

Astrometry by small ground-based telescopes

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Abstract. Many small ground-based telescopes (with diameter less than 2m) allow us to perform programs of observations well adapted to astrometric measurements. The improvement of limiting magnitudes thanks to the use of CCD detector and their availability make them very useful for follow-up programs or observations on alert. This communication gives several examples of research carried out by members of the IAU working group “Astrometry by small ground-based telescopes”. We also propose setting up of a network of observers for the Gaia follow-up observations.

Keywords. astrometry, surveys, telescopes, asteroids, occultations

1. Introduction

What is the interest to use small telescopes for astrometry nowadays when we can access new technologies on large telescopes or in space? What will be the use of small telescopes for astrometry once the Gaia mission provides a variety parameters for astrophysical objects and Solar System bodies with a never reached accuracy? Our Working Group intends to give the answers to these questions, by collecting information on research programs carried out and on scientific results obtained thanks to these instruments. The WG would also like to promote new astrometric programs.

2. Overview

Small telescopes (up to 2 m diameter) are numerous and generally easier to access than the larger ones. These characteristics are precious and we can get benefit from them by performing well adapted programs, in particular, observations on alert or long term programs. A census organized in 2006 by our working group showed that many programs are active. Some of them will be no more relevant after the Gaia mission but may

† Astrometry by Small Ground-Based Telescopes Working Group members: Andrei A., Arlot, J.-E., Pinigin G., Bazey N., Gontcharov G., Gumerov R., Jin Wenjing, Muinos Haro J., Niarchos P., Pereira Osorio J., Pascu D., Pauwels Th., Prostyuk Y., Pugliano A., Rafferty Th., Russell J. L., Rylkov V., Sanchez M., Shulga A., Souchay J., Tang Z. H., Teixeira R., Upgren A., van Altena W., Vieira Martins R., Zacharias N

nevertheless contribute to its preparation. Our website at <http://www/imcce.fr/astrom> provides this list.

3. Several international cooperations

Several projects are based on the use of the small telescopes leading to international cooperation. We can for example mention the following examples. Astrometry for the prediction of stellar occultation can be a key program in order to organize the campaign for these events. The small telescopes can carry out the photometric observations and guarantee the success thanks to the longitude and latitude coverage. Such events have been successfully predicted and observed recently by Sicardy *et al.* (2006), in particular thanks to 60 cm to 1.6 m size telescopes of the Laboratório Nacional de Astrofísica (LNA, Itajuba, Brazil) by the Rio Group (Assafin M., Andrei A., Vieira-Martins R., Veiga C. and colleagues from Observatório Nacional/MCT and Observatório do Valongo). Small telescopes can perform the photometry of mutual events of natural satellites which are currently predicted for the Galilean system, but also the Saturnian and the Uranian satellites. A campaign is organized by Arlot *et al.* (2006) and lightcurves will give highly accurate astrometric measurements. Mutual events of satellites of asteroids can also be performed to get the measurement of shape, size, and the determination of orbital elements (Descamps *et al.* 2007). Another international collaboration is involved in the CCD astrometry of ICRF radio sources. The Rio Group and astronomers from the Astronomical Institute of the Romanian Academy and USNO currently use small size telescopes in this work (Assafin *et al.* 2003).

4. A ground-based network for a Gaia follow-up

Small telescopes are involved in the organization of a ground-based network for the Gaia follow-up. This network will have the goal to supplement some Gaia observations for specific Solar System objects (Thuillot 2005). Supplementary astrometric observations could be necessary for some fast moving Near Earth Asteroids, Inner-Earth orbit asteroids, for improvement of orbits and photometric measurements could be necessary for objects suspected in cometary activity. Furthermore, astrometric observations will be useful to supplement the observations of asteroids by Gaia gravitationally deflected during asteroid/asteroid encounters on dates close to the edge of the mission (Mouret *et al.* 2007). Setting up such a ground-based network of observers dedicated to the Gaia follow-up is in progress. Several candidate sites are already identified but new locations are welcome in order to cover a large span of longitudes and latitudes.

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