The investigation of novae with the small telescopes.

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The program to search for new variable stars in external galaxies and their study has been held for more than 30 years. It was launched in 1968 on the initiative and under supervision of prof. A.S. Sharov. The program included photographic observations with wide field telescopes of the Sternberg Astronomical Institute of Moscow State University (40-cm astrograph and 50-cm Maksutov camera of Crimean Laboratory - AZT-5) and the Schmidt telescope at the Baldone Astrophysical Observatory of the Institute of Astronomy of Latvian University (principal investigator Dr. A.A. Alksnis). The picture of AZT-5 is shown in Fig. 1.

The main feature of this program was the coverage of a wide field around M31 by observations. The plates cover a field of 3.5x3.5 degrees.

The filters that reproduced the B photometric system were usually applied. ORWO ZU-2 and ZU-21 plates were used for a long time (1961-1993 yrs) with the limiting magnitude of about 17-16 mag.

Earlier studies of the central regions of galaxies were difficult because of the strong overexposure. There are two sets of the plates, the first one with 15 minutes exposition and the second one with 60 minutes exposition. Now the modern CCD technique has replaced the photographic observations.

From 1993 to 2005 the NT-1 AS plates manufactured by DAR company (chief technologist D.K. Mihailov, Pereslavl-Zalessky, Russia) were used. Due to the fact that a fine-grained emulsion was used it became possible to increase the limiting value of plates up to 21 mag for the best plates. The Moscow plate collection contains 678 plates of the M33 galaxy and 1862 plates of the M31 galaxy. The Baldone plate collection contains about 600 plates of the M31 galaxy. The example of the M31 (Andromeda Nebula) photo plate is presented in Fig. 2.

The investigation of novae with BVRı-bands are shown in Fig. 3. Some values has been taken from [2, 3]. It should be noted that the data by V. Burwitz [3] laid previously on the site, which currently does not exist. The colour-indices curves are presented in Fig. 4. It is seen that the decrease of $B-V$ index changed to its increase 10 days after the outburst. While the colour-index V–R increased slowly, the R index was practically stable. The $B-V$, $V-R$ diagram (Fig. 5) shows the object displaced from MS (sp G0, 4 day AO) right and up (11 day AO). Thereafter the position of the object was shifted downward (17 AO).

References:

1) R. Quinn et al., Astron. Telegrams 600 (2005a)
3) V.Burwitz, the data early were presented here: www.burwitzastro.info/OAM/M31/home/200509

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Fig. 1. 50-cm Maksutov kamera of Crimean observatory (AZT-5), photo by V. Metlov

Fig. 2. The example of the M31 (Andromeda Nebula) photoplate.

Fig. 3. The light curves of Nova 2005-13 in M31.

Fig. 4. The light curve in $B$-band and the colour-indices curves. The days after outburst (AO) are indicated in upper axis.

Fig. 5. A track of the Nova on the two-colour diagram. Arabic numerals near the blue points denote the days after outburst (AO). The uncertain values are designated by open symbols in Figs. 4 and 5.

Nova M31 2005-13 is a slow nova because $T_2$ is equal 18 days (for slow novae $T_2$ = 2-13 days). Using $T_2$ it is possible to evaluate absolute magnitude of Nova following the formulae from papers [4, 5, 6]. Hence it appears that $M(V)\approx -8.3 \pm 0.3$. Accepting distance modulus for M31 equal 24.2 mag, we get $M(V) = -7.7$. Both values are very close. The presented investigation of Nova 2005-13 is a good example of the research program “Novae in the external galaxies” which is realized with the small telescopes.