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New M-Type Variables in Galactic Dark Clouds

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Abstract. We present the results of the classification of newly discovered M-type variables obtained as part of an H-alpha survey of Galactic dark cloud regions.

1. Introduction

Long Period Variables (LPVs) are an important phase of red giant and supergiant stars. A large proportion of these are Mira Ceti stars. They represent one of the best distance indicators to galaxies, and they are also useful in the study of galactic structure. Relatively little is known about the precursors of LPVs, and their masses and luminosities are not well determined. This is due to the fact that almost all Galactic LPVs are isolated members of the main field. The studies of the Galactic kinematics of LPVs (Feast 1963) show that they evolve from stars of typically 1.2 $M_{\odot}$. A few LPVs are known to be members of old Galactic globular clusters, and a few supergiant examples are known in very young open clusters. No large-amplitude LPVs are known to belong to clusters with a turn-off mass in the range 1-9 $M_{\odot}$. It is this range of stellar masses that mainly gives rise to the high mass loss rate AGB stars, such as Mira variables, OH/IR stars and dusty carbon stars, which are the major contributors of material to the interstellar medium (Schild 1989). In this report, the preliminary results of 21 newly discovered red variables in 3 Galactic dark cloud regions are presented.

2. Observations

The observations were performed with the 40″ and 2.6m telescopes of Byurakan Observatory. The 40″ Schmidt camera was used in the discovery of these stars. The observational material for the spectral classification of the new variables was obtained with the 2.6m telescope. More detailed descriptions of the detectors and the observational methods employed have been published previously (see Melikyan & Karapetian, 1997 and Movsessian et al, 2000).

3. Results

The details of the discovery of these variable stars have been published by Magnan et al (1997). The spectral classes of the first 6 stars was reported by Magnan et al (2000) at the Montpellier workshop on Mira Ceti type variables. The main results presented in this paper are the spectral classification of 21 new red variables, which were done with two different methods. The first method used is the classical method of classification described by Jaschek and Jaschek (1987). The second method was the quantitative spectral classification suggested more recently by Mulyato et al. (1997) on the Galactic K-M stars.

The results of this study have shown that, the spectra of 11 variable stars show the H_α emission. It is worth noting that the detected H_α emissions of these 11 stars shows a change of intensity, which is one of the important characteristics of LPVs. The second interesting fact is that 8 of the 21 variables are identified with previously known infrared sources. Finally, 18 variables out of 21 are situated in, or near, the association Cyg OB7 where 40 new H_α objects and 3 groups of HH objects (Melikian & Karapetian 2001, Harutyunyan & Melikian 2001), have been discovered. The view that LPVs are progenitors of planetary nebulae, makes the further study of the discovered stars very important.

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