Study of stellar populations and extinction in Local Group galaxies

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Изследване на звездни населения и екстинкция в галактики от Местната група

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(Анотация на Дисертация за образователната и научна степен "Доктор")

Detailed studies of stellar populations in galaxies are primarily important for accurate modeling of the stellar evolution in different environments. They are important for modeling the evolution of the galaxies themselves as well as for the determination of some of their basic parameters. Moreover, the stars are the only source of heavy elements in the interstellar medium so they define the chemical evolution of galaxies and also the optical properties of the interstellar dust - i.e. the way it scatters and absorbs the radiation coming from an astronomical object.

Good knowledge of dust extinction law and its dependence on wavelength is needed because all objects are observed through our galaxy at least and to obtain their absolute magnitudes we have to correct for this effect. In nearby galaxies different stellar populations can be resolved into individual stars and this gives us the opportunity to study comprehensively their photometric properties.

In this dissertation the study of stellar populations and extinction in three nearby galaxies - WLM, LMC and M31 is presented. The first two chapters of this work contain a short introduction and the basic characteristics of the studied populations and the properties of the interstellar dust.

The third chapter is devoted to the studies of the stellar populations. At first, the results from IR study of AGB stars in the Local group galaxy WLM are presented. The use of an observational criteria allows to discriminate between the oxygen-rich (M-type) AGB stars from carbon-rich (C-type) AGB stars. The ratio of the number of M- stars to C-stars is determined as well as the mean K-magnitude of C-stars. A comparison with similar results is performed and the differences are discussed. Gas-to-dust ratio in this galaxy has been obtained and allows to determine the individual extinction towards 5 identified Cepheids and in combination with the period-luminosity relation the true distance modulus of WLM has been found. In addition the disk scale

lenght of WLM is determined. Next, the results of the study of the slope of the Initial Mass Function both for stars in the OB associations and in the field of the irregular galaxy Large Magellanic Cloud (LMC) are presented. The influence of combining photometric data for stars at different evolutionary stages on the slope for large mass interval - from 9 $M_\odot$ up to 120 $M_\odot$ is investigated.

The forth chapter contains results of the studies of the extinction law and the properties of the dust. In the latter galaxy the total-to-selective ratio R_V which describes the extinction law is determined. BVRIJHK photometry of red supergiants (RSGs) was used and the differential extinction method was applied to different pairs of RSGs. In spiral galaxy M31 the radial distribution of the opacity and its possible correlations with the column hydrogen density is studied using 120 estimates of the extinction from the literature. The opacity of the disk of M31 at different galactocentric distances is also estimated by the use of distant galaxies seen through its disk. The observations of the distant galaxies are carried out in the near-IR filters HK. Obtained opacities are independent of the distance from the center and the values are representative for an optically thin constant disk with $A_V \sim 1^m$. Mean gas-to-dust ratio is also estimated.

The main results in this dissertation are summarized in the last chapter.

Key words: galaxies: stellar content, extinction; galaxies: WLM, LMC, M31

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