic plane for the F and G dwarfs observed in SA141. The sample is complete up to 500 parsec. The cross corresponds to typical uncertainties of σ[Fe/H] = $\pm$ 0.2 and $\sigma M_V = \pm 0^{m}.5$ at z=700 pc.

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