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(Extra) galactic stellar aggregates

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Abstract. The study of open clusters naturally introduces many advantages, because they are physically related groups of stars held together by mutual gravitational attraction that were formed at roughly the same time from one large cosmic gas and dust cloud. Their evolutionary stages range from clouds where star formation takes still place at this moment, to very old aggregates with turn-off points as late as solar type stars. Therefore, they represent samples of Population I stars of constant age and comparable intrinsic chemical composition, suited for the study of processes linked with stellar structure and evolution, and they fix lines or loci in several most important astrophysical diagrams.

Key words: Galaxy: open clusters – stars: chemically peculiar

1. Introduction

Open clusters can be used to study the evolution and distribution of various stellar groups (e.g. chemically peculiar stars). But what is the accuracy of the presently known open clusters parameters? To answer this question, we have searched the literature for determinations of the age, distance and interstellar reddening of open clusters (Paunzen, Netopil 2006). For the final list, we have averaged the data of open clusters for which at least three independent estimates of the parameters are available. It contains 6437 individual estimations for 395 open clusters. This data was used to calculate means and the respective errors. While reddening seems to be quite accurate, ages and distances suffer from severe uncertainties. For the distance we find absolute errors of less than 20% for about 80% of the aggregates. But only 11% of the investigated open clusters have errors of age which are less than 20%. As last step, a set of 72 open clusters with the most accurate (in a statistical sense) errors were established. Those clusters should serve in the future as standard tablet for testing theoretical models.

1.1. Δa survey of galactic open clusters

The continuation of our Δa survey and the search for chemically peculiar stars in galactic open clusters includes the investigation of 16 further clusters (Paunzen *et al.*, 2006; Netopil *et al.*, 2007) spanning an age range of 60 to 500 Myr. Among the about 7000 objects studied (cluster members plus nonmembers) we were able

to find 48 new CP2's, 9 emission line stars and 27 objects which show a peculiar behaviour, but which is probably caused by binarity or variability. The data, in total 465 frames, was obtained at various observatories (ESO, Rozhen, CTIO, CASLEO and OSN), showing the flexibility of the photometric CP detection method. As an important application of the Δa system, isochrones were fitted to the color-magnitude-diagrams of the programme clusters, helping to improve the accuracy of the cluster parameters.

1.2. The peculiar star content in the Large Magellanic Cloud

The detection of magnetic chemically peculiar (CP2) stars in open clusters of extragalactic systems can give observational answers to many unsolved questions. For example, one can study the influence of different global as well local environments on the lack or presence of peculiarities. After the first detection of extragalactic CP2 objects in the Large Magellanic Cloud via Δa photometry (Maitzen *et al.*, 2001), the investigation continued with the works by Paunzen *et al.* (2005) and Paunzen *et al.* (2006). The sample studied comprises the LMC clusters NGC 1866, NGC 1711, the double cluster NGC 2136/7, their surroundings, and an independent LMC bulge field. We conclude from our investigations that the occurrence of classical chemically peculiar stars is 2.2(6)% in the LMC, which is only about half of the typical value in the Milky Way. The age and mass distributions, derived by applying appropriate isochrones, do not differ from those of CP stars in galactic open clusters. This provides a valuable observational source for understanding the CP phenomenon of the upper main sequence in a global environment different from our Milky Way.

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