

## TIME-SCALES, ANGULAR MOMENTUM AND MATTER CIRCULATION IN THE GALACTIC EVOLUTION

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Various time-scales related to the Galactic evolution have been classified and reexamined with respect to their self-consistency. They turned out to be roughly in agreement with the observed properties of our Galaxy in terms of the angular momentum and the matter circulation.

## ON THE DISTRIBUTION OF STELLAR POPULATIONS IN THE GALAXY

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We have analyzed observational data on the space distribution of the different types of stellar populations. We also examined the galactic rotation curves and models of mass distribution for the Galaxy. The need for the new observational data, reinterpretation of the concepts of stellar populations and remodeling of the mass distribution of the Galaxy are suggested.

## HEAVY ELEMENT ABUNDANCES OF THE GALACTIC CLUSTERS AND THEIR SPACE DISTRIBUTION

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Defining a metal parameter,  $(SP)_c$  which is related to the morphological parameters of a C-M diagram, we have estimated metal abundances of 97 globular clusters in our Galaxy. A correlation between absolute magnitude of the horizontal branch and metal abundance is derived and this is used for the derivation of distances for globular clusters

whose visual magnitudes of the horizontal branch are known. The space distribution of the globular clusters and the chemical evolution of the halo are examined, suggesting

the initial mean gradient of metallicity,  $d[\text{Fe}/\text{H}]/dr_g \simeq -0.06 \text{ kpc}^{-1}$  for the halo in galactocentric distance,  $r_g < 20 \text{ kpc}$  and a slow collapse of the protogalaxy.

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## CHEMICAL EVOLUTION OF INTERSTELLAR CLOUDS AND VARIATIONS OF MOLECULAR ABUNDANCES

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The abundances of simple molecules are examined in terms of the time-dependent cloud evolution. The formation and destruction mechanisms of  $\text{H}_2\text{CO}$  are reviewed. The average value of the fractional abundance of  $\text{H}_2\text{CO}$  is derived to be in the range of  $10^{-10}$

to  $5 \times 10^{-9}$ . This is comparable to the observed values. The expected variations of the molecules formed from or destroyed by  $\text{CO}$ ,  $\text{CI}$ , and  $\text{C}^+$  whose abundances depend on the evolutionary state of the cloud, are discussed.

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## CONFIRMATION OF ELECTRON TEMPERATURE GRADIENT IN OUR GALAXY

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Various assumptions used in interpreting recombination line observations are critically assessed to confirm the gradient of electron temperature with distance from the galactic center. The total temperature increase between 5 and 13 kpc is about  $2,500^\circ\text{K}$ . Among

many suggestions, we have singled out decrease of trace element abundances with the galactocentric distance as the most viable cause for the temperature-gradient. This will impose an important constraint on evolutionary models of the Galaxy.