SOME COMMENTS ON THE AGE–ABUNDANCE RELATION

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Abstract. From the results obtained with the tri-dimensional quantative classification method of Spite (1966), the relation age-abundance is analyzed for the Galaxy. The dispersion on the abundance for stars at a given age appears to prevail over a possible relation between the age and the abundance for these stars. From a detailed analysis of eight F2-G2 stars, it appears that the index Δm_1 is sensitive to microturbulence velocity.

The method of quantitative tri-dimensional classification for stars from F5 to K0 elaborated by Spite (1966) was recalibrated (da Silva and Grenier, 1976) for two reasons. First, L. da Silva and F. Spite have performed new measures and, secondly, a lot of stars were observed after 1966 with high resolution and are now available in the literature, giving new stars usable as valid standards.

The main advantages of the method are the following. The derived results are independent of the interstellar reddening and of the microturbulence. Moreover the spectra used allow also the derivation of radial velocity (useful for the research of the relations between the kinematical and atmospheric parameters). The calibrated quantities are given in Table I.

TABLE I

Parameter	M_V	θ_{eff}	[Fe/H]	$(B-V)_0$
Standard deviation	0.37	0.015	0.17	0.014

The results obtained were used in order to search for a relation between metallicity and age (see Figure 1) only for the 197 stars, the evolutionary degree of which allowed a sufficiently reliable estimate of the age from the evolutionary tracks given by Iben (1967). The influence of metallic abundance determination of the age was not taken into account for no usable grid of isochrones was found.

18 stars were considered separately. They deviate significantly from the kinematical law of the total sample as was shown (see Grenier *et al.*, 1976) by the independent

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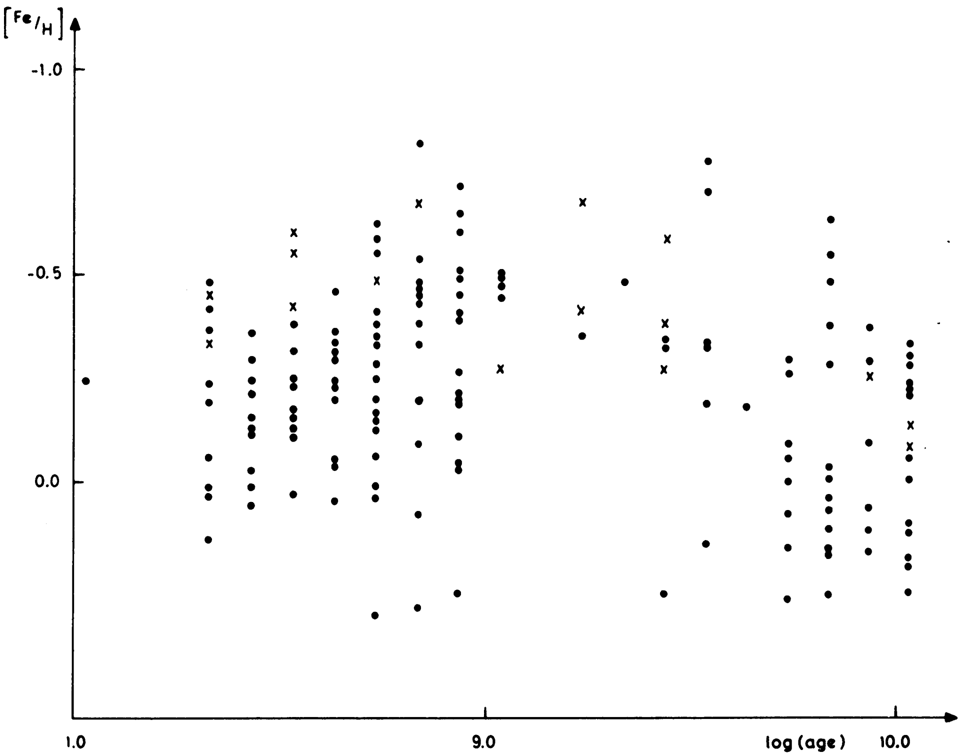

Fig. 1. Metallic abundance vs log (age) for the total sample. Crosses represent stars which deviate significantly from the kinematical law of the total sample.

application to this sample of a method of statistical parallaxes (see, e.g. Jung, 1970; Heck 1975a, b). These stars (shown by crosses) can be considered as not belonging to the galactic disk.

Figure 2 shows only the 75 stars observed by S. Grenier in the direction of the galactic rotation. They constitute an unbiased sample. In these two figures, no clear relation appears between metallicity and age.

It seems between 10^8 and 10^{10} yr, the dispersion of the abundances, for a given age, prevails over any relation with the age. This conflicts with the results found by Mayor (1975) who finds metal enrichment in the galactic disk, through the Δm_1 index of the *uvbyβ* photometry of F stars. To explain this conflict two of us (LDS and SG) and R. Foy have analyzed the influence of the microturbulence on the [Fe/H] determination from the Δm_1 index. Two of us (LDS and SG) and R. Foy have analyzed the influence of the microturbulence in the [Fe/H] determination from the Δm_1 index of the *uvbyβ* photometry.

Figure 3 shows an unexpected relation between Δm_1 and metallic abundance for dwarfs and subgiants studied with high resolution (~ 3 Å mm^{-1}) in the same way either by M. Spite (1967a, b, 1968) or by L. da Silva (da Silva, 1975; Scheid and da Silva,

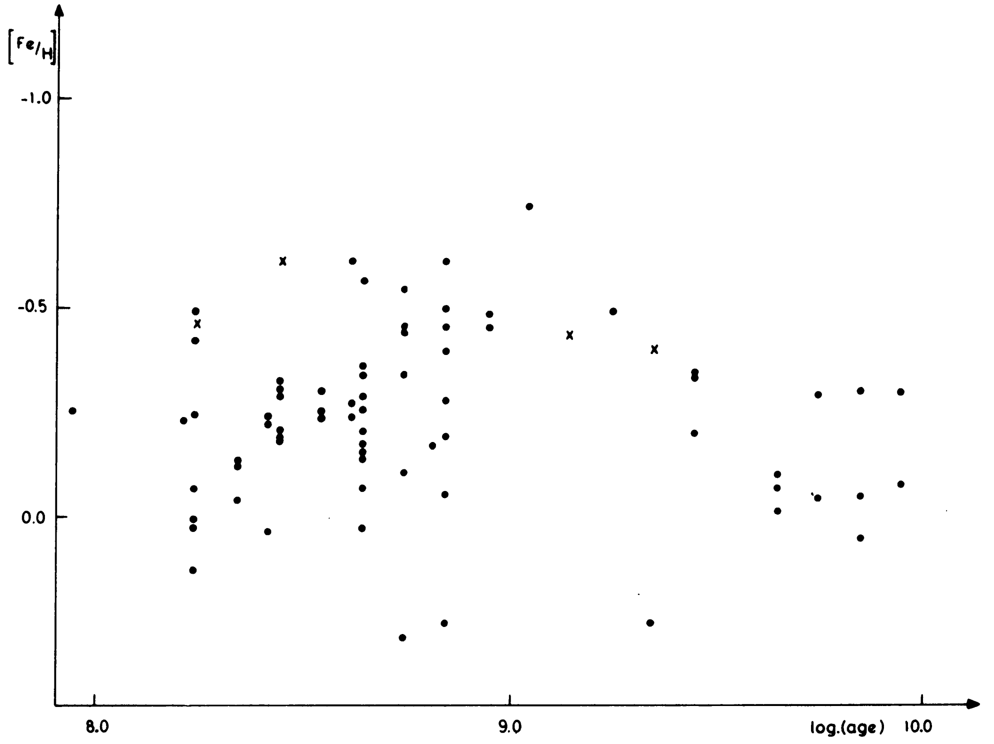

Fig. 2. Metallic abundance vs log (age) for 75 stars of an unbiased sample. Crosses have same meaning as in Figure 1.

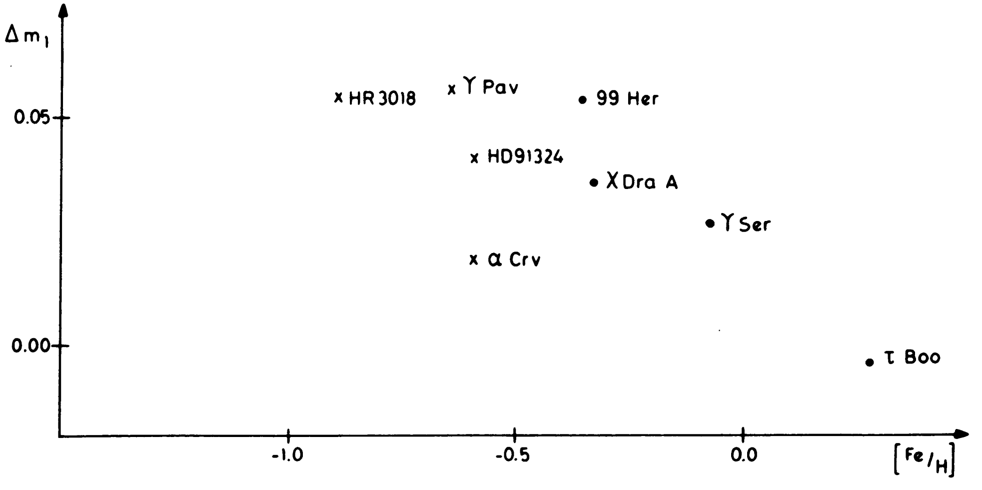

Fig. 3. Δm_1 vs metallic abundance for stars studied with high resolution by M. Spite (dots) and L. da Silva (crosses).

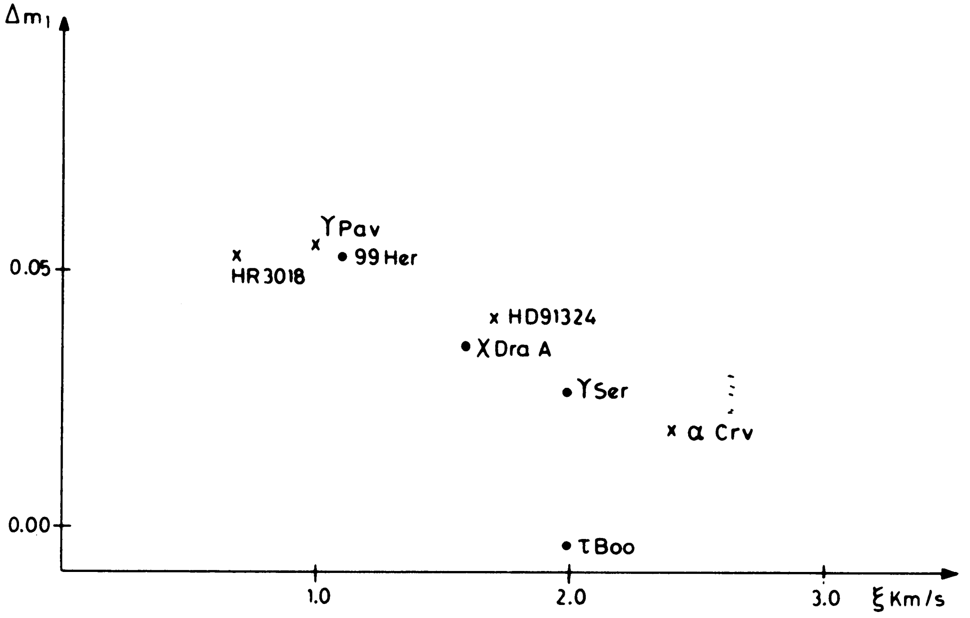

Fig. 4. Δm_1 vs microturbulence for same stars as in Figure 3.

1975). However, in Figure 4 it appears that Δm_1 is also a function of ξ. Three stars (γ Pav, HD 91324 and α Crv) analyzed in detail by da Silva have the same abundance, but have different Δm_1 in relation to their microturbulence velocities. Two other stars (γ Ser and τ Boo), analyzed by M. Spite, have the same ξ, but different Δm_1 because their [Fe/H] are different.

Thus it seems that Δm_1 is sensitive both to [Fe/H] and to ξ.

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