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The results of the 2015 campaign of observation of mutual events of the Jovian satellites

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Abstract

From September 2014 to June 2015 mutual events of the Galilean satellites occurred around the Jovian equinox occurring on February 6, 2015. The observations of these events provide very accurate information on the relative astrometry of the satellites. Previous campaign of observations have shown the high interest of such observations now performed mainly by amateur astronomers: the Galilean satellites are bright and the magnitude drop during these events is easily observable. The 2014-2015 campaign is especially favorable because of the maximum of events which will occur during the opposition between the Sun and Jupiter. More, eclipses of Thebe and Amalthea by the Galileans have been observed. Note that the positive declination of Jupiter made the observations easier inthe Northern hemisphere where, unfortunately, the meteorological conditions were bad.

1. The mutual events

The mutual occultations and eclipses of the Galilean satellites of Jupiter are now observed since 1973.It has been demonstrated that the astrometric accuracy of the deduced relative positions of the satellites is good enough to refine the dynamical models of these objects. These observations usefully complete the astrometric positions derived from imaging the Jovian system. Note that the bright magnitude of the satellites prevents from easy imaging of the system. Sophisticated filters are needed, making the observations not enough numerous.

2. The Phemu campaign

In order to be able to observe as many events as possible, we need a network of observers worldwide that allows us to catch most of the events as we did previously (Arlot et al. 2014). At the date of the writing of this abstract (April 2015) we received about 300 observations under the form of light curves. Some examples are shown in the figures herewith. A website has been especially set up in order to help the observers (see www.imcce.fr/phemu). A page for uploading the data is also available.

3. The observations

Below, you will find an example of an included figure. You should use the “Figure_caption” auto-formatting style for the caption.

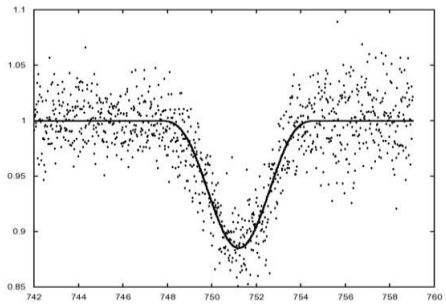

Figure 1: 3E1 on January 19, 2015 (SCO)

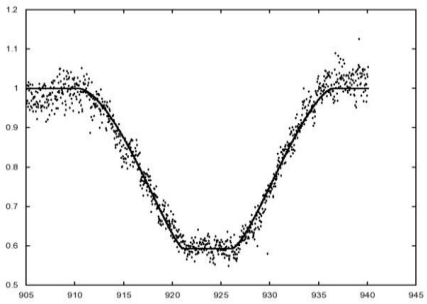

Figure 2: 3O1 on December 28, 2014 (KUR)

4. Observing Amalthea and Thebe

Among the mutual events, some are very specific: there are the occultations and eclipses of Amalthea and Thebe by the Galilean satellites. Only the eclipse are easily observable because of the large magnitude drop, the satellite disappearing completely. Note that the difference of magnitude between the Galileans and the small inners is about 10 magnitudes making the observation of both at the same time impossible. We succeeded to observe a few events as Christou made it during the former campaign in 2009 (Christou et al. 2010). Light-curves obtained are shown below.

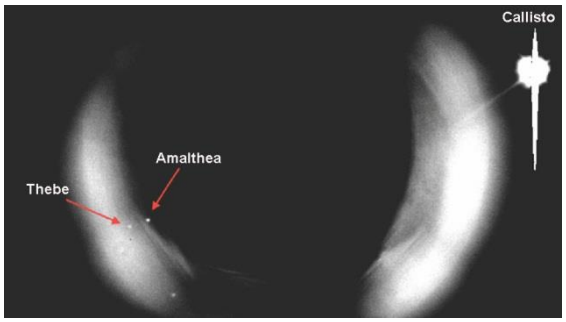

Figure 3: Amalthea and Thebe as seen on the 1m-telescope at Pic du Midi Observatory

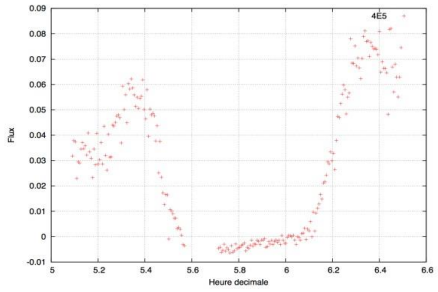

Figure 4: Eclipse of Amalthea by Callisto

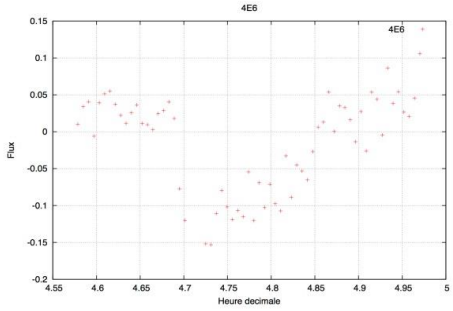

Figure 5: Eclipse of Thebe by Callisto

5. Summary and Conclusions

As we did during the previous campaigns, we obtained useful observations for studying the dynamics of the Galileans. More, we succeeded to observe the inner Amalthea and Thebe. We now look forward planning observations during the next years when no mutual events occur. After the arrival of the Gaia astrometric reference catalogue, new types of observations should be started on ground based observatories (Arlot et al. 2012).

Acknowledgements

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