TIME RESOLVED PRECISION DIFERENTIAL PHOTOMETRY WITH OAFA'S DOUBLE ASTROGRAPH

Eric P.A. González[1], Federico Podestá[1,2], Ricardo Podestá[1,2], Ana Mara Pacheco[1,2]

For the last 50 years, the Double Astrograph located at the Carlos U. Cesco station of the Observatorio Astronmico Felix Aguilar (OAFA), San Juan provence, Argentina, was used for observations and research in the field of astrometry. 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 51cm diameter lens; one optimized for blue light and the other for yellow light. They focus the incoming ligth separately on each CCD camera located at their focal planes. The telescopes are four element Ross type astrographic lenses with a bandwidth spanning from 410nm to 480nm for the blue lens and from 520nm to 570nm 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, 4096x4096 CCD. At the blue lens telescope there's an Apogee Alta E-42, 2048x2048 pixels array. In order to analyze the photometric precision of the system, two previously studied, well known open clusters were observed; Blanco 1 (Moraux 2007) and NGC 2243 (Kaluzny 1996). For Blanco 1, groups of 5, 10, 30, 60, 120 and 300 second exposure images were taken to measure the Signal to Noise Ratio (SNR) while the cluster was transiting the meridian. For NGC 2243, 12 exposures 30 seconds each were taken, with time intervals to cover 80 minutes of observing time. A previously known (Kaluzny 1996) eclipsing binary system was identified in the images obtained. It has an orbital period of 1,42 or 2,48 days and a 0.7m amplitude. Figure 1 shows part of the eclipse observed during the observing run. From the obtained results

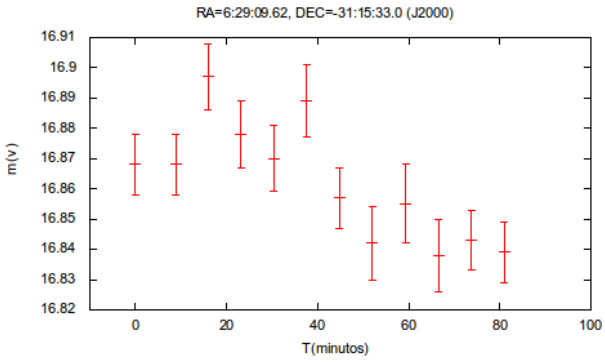

Fig. 1. Eclipsing binary system at NGC2243 Open Cluster.

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 up 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 Variation Time Transit (VTT) technique (Espinoza 2010). 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) permit to find easily two or more comparison stars most of the time, wich is vital to perform good differential photometry.

REFERENCES

The Southern Proper Motion Program IV. The SPM4 Catalog. T. M. Girard, W. F. van Altena, N. Zacharias, K. Vieira, D. I. Casetti-Dinescu, D. Castillo, D. Herrera, Y. S. Lee, T. C. Beers, D. G. Monet, C. E. Lopez

Moraux et al (2007) 2007jena.confE..11M

Variable stars in the field of the old open cluster NGC 2243, J. Kaluzny 1 , W. Krzeminski 2 and B. Mazur 3. Astron. Astrophys. Suppl. Ser. 118, 303-310 (1996)

Transit Timing Variations, Nstor Espinoza Mon. Not. R. Astron. Soc. 15 (2010)

[1]Universidad Nacional de San Juan - Argentina.
[2]Observatorio Astronómico Félix Aguilar - Universidad Nacional de San Juan - Argentina.