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EMISSION-LINE STARS IN THE ORION REGION

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I. INTRODUCTION

Under a cooperative program between Indonesia and Japan we have conducted wide and deep survey observations for Hα emission stars in the Orion star-forming region. Previous surveys for Hα emission stars in this region have been carried out by many authors, e.g., Haro and Moreno (1953), Herbig and Kuhi (1963), Herbig and Rao (1972), and Ogura and Hasegawa (1983). However, the survey area was so far mostly concentrated in the region of dark clouds and nebulosities, or the surveys were not sufficiently deep.

Our survey program of 300 square degrees extends far outside the dark cloud complex which contains twelve Kiso sky areas, i.e., A-0831, A-0832, A-0833, A-0902, A-0903, A-0904, A-0905, A-0974, A-0975, A-0976, A-1047, A-1048, each of 5° × 5°. The full-length paper for the first result for Kiso sky area A-0904 were presented by Wiramihardja et al. (1989), followed by the second results by Kogure et al. (1989) for area A-0903, the third results by Wiramihardja et al. 1991 for areas A-0975 and A-0976, the fourth results by Wiramihardja et al. (1993) for areas A-1047 and A-1048, and the fifth results by Nakano (1995) for areas A-0831, A-0832, A-0833, A-0902, A-0905 and A-0974.

II. OBSERVATIONS

For the whole works of spectral and direct observations we used mainly the Kiso (105/150/330 cm) Schmidt telescope, and partly the CTIO Curtis (61/91/213 cm) Schmidt telescope, with dispersions of 700 Å mm^{-1} and 600 Å mm^{-1} at Hα, respectively. The plate-filter combinations are 103aE+RG610 or IIIaF+RG610 or 098-04+RG610 for Kiso and IIIaF+RG630 for CTIO. All emulsions were hypersensitized by baking in forming gas before exposures and the spectra were not widened with exposure time ranges from 10 to 120 minutes. In all cases the direct-image plates were collected with the Kiso Schmidt telescope with plate-filter combination of IIaD and GG495. The exposure time is from 10 to 45 minutes.

III. INSPECTION AND MEASUREMENTS

The spectral plates were inspected visually using magnifiers to detect Hα emission stars, and the Hα emission stregth relative to the adjacent continuum was estimated by eye into six grades of 5 (very strong), 4 (strong), 3 (medium), 2 (weak), 1 (very weak), and 0 (suspected or doubtful). A total of 1220 Hα emission objects, including 29 non stellar objects, were thus detected among which 804 are new Hα emission stars. The celestial coordinate of the Hα emission objects were determined using the V-band plates. The accuracy of measurements is better than 2(for each coordinate. The V-magnitudes were also measured on the same plates with the iris photometer at Kiso Observatory with an accuracy of about 0.1 mag. The limiting magnitude is between V = 17.0 and 17.5

IV. RESULTS

The apparent magnitude of the stars are roughly from V = 13 to V = 17.5. If we adopt a distance of 450 pc to the Orion complex and assume the interstellar absorption of Av 1 mag, these magnitudes imply that the detected Hα emission stars are mostly T Tauri type stars. These are confirmed by spectroscopic observations for a sample of the Hα emission stars which show that most of them reveal T Tauri star characteristics in their spectra (Kogure et al. 1992).

It is found that the Hα emission stars with strong Hα intensity locate in or near dark cloud, while the Hα emission stars with weak Hα intensity are widely distributed over the whole region.

For surface distribution of all Hα emission stars we found that the surface densities in the outer areas are remarkably lower than the adjacent inner areas. It is also found that the distribution of emission line stars extends toward the western direction.

Remarkable difference is seen between the surface distribution of emission-line stars and that of the Ori OB1 association members. Characteristics of the star formation activities in this region and relationship with other young stellar objects or with other nearby star-forming regions will be discussed in another paper.

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