TIME RESOLVED PRECISION DIFFERENTIAL PHOTOMETRY WITH OAFA'S DOUBLE ASTROGRAPH

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For the last 50 years, the Double Astrograph located at the Carlos U. Cesco station of the Observatorio Astronómico Félix Aguilar (OAFA), San Juan province, Argentina, was used for astrometric observations and research. The main programs involved the study of asteroid positions and proper motions of stars in the Southern hemisphere, being the latter a long time project that is near completion from which the SPM4 catalog is the most recent version. In this paper, new scientific applications in the field of photometry that can be accomplished with this telescope are presented. These first attempts show the potential of the instrument for such tasks.

The Double Astrograph consists of two 51-cm diameter lens, one optimised for blue light and the other for yellow light. They focus the incoming light separately on two CCD cameras located at their focal planes. The objective lenses are four-element Ross-type astrographic lenses with a bandwidth spanning from 410-nm to 480-nm for the blue lens and from 520-nm to 570-nm for the yellow lens. There are B and V Bessell filters placed in front of each CCD camera. Mounted at the yellow lens telescope there's a Spectravideo Pixelvision model SV40CAF, 4096 × 4096 pixels CCD array. At the blue lens telescope there's an Apogee Alta E-42, 2048 × 2048 pixels CCD array. In order to analyse the photometric precision of the system, two previously studied, well known open clusters were observed: Blanco 1 (Moraux et al. 2007) and NGC 2243 (Kaluzny et al. 1996). For Blanco 1, groups of 5, 10, 30, 60, 120 and 300 second exposure frames were taken to measure the Signal-to-Noise Ratio (SNR) while the cluster was transiting the meridian. For NGC 2243, 12 exposures of 30 seconds each were taken, with time intervals to amount a total of 80 minutes of observing time. A previously known eclipsing binary system (Kaluzny et al. 1996) was identified in the frames obtained. It has an orbital period of 1.42 or 2.48 days and a 0.7-mag amplitude. Figure 1 shows part of the eclipse observed during the observing run. From the obtained results it is reasonable to expect millimagnitude errors for stars m(V) = 13.01 or brighter and m(B) 11.76 or brighter. If the precision required is of the order of a hundredth of magnitude one can safely observe down to m(V) = 16.00 and m(B) = 12.3. This numbers make the Double Astrograph stand as an interesting option for the detection of exoplanets using the Variation Time Transit (VTT) technique (Agol et al. 2005). Other possible targets include variable stars that have periods on the order of hours, such as RR Lyr, Delta Sct, SX Phe, W Uma eclipsing binaries, some cataclysmic variables and BY Dra. It is worth to note that the field of view in both telescopes, but specially in the V telescope (56.2 x 55.5 arc-minutes) allows to find easily two or more comparison stars most of the time, which is vital to perform good differential photometry.

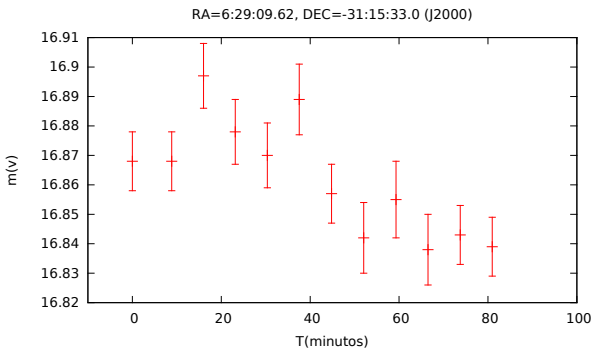

Fig. 1. Eclipsing binary system at NGC2243 Open Cluster.

REFERENCES

Girard, T. M. et al. 2011, AJ, 142, 15
Moraux, E. et al. 2007, JENAM-2007, 11, 11
Kaluzny, J. et al. 1996, A&ASS 118, 303
Agol E., et al., 2005, MNRAS, 359, 567

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