

Information sheet n°07 :

How to observe on June 8 in order to get a useful measure

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I. Introduction

When having understood how to observe the Sun, with what instruments and how to make safe observations of Venus in front of the Sun, one should be prepared to make useful observations and measurements in order to calculate the astronomical unit either with our simplified formulae and the measure made by a correspondent, or by sending your measurement to the center of calculation which will send you back the result from your measurement and the result from all the measurements received.

In order to be able to send your measurement, you should register first by connecting to the address below :

<http://vt2004.imcce.fr>

Attention, be careful to register as many times as you have several instruments : one measurement will need one registration. One registration will allow you to send only one measurement (one measure of the four contacts).

II. Observation of the contacts

The observation itself consists in the determination of the precise time of the contact between Venus and the limb of the Sun. Attention, this timing should be made in Universal Time obtained thanks to GPS or thanks to the clock by phone or by any radio signal. It is not necessary to modify your watch, just note precisely the difference between your watch and the Universal Time. At last, note that the measure must be made with an accuracy better than one second of time. Four contacts have to be measured :

- The first contact is an exterior contact (labelled 1 on the figure 1) between Venus and the disc of the Sun (near impossible to observe because, when you

will see Venus, it will be too late !). Only the observations made with a H_{α} filter and recorded on images could allow to measure the first exterior contact.

- The second contact is an interior contact (labelled 2 on the figure 1) between Venus and the limb of the Sun (easy to observe : as soon as Venus enters the disk of the Sun, be prepared to measure the instant of the second contact (it takes about 20 minutes for Venus to go from the first contact to the second contact); attention to the « black drop », an effect due to the diffraction which leads Venus to be stuck to the limb of the Sun with some kind of chewing-gum! (see fig. 2).
- The third contact (labelled 3 on the figure 1) is an interior contact between Venus and the Solar limb (the easiest to observe since we observed Venus moving in front of the Sun: attention to the “black drop” here also)
- The fourth contact (labelled 4 on the figure) is an exterior contact between Venus and the Solar limb (easy to observe when Venus definitively leaves the Solar disk)

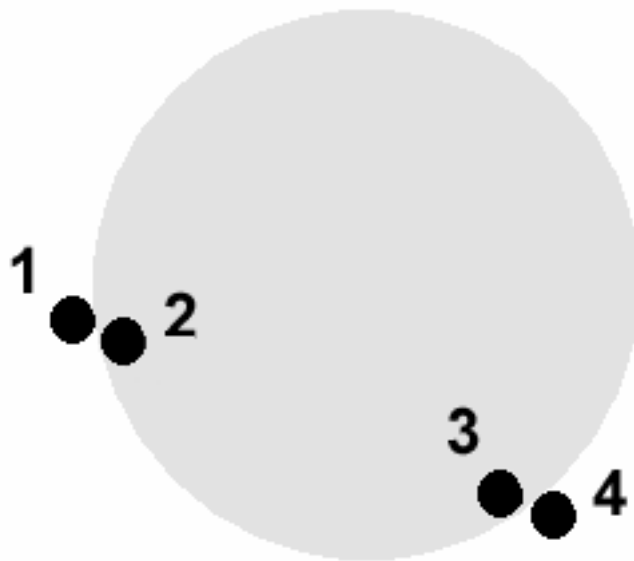


Fig. 1 Description of the contacts

III. Methods to measure the times of contact

a) Visual method

You observe Venus and try to determine the time of contact. When you think this is time either you switch on a button to record this time or you give a signal

to an assistant who can accurately read the time (one second of time is necessary) on a time keeper or a clock. The measure of this time will be delayed of about 1 or two tenth of a second because of your “personal equation” (your reaction time to record an event), but his delay can be determine independently to the observation.

b) The recording of images

If a video camera, a CCD camera or a webcam is available, you can record a series of images which have to be also all referred to the Universal time or other timescale with a known shift to the Universal time. The analysis of such images will allow you to determine the times of contact by interpolation.

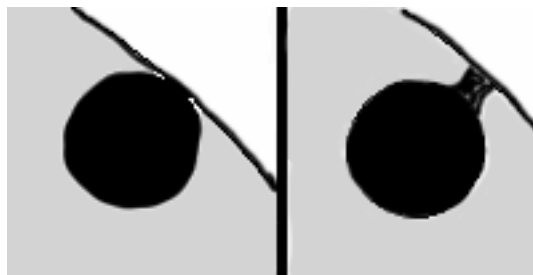


Fig 2 The Black Drop

IV. The observation of least distance from Venus to the Solar limb

If you record images, well referred with respect to the Universal time, all along the transit of Venus, they could be used to compute the Earth-Sun distance by another method than by observing the contacts. Therefore, despite possible bad meteorological conditions at the beginning or at the end of the transit of Venus, you will be able to participate to the computation of the Earth-Sun distance.

For this purpose, your images must allow us to measure the distance between Venus and the Solar limb (see fig. 3). The edge of the Sun, and Venus must be simultaneously recorded on your images, even if Venus is far from the edge (see fig. 4 and 5) . If you carry out this kind of observations, you could send us your images for analysis (send first an e-mail to images@imcce.fr in order to get instructions). In this case, we also ask you to send us your agreement to keep your images – which will be transformed in a standard format – in a data base in order to be used in a next future for educational purposes. You will have access to the whole data base.

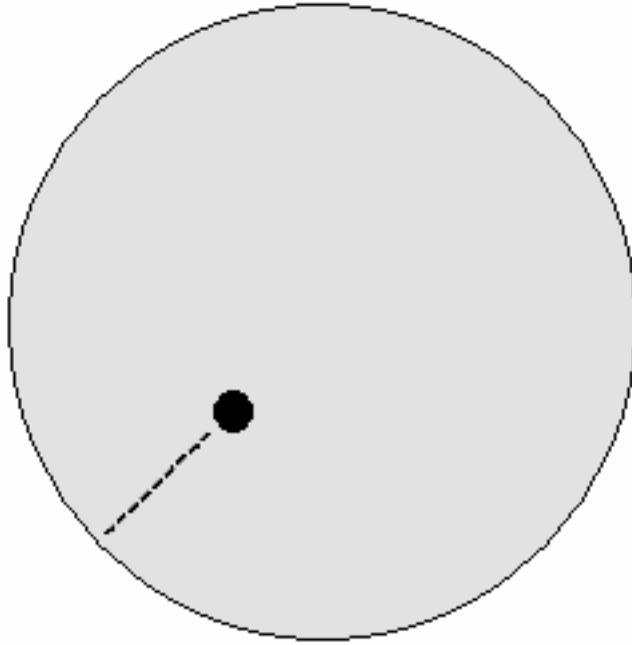


Fig. 3 Image of Venus in transit for a given time: the least distance to the edge is the observational data useful for the analysis.

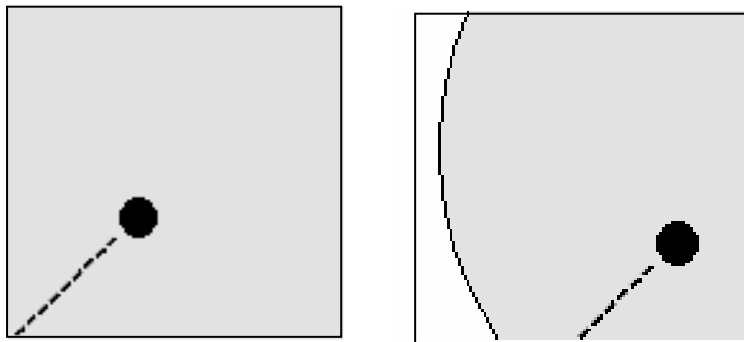


Fig. 4 Unusable images : we cannot measure the least distance to the Solar limb

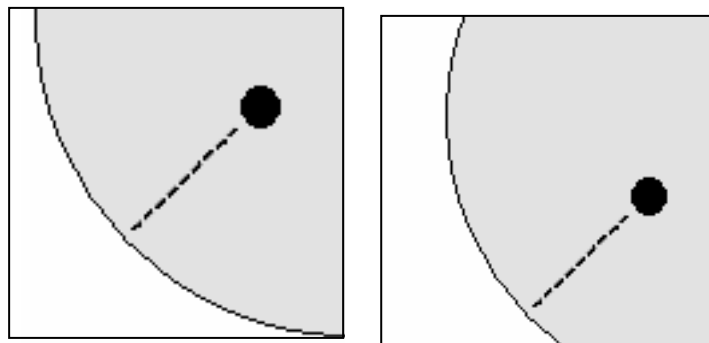


Fig. 5 Useful images : the least distance to the Solar limb can be measured.