ABUNDANCE EFFECTS ON *uvby* PHOTOMETRY

D. L. CRAWFORD

Kitt Peak National Observatory, U.S.A.*

and

C. L. PERRY

Louisiana State University, U.S.A.

Abstract. Abundance differences from one star to another cause differences in the observed parameters of the Strömgren four-colour system. The major effect is on the m_1 parameter, of course.
This paper describes these effects on the parameters.

The *uvby* system was designed by B. Strömgren to separate the surface gravity and abundance effects that appear for F-type stars in a parameter such as $\delta(U-B)$. The parameter δm_1 is a measure of abundance, essentially free of gravity effects, while δc_1 is a gravity parameter, essentially free of abundance effects.

By comparing $(R-I)$, β, and $(b-y)$ for stars with different δm_1 values, we find no correlation with δm_1 for the deviations from an average $(R-I)$ vs β relations. There are small correlations with δm_1 for the residuals from an average $(b-y)$ vs β or $(b-y)$ vs $(R-I)$ relation.

In this paper we derive the δm_1 values with β as the independent parameter. We call the parameter δm_1 (β) to distinguish it from δm_1 $(b-y)$, where $(b-y)$ is the independent parameter.

The relation between δm_1 (β) and [Fe/H] values tabulated by Cayrel and Cayrel de Strobel (1966) is [Fe/H] = 0.20−12 δm_1 for 41 stars, with a standard error in one value of [Fe/H] of ±0.21. The Hyades abundance is 0.20, and the solar δm_1 is $+0^{m}015$.

The relation between δm_1 $(b-y)$ and the [Fe/H] values was determined to be [Fe/H] = 0.18−14 δm_1 $(b-y)$ for 49 stars, with a standard deviation in [Fe/H] for one value of ±0.22.

Reference

Cayrel, R. and Cayrel de Strobel, G.: 1966, *Ann. Rev. Astron. Astrophys.* **4**, 1.

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B. Hauck and P. C. Keenan (eds.), Abundance Effects in Classification, 71–72.

DISCUSSION

Morgan: What is your current estimate of the magnitude limit of observation where no serious loss in precision is encountered?

Crawford: About 15th magnitude is reasonable length of time.

P. E. Nissen: In your $\beta - m_1$ diagram many stars fall below the Hyades relation. Is that due to observational errors of m_1, or do you think that it indicates that there exist several stars more metal rich than the Hyades?

Crawford: Most are probably due to observational scatter, but not all; some stars appear to be more metal rich than the Hyades.

Williams: Which is the metal rich ([Fe/H] ~ +0.34) star in your calibration diagram?

Crawford: HR 3951 (20 L Mi).

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