Biannual Report 2021-2022
IAU Division A Working Group
Astrometry by Small Ground-Based Telescopes

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Jean-Eudes Arlot (IMCCE, Paris Observatory, France) reports on the observation of mutual events of the Galilean satellites which provide high-quality data allowing to reach an unprecedented resolution in the satellites' dynamical models. A worldwide campaign

of observations of the mutual events of the Galilean satellites was conducted by IMCCE, Paris, France and Sternberg Astronomical Institute, Moscow University, Moscow, Russian Federation in 2021. The magnitude of the Galilean satellites is sufficiently bright to allow observations with very small telescopes that increases the possibility of their observations. 37 observers from 18 different sites of observation observed 85 phenomena in spite of many difficulties: the campaign must be conducted only during the occurrence of the events (when the Earth and the Sun pass through the equatorial plane of Jupiter) and during the opposition of Jupiter as seen from the Earth. Unfortunately, the maximum of events occurred during the conjunction of Jupiter with the Sun. A publication of the results is in preparation.

Jean-Eudes Arlot reports on the ongoing digitizing project of photographic plates at IMCCE, Paris Observatory, France. From 1890 to 1990, astronomical observations were taken mostly using photographic plates at small telescopes with apertures from 30 cm-refractors to 2 m-telescopes. The project will consider some of these plates, reduction of them using new accurate star catalogues such as GAIA for astrometry, so it will be possible to measure the past observations with today's accuracy. The works conducted at the present time are related to natural satellites astrometry and Be stars spectroscopy.

Marcelo Assafin and Roberto Vieira-Martins report on the astrometric and photometric use of the T0.6m and T1.6m telescopes at the Observatorio do Pico dos Dias (OPD), Brazil. Dozens of nights at each telescope were used to observe small bodies, mostly TNOs, dwarf planets and natural satellites of Jupiter and Uranus, but also Jupiter Trojan asteroids. TNO observations were dedicated for the prediction and observation of stellar occultations. The Uranus system was observed with the technique of mutual approximations between the main satellites (Santos-Filho et al., 2019). Astrometry of Jupiter irregular satellites was also made. They observed 5 mutual events of the Galilean satellites plus one of Thebe that were visible at OPD for the 2021 season.

Charlie Thomas Finch (U.S. Naval Observatory, USA) reports that astrometric and photometric observations continue with the Deep South Telescope (DST) after a long pause in 2020 due to the COVID-19 pandemic with 10,298 exposures taken in 2021 and 17,639 exposures taken in 2022. The main goal is to monitor a select list of extragalactic celestial reference frame sources (AGN, QSOs) to better understand the radio-optical position offsets. As a secondary project, we are also looking at implementing a bright star

photometry program on the optical arm of DST taking advantage of the Marana camera capabilities. The principal instrument (Sophia 4K CCD) is still down for repairs. We plan to have the 4K back on DST by mid-year. The IR camera for the optical IR port on DST is ready to be installed. This will support an ICRF photometric characterization and monitoring effort and allow for southern-sky imaging of infrared-bright objects.

William Thuillot (IMCCE, Paris Observatory, France) reports on the activity related to astrometry by small ground-based telescopes, focused on monitoring Gaia alerts for solar system objects (SSOs). As soon as Gaia detects an uncatalogued mobile source, an alert is triggered via a public website to the Gaia-FUN-SSO network. At the time of writing, about 300 uncatalogued SSOs, either newly detected or with imprecise orbits, have been observed and their astrometry provided to the IAU Minor Planet Center. These observations were made by telescopes of one meter diameter or less at the Las Cumbres Global Telescope, Observatoire de Haute-Provence, C2PU at Calern-OCA, Terskol, Kyiv Comet Station, Odessa-Mayaki, Abastumani (Carry et al., 2021).

The IAU Focus Meeting 10 “Synergy of Small Telescopes and Large Surveys for Solar System and Exoplanetary Bodies Research”, https://iaufm10.org, supported by the Working Group was successfully held at the XXXI IAU General Assembly in Busan, Republic of Korea on August 2-11, 2022. In total, there were 49 talks by 48 scientists from 27 countries communicated to the participants within two days. The SOC was comprised of three members of this WG (Marcelo Assafin, Anatoliy Ivantsov, and William Thuillot).

Concluding Remarks

Small telescopes with apertures less than 2 m are still useful for getting accurate astrometric measurements of Small Solar System Bodies, natural satellites and extragalactic sources either through direct imaging or using photometric measurements of mutual events. The Working Group is actively facilitating the exchange of information, coordination of campaigns and setup of telescope networks. Further details are provided on the continuously updated webpage at https://iau_wgnps.imcce.fr.

Anatoliy Ivantsov & Marcelo Assafin

Chair & Co-Chair of Working Group

References

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Santos-Filho, S., Assafin, M., Morgado, B.E., Vieriera-Martins, R., Camargo, J.I.B. et al. 2019, Mutual approximations between the five main moons of Uranus, MNRAS, 490, 3464-3475; doi: 10.1093/mnras/stz2841.