SPATIAL DISTRIBUTION OF METALLICITY IN A LOCAL PART OF THE GALACTIC DISK

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Many recent observations have indicated variations of metallicity within our Galaxy. Apart from a general negative radial abundance gradient indirect evidences suggest the existence of spatial chemical inhomogeneities in different regions of the galactic disk. Since this problem is of great importance in providing clues to processes of nucleosynthesis and galactic structure and evolution, it seems to be interesting to examine if these spatial inhomogeneities have any systematic character and if they are correlated with position of spiral arms.

Two groups of population I objects with known distances and metal to hydrogen ratios have been chosen : a sample of galactic clusters younger than 10^9 years and a group of classical cepheids together with supergiants of similar spectral types. Both of these groups include objects of sufficiently high masses and young ages to be good tracers of spiral arms and of chemical large scale spatial inhomogeneities. The distances and abundance data ($(Fe/H)_\odot$) for these objects were taken from "Catalogue of Stellar Abundances" compiled at the Toruń Observatory by J. Strobel. The results for both groups are presented in Fig. 1a and 1b for cepheids and clusters respectively in the form of a distribution of metallicity ($(M/H)_\odot = (Fe/H)_\odot$) along the axis directed towards the galactic center. The position of the Sun is indicated by O on abscissa axis. The positions of spiral arms are approximately marked by narrow horizontal shaded areas. They were determined for early type stars arm (which we identified with a cluster arm) by Dixon (1967), Kilkenny et al. (1975), and Quiroga and Schlosser (1977) and for classical cepheids by

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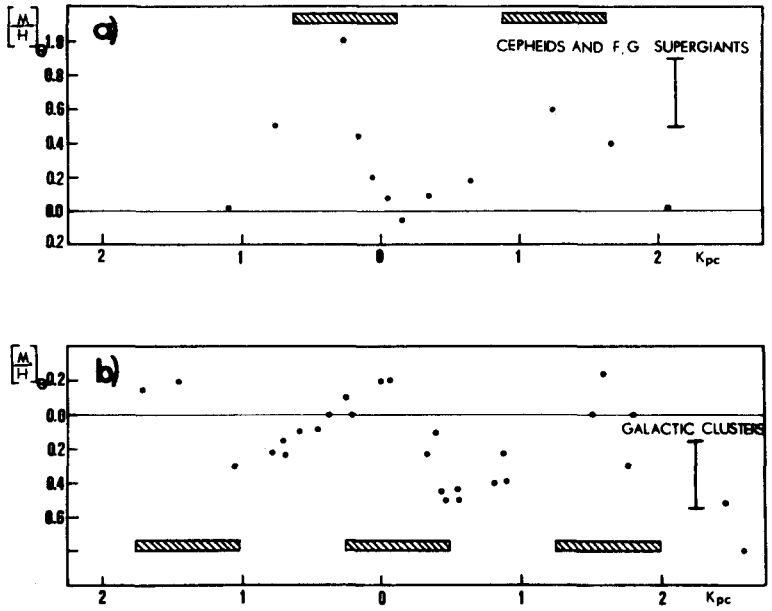

Fig. 1. Variation of $(M/H)_\odot$ with distance along the line directed towards galactic center for two groups of objects : cepheids and open clusters. The points in a) represent a mean of few points in a given distance range, in b) they represent average $(M/H)_\odot$ values for individual clusters. Dispersion measures of $(M/H)_\odot$ values are marked by lines. A narrow shaded area shows approximate position of spiral arms as delineated by these two groups.

Fernie (1968). It can be seen from Fig. 1 that the group of cepheids is slightly shifted relatively to the Sun, towards the galactic center in concordance with a statement by Fernie (1968). Each plotted point in Fig. 1a) represents a mean of few points in a given distance range. In Fig. 1b) points represent average $(M/H)_\odot$ values for individual clusters. Very uncertain data and different numbers of points make difficult to estimate correctly the error bars for the metallicity as well as for distance. Dispersion measures for metallicity are marked in the figures. The distance scale errors are estimated not to be larger than $\pm$ 200 pc on average.

It can be seen in Fig. 1 that similar trends in metallicity distribution are observed for both groups of objects. There is distinct correlation of metal enhancement with spiral arms positions in the sense

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that metal-rich objects are sharply concentrated in spiral arms, whereas extremely metal-poor objects are located between them. In spite of very inhomogeneous data on abundance and possible errors in distance determinations as well as relatively small samples of objects, the correlation of enhancement of metallicity with spiral arms seems to be statistically significant and suggests definite spiral structure in the distribution of metallicity in the galactic disk. In the case of open clusters, extending over larger distance, it can be seen that this wave character of metallicity distribution is superposed on the general radial metallicity gradient with an average value between -0.06 and -0.09 in $(M/H)_\bullet$ per kpc what agrees well with other similar determinations (Mayor, 1976).

A more detailed account of this investigation will be published later.

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