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Astrometric results of observations of mutual occultations and eclipses of the Uranian satellites in 2007

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Abstract

Context. The photometry of mutual occultations and eclipses of natural planetary satellites can be used to infer very accurate astrometric data. This can be achieved by processing the light curves of the satellites observed during international campaigns of photometric observations of these mutual events. **Aims.** This work focuses on processing the complete database of photometric observations of the mutual occultations and eclipses of the Uranian satellites made during the international campaign in 2007. The final goal is to derive new accurate astrometric data. **Methods.** We used an accurate photometric model of mutual events that explicitly depends on parameters that these accurate observations should be sensitive to, including the albedos of the satellites. Our original method is applied to derive astrometric data in relative positions from photometric observations of mutual occultations and eclipses of the Uranian satellites. **Results.** We process the 41 light-curves obtained during the international campaign of photometric observations of the Uranian satellites in 2007. The root-mean-square (rms) of the residuals "observations minus calculations" (O-C) with respect to theory for the best 34 observations are equal to 10.3 and 17.7 mas in right ascension and declination, respectively. For five observations only the position angle was derived. Topocentric or heliocentric angular differences for satellites pairs were obtained from 25 central instant offsets between observation and theory during the time period from May 4, 2007 to January 4, 2008. **Conclusions.** The rms of the residuals is from 10 to 20 mas that corresponds in situ to 10 to 20 km. These mutual event observations appear to be the most accurate astrometric ground-based observations of the major Uranian satellites to-date and should be used for dynamical purposes. © 2013 ESO.

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Keywords

Ephemerides, Planets and satellites: general