

CCD OBSERVATIONS OF SOLAR SYSTEM BODIES FROM BELGRADE ASTRONOMICAL OBSERVATORY

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Abstract. Possibilities of "small instruments" with new CCD devices have been discussed as well as the corresponding observational programs on Belgrade Observatory and their improvements with new instruments.

The exceptional success of the Hipparchos Mission and the start of new cosmic programmes such as DIVA, SIM, GAIA, FAME, etc, make the sense and development of terrestrial investigations performed with optical instruments narrower and narrower. In this connection especially the importance of "small instruments" is diminished and as such all instruments with objective diameter less than 1 m are thought. In more rigorous considerations telescopes under 2 m are viewed as "small-dimension" devices. Nevertheless, the case of a majority of observatories all over the world is that instruments under 1 m are still used, but the scientific programmes are aimed at complementing the basic actions carried out actually with telescopes of all essentially large observatories all over the world.

For instance, in the framework of the IAU there is a working group for "Future Development of Ground-Based Astrometry" which has indicated the main possibilities of using "small telescopes" in the future observations of exceptional astrometric importance. This especially concerns the detection of all astronomical phenomena having a higher scientific importance over long time intervals and where the results are still indispensable in the developing of theoretical models and analysing of their dynamical parameters. Observations of Solar-System minor bodies have grown in their importance during the last two decades, besides all Near Earth Objects and those concerning natural satellites of major planets, to be added astrometric and astrophysical observations of comets and observing of extragalactic radio sources aimed at redefining of optical and radio reference networks in the connections of extending the Hipparchos Catalogue towards fainter objects.

Some observing programmes are aimed at correcting of the dynamical parameters for Solar-System minor bodies with respect to ICRF, as well as at improving the mass values for these objects. The search for a transneptunian population, asteroids, binary and multiple stars, variable stars, extrasolar planets, etc is also actual.

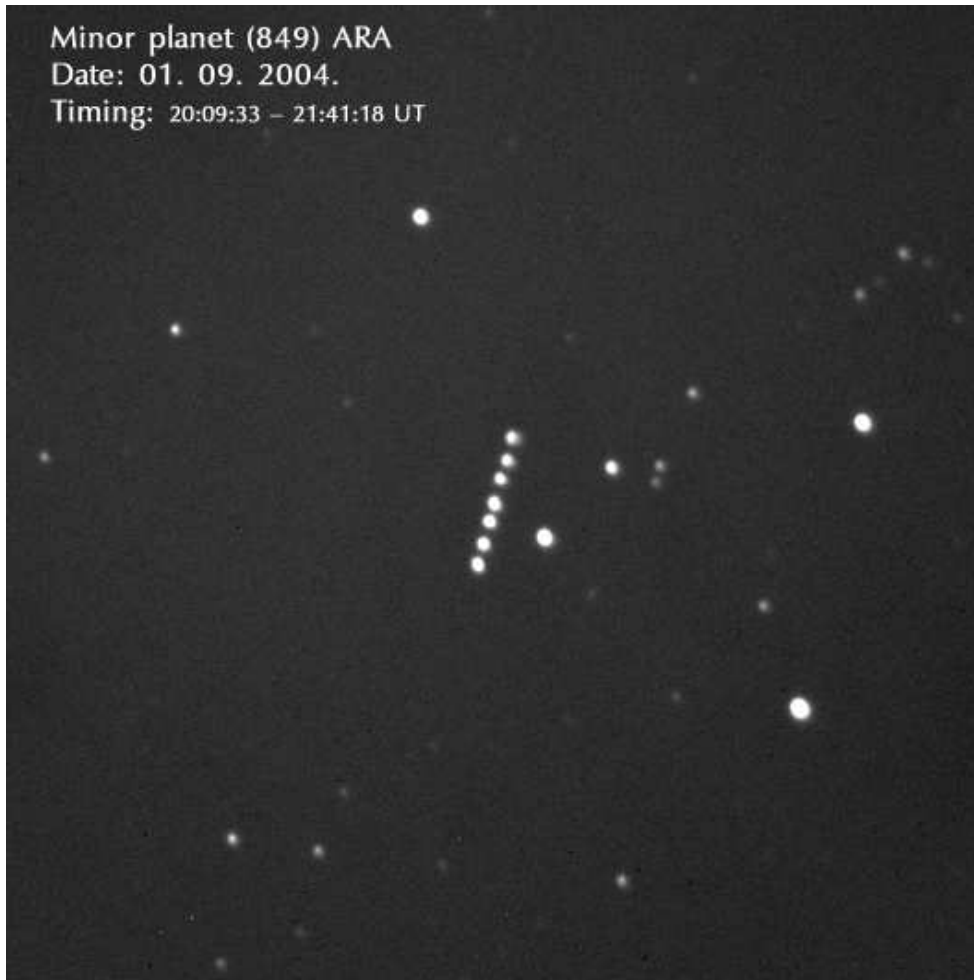


Figure 1: Picture of the globular stellar cluster M 13 obtained by the new instrument.

During the last twenty years an exceptional technological revolution took place in the developing of new CCD detectors which have found application in many sciences, especially in astronomy.

The development of these devices has been followed by a corresponding evolution of hardwares, softwares and programming packets, all of this in order to make the treatment of observational material as rapid and efficient as possible.

The Astronomical Observatory in Belgrade has a relatively long and non- interrupted tradition in discovering and observing minor Solar-System bodies - as early as from the distant 1935 - almost over full 70 years.

The first CCD observations were initiated in 1994: a CCD SBIG ST - 6 camera was mounted on the Zeiss 65/1055 cm Refractor and in July in the same year the

disruption of Shoemaker-Levy 9 comet and the falling of its fragments onto Jupiter was observed. During the systematic observation of this exceptionally rare phenomenon by applying the new technique, from Belgrade Observatory, 233 CCD successful records were obtained by L. Č. Popović.

Within the framework of the research project "Positions and Motion of Solar-System Minor Bodies" the following observational activity is carried out:

- : follow up of minor planets, especially for the NEO asteroids and objects of unusual dynamical characteristics**
- : keeping under observations of new and periodic comets**
- : observations of major planets and their satellites**
- : participation in international observing campaigns concerning Solar and Lunar eclipses, transits of inner planets across the Solar disc, occultations of stars by the Moon, minor planets and comets, mutual occultations and eclipses among the satellites of Saturn and Jupiter, etc.**

The observations done at the Observatory with instruments of relatively modest dimensions have been improved due to the successive use of CCD cameras **SBIG ST 6, ST 7, ST 8** in this decade and during the last two years camera **APOGEE AP 47p 1056 × 1020 pxs (13 × 13 microns)**. This camera, having exceptionally good performances when recording of back illuminated objects is the case, combined with an astrograph yields a field of 36.9×35.6 arc minutes, i. e. of 4.4×4.3 arc minutes in the case of the Zeiss Refractor. Besides, the high quantum efficiency of this camera (90%) contributes significantly to the quality of the obtained images and to the number of objects detectable from the Observatory. The faintest object taken with the Zeiss Astrograph and this camera was a minor planet with an apparent magnitude of **17.2!**

Recently, we expect the new instrument Meade 16" LX 200GPS-SMT fully automated, which will be used for improved astrometrical work of NEAs as well as for precise photometry of Solar system bodies and stellar systems.