SPACE DISTRIBUTION AND METALLICITIES OF GLOBULAR CLUSTERS. THE DISTANCE TO THE GALACTIC CENTRE

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The distance to the galactic centre R_0 can be determined by direct (e.g., using selected objects) and indirect (e.g., adopting a rotation model) methods. In the past few years, most of these estimates indicate a systematic decrease relative to the previous IAU recommended value, $R_0 = 10$ kpc. On the other hand, an accurate determination of this parameter has several important astrophysical implications, from the calibration of galactic distances to the study of radial gradients in the disk.

The system of globular clusters has remained a favourite group for the purpose of determining R_0, owing to its characteristic space distribution. In the present work, the whole system of known globular clusters in the Galaxy is considered, in order to determine the distance to the galactic centre. In particular, the space distribution and metallicity variations are used to distinguish those objects which have a closer association with the galactic bulge. As a result, a new determination $R_0 < 8.0$ kpc is obtained, which is in agreement with recent independent estimates. (CNPq/FAPESP/CAPES).

MOLECULAR CLOUDS IN THE OUTER SOUTHERN GALAXY

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A new survey of the third galactic quadrant, with higher resolution and better sensitivity, has been recently completed by our group (May et al. 1992). From a preliminary analysis of the survey data, emission from about 250 molecular clouds, beyond 2 kpc from the Sun, has been found. With distances up to 20 kpc from the galactic center and up to 1 kpc from the galactic plane, these clouds delineate the global structure of the outer molecular disk, providing further evidence of its warping and flaring. Also some indication of spiral structure appears to be present although a further analysis is needed.

To study the physical properties of the outer Galaxy molecular clouds Gaussian fits to the composite spectrum of each one of the best defined and well mapped concentrations of molecular gas have been obtained. Positions, line widths, radii, CO luminosities and masses, and virial masses have been determined. Analysis of the luminosity-line width relation and the ratios of the virial masses to the luminosity-inferred masses of the individual clouds in the outer Galaxy is under way.

STATISTICAL REQUIREMENTS FOR A GALACTIC STRUCTURE STUDY

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Star count studies alone seem unable to definitively characterize the properties of the various components of the Galaxy. Kinematical data are required to compare the predictions of current models with the observed trends in a multi-dimensional observational space. An important goal of the Yale/San Juan Southern Proper Motion program (SPM) is to provide these kinematical data.

To ensure that the SPM program includes a sufficiently large sample of stars, an estimate is made of the number of stars as a function of magnitude needed to properly sample the thin disk, thick disk, and spheroid components of the Galaxy. We make use of the fundamental equation of stellar statistics and luminosity functions, density distributions, mean velocity, and velocity dispersion estimates taken from the literature.

For a sample region near the South Galactic Pole, it is projected that around 31 000 stars need to be measured to allow for the modeling of the kinematical properties of the disk, thick disk, and spheroid, in the magnitude range covered by the SPM program (≤ 18 V mag). The stars will be randomly selected, at the desired density, from the COSMOS/UKST Object Catalog of the Southern Sky. The kinematic and photometric data to be obtained from the SPM program will be analyzed with a multi-component galactic structure code currently under development at Yale.