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Disposition, Sizes and Ages of Star Forming Regions in Disks of Galaxies

A. S. Gusev

Sternberg Astronomical Institute and Institute of Solid State Physics, Moscow, Russia

Abstract. An analysis of the parameters of the 71 star forming regions in the nine late type spiral and irregular galaxies is presented. The disposition, the sizes and the colors of the star forming regions are studied.

A study of disposition, sizes and colors of 71 star forming regions in 9 SBc and IBm galaxies is based on the *UBVRI* surface photometry data. Data for the galaxies NGC 3184, NGC 3726, NGC 4136, NGC 5351, NGC 5605, NGC 5665, NGC 6217, NGC 7292 and NGC 7743 were obtained with the 1-m telescope at SAO RAS (Caucaus) and 1-m and 1.5-m telescopes at Maydanak Observatory (Uzbekistan, MO) using EIC and CCD cameras TI-800 and K585. The average seeing for the MO and the SAO observations was about $0\farcs8$ and $2\farcs0$, respectively. They correspond to a linear scale ranging from 80 pc for NGC 6217 to 200 pc for NGC 7678, except for the farthest galaxy NGC 5351 (500 pc). All of the images were reduced using standard routines. ESO-MIDAS image processing package was used.

The ages of the star forming regions are estimated by their *UBVRI* colors using evolutionary synthesis method (Fig. 1). PÉGASE code was used. The diameters of star forming regions were determinated as FWMHs for regions having starlike profile, and as distances between points of a maximal light gradient. The correlation between age and size exists for young (age < 10 Myr) star forming regions. The younger regions have the larger average sizes (Fig. 2a). The distribution of the star forming regions by sizes shows a maximum at $100 - 350$ pc (Fig. 2b). It corresponds to the size of stellar aggregations in the hierarchical scale of star formation (Elmegreen & Efremov 1996). There are no single star forming regions with a size larger than 550 pc. The correlation between maximal diameter of star forming regions (D_{max}) and absolute blue magnitude of parent galaxy (M_B) exists. Our dependence $\log D_{max} = -(1.22 \pm 0.08) - (0.19 \pm 0.03) M_B$ is similar to the dependence found by Elmegreen et al. (1996) $\log D_{max} = -(1.47 \pm 1.72) - (0.22 \pm 0.09) M_B$. Most of the star forming regions in the galaxies are located in the Inner Lindblad Resonance ring and in other resonance rings (Fig. 2c). Distances between neighbouring star forming regions are approximately similar (Fig. 2d) in different ring galaxies, according to the theory of star formation in galaxies (Elmegreen 1994).

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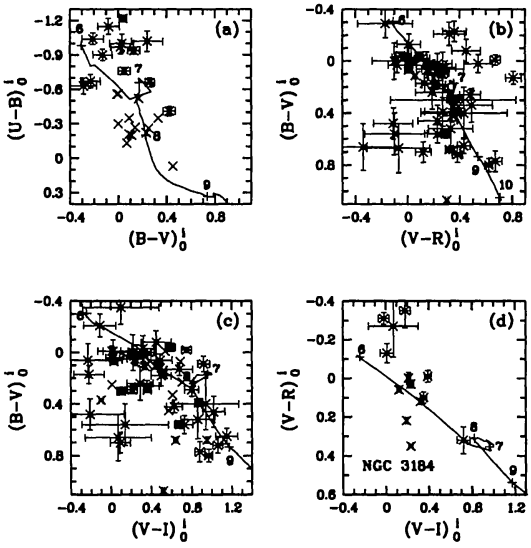

Figure 1. Two-colors diagram $(U-B)^i_0-(B-V)^i_0$ (a), $(B-V)^i_0-(V-R)^i_0$ (b), $(B-V)^i_0-(V-I)^i_0$ (c), and $(V-R)^i_0-(V-I)^i_0$ (d) for the star forming regions in the target galaxies. Solid curve is an evolutionary track of aging stellar system. Numbers indicate a logarithm of systems age in years.

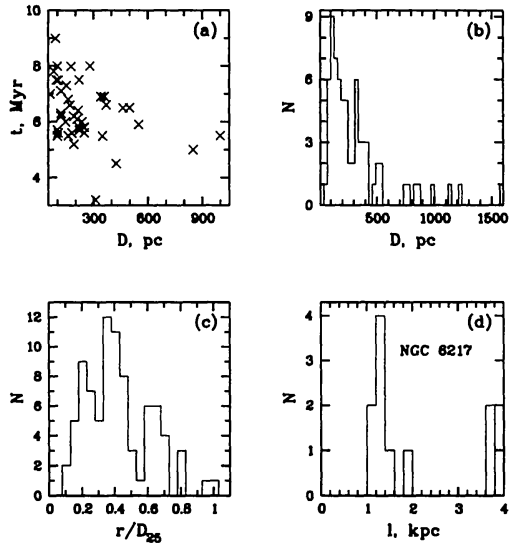

Figure 2. Correlation between ages and diameters for the young star forming regions (a); distribution of the star forming regions by diameters (b) and by galactocentric distance (c) for all the investigated galaxies; distance distribution of neighbouring star forming regions in NGC 6217 (d).

References

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