An international network of observations for the International Year of Astronomy

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Abstract

The equinox of Jupiter, defined as when the Sun passes through the plane of the equator of Jupiter and hence through the orbital plane of the Galilean satellites, will take place in 2009. The French committee for IYA2009[1] will take this opportunity to propose coordinated observations. The equinox of Jupiter is favourable for many events such as eclipses of the Galilean satellites by the planet Jupiter, occultations and transits and also mutual phenomena among the satellites themselves. These events are very easily observable, even with a small telescope, since the Galilean satellites are very bright. The events are spectacular since the satellites will disappear within a few seconds. We propose that these phenomena be observed worldwide by amateur astronomers, students and schoolchildren. Observers should send their data to a central web-site which will analyse each observation and provide a database of all the observations. Many observations can be explained in terms of the physics and the dynamics of the Galilean satellites themselves. The history of astronomy is also relevant as the Galilean satellites were the first celestial objects observed extensively from Earth and were used as the first reliable clock for longitude calculations. At the end of the observational campaign, the results will be collated and the scientific benefits from these observations will be explained and published.

Introduction

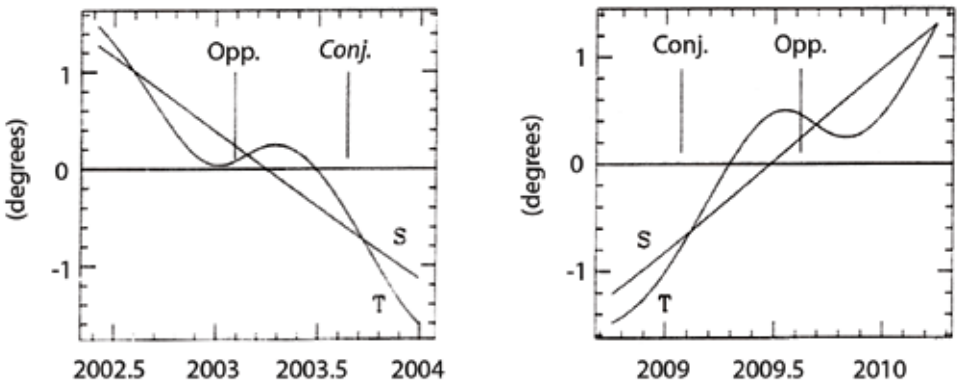
The equinox of Jupiter will take place in 2009 and the French committee for IYA2009 will take this opportunity to propose coordinated observations gathered on a unique internet site providing analysis and global results.

The equinox of the planet occurs when the planetocentric declination of the Sun and the Earth become zero, see Figure 1. The equinox of Jupiter is favourable for many events such as eclipses of the Galilean satellites by the planet Jupiter, occultations and transits and also mutual phenomena among the satellites themselves, as illustrated in Figure 2.

Observations of the events

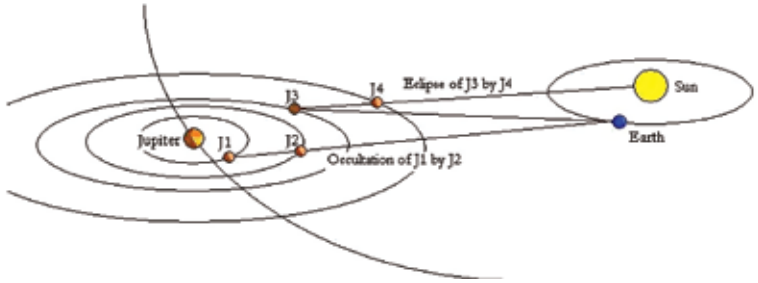
These events are very easily observable, even with a small telescope and a digital camera, since the Galilean satellites are very bright. Typical views are shown in Figures 3 and 4.

[1] http://www.astronomy2009.fr/



W. Thuillot/IMCCE

Figure 1 – Jovicentric declinations of the Sun and the Earth for the occurrences of 2003 and 2009 regarding the date of the opposition of Jupiter.



J. Mc Auliffe

Figure 2 – Configuration of the intersatellite events: the satellites are in the same plane, the equatorial plane of Jupiter.

Where two satellites are involved, we will record the quantity of light received from the satellites as a function of time in Universal Time Coordinates to an accuracy of 0.1 second of time to produce a light curve similar to that in Figure 5.

Observations worldwide

We propose that these events be observed worldwide by amateur astronomers, students and schoolchildren, and their results collected on a central website, which will analyse each observation and create a database of all the observations.

Interest of the observations

Many observations can be explained in terms of the physics and the dynamics of the Galilean satellites themselves. They are among the most interesting bodies in the Solar System with volcanoes, ice, and many other interesting physical features, and some may even be suitable for life (such as Europa, Figure 6).

The Galilean satellites are important to the history of astronomy: they were the first celestial objects observed from Earth extensively and they became the first reliable clock available for measuring longitudes. Timings of the eclipses of one of the satellites were also used to measure the speed of light.

E. Karkoshka/NMSU

Figure 3 – Transits of satellites and shadows on the disc of Jupiter. They are also spectacular since the satellites will disappear within a few seconds.

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Figure 4 – The Jovian system as seen in a small telescope.

Results and publications

At the end of the observational campaign, the results will be collated and the scientific benefits from these observations will be explained and published. Educational material, such as a method for determining the speed of light, will be developed from observations by students and pupils. Scientific results will be published using data from amateur astronomers. The IMCCE[2] has experience of such an association.

References

- Arlot J.E. (2007), Predictions of the mutual events of the galilean satellites of Jupiter in 2009, To appear in Astron. & Astrophys.
- Vienne A. (2007), Dynamical objectives of observations of mutual events, To appear in Planetary and Space Sciences

[2] http://www.imcce.fr/phemu09

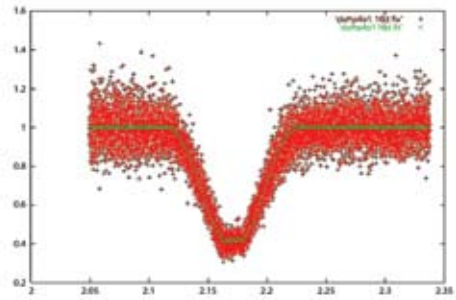

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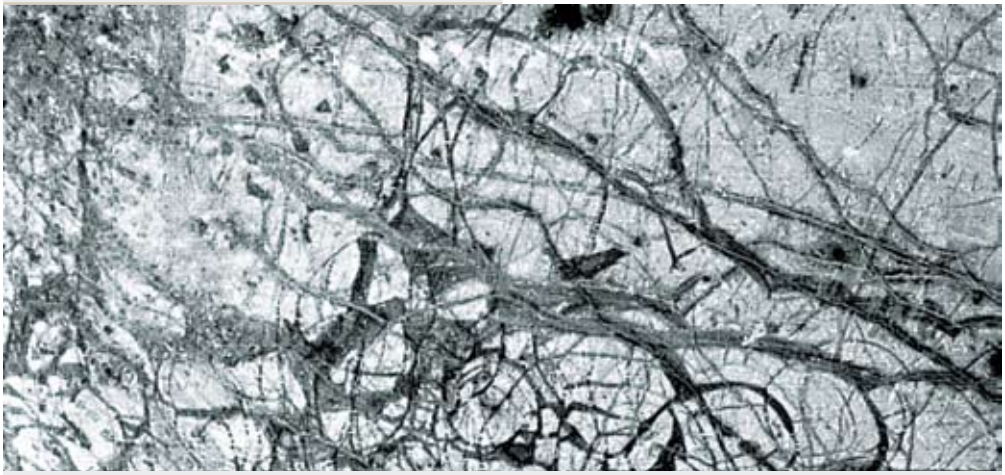
Figure 5 – A light curve recorded during an event showing the magnitude drop during the occultation or the eclipse.



NASA

Figure 6 – The ice crust on Europa: accurate astrometric observations of the intersatellite events may help reveal internal structure of the Galilean satellites.

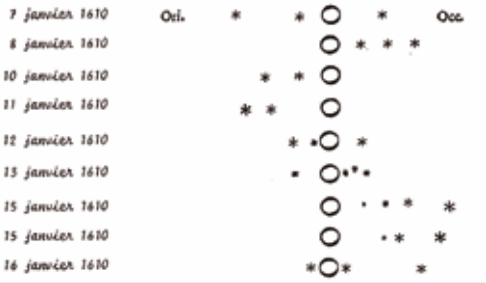


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Figure 7 – Observations by Galileo in 1610