formation. However, additional optical and infrared results are required in this ongoing research, in order to be conclusive about the CMa R1 population's nature.

THE FRACTAL DIMENSION OF CHA I CLOUD

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The use of the star counting method plays an important role in the history of the interstellar medium physics. Its resulting extinction in the visible, combined with observations of rotational molecular bands, enables the determination of many properties of molecular clouds (mass, density and other characteristics). We use CCD images to make star counts in the Cha I molecular cloud and in a reference region near the cloud, but free of obscuration. We propose a quantitative method for finding the best resolution for star counts, using the geometry of the distribution of stars observed by imaging the Cha I cloud. This method is based on fractal theory applied to distribution of points in the space. We also show that the apparent two-dimensional distribution of stars does not have a completely random distribution, but presents an organization with self-similarity geometry. The assumption of a random distribution of stars is a basis for most determinations of molecular clouds properties based on star counts. Besides, there are some implications concerning some evolutionary aspects. There are a number of measures of the fractal dimension of molecular clouds in many wavelengths and scales and their values are from about 1.21–1.28, from *IRAS* images, to 1.44–1.52, for star counts in the visible. From the theories of star formation and evolution of molecular clouds, one can try to relate these values to that obtained from the distributions of stars. A short model starts from the hypothesis that a given molecular cloud has no stars or star formation regions inside, but there are some gradients in density and temperature and a fractal dimension. Considering only the gravitational effects, the irregularities in density become stronger, due to migration of gas to the denser regions. Simultaneously, the mean optical depth decreases (the cloud evolves to be "transparent"), and the star counts taken through the gas increase. The model evolves until all the gas is confined in compact regions —that can be interpreted as new stars.

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ON THE STABILITY OF HOMOGENEOUS AND NON-HOMOGENEOUS THERMAL STRUCTURES OF MOLECULAR GAS

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The thermal stability of molecular gas structures is analyzed. A heating rate by cosmic rays and photoelectrons from grains, a cooling rate $\sim \exp(-\alpha/T)$ and a thermal diffusion by neutral particles are assumed. The linear stability of the thermal equilibrium steady state solutions: $(heating = cooling)$ is analytically carried out. In particular, instability criteria and explicit coupling relations between the resulting modes are obtained. The non-equilibrium thermal steady state solutions: $(heating \neq cooling)$ and the corresponding eigenvalue problem are numerically solved. Several implications for molecular regions of the interstellar medium are also discussed.

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THE CLUSTERING PROPERTIES OF THE YOUNG STARS IN ORION A AND λ ORIONIS

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Using synthetic models we investigate the possibilities of the two-point angular correlation function as a clustering searching/analyzing tool. We are particularly interested in the physical interpretation of features in the correlation function such as: power-law indexes, breaking points, and scale at which the correlation function goes to zero. In general, breaks are related with the clusters' radii and the correlation function goes to zero at the length of the clusters' configuration. The influences in the correlation function features of a background population in which the clusters may be embedded are also tested. The main effect depends critically on the density contrast between the clusters and the background population and is to dilute features in the correlation function.

This technique is applied to the study of the clustering properties of the Hα emission and OB stars in Orion A and to the λ Orionis association. The correlation functions for the Hα emission and the OB stars in Orion A are fitted by power-laws

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