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A VT-2012 project for the observations of the next transit of Venus on June 2012

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Abstract

The 2004 transit of Venus was an opportunity to explain how mankind succeeded to mesure the universe: during centuries, it was not possible to know the distance Earth-Sun which is the basis of the measurements in astronomy. During the XVIIIth century, the observation of the transit of Venus allows to know this distance. Through an international project VT-2004, we proposed to make the same observation on June 2004 but with another goal: astronomers were replaced by pupils, students and amateur astronomers and travels to favorable sites were replaced by the use of Internet. The VT-2004 project was a success with several thousands of observers worldwide sending their observations to a central site through Internet allowing to re-measure the Astronomical Unit with a good accuracy The transits of Venus are very rare (two times every century) and we plan to do a similar project in 2012.

1. The VT-2004 project

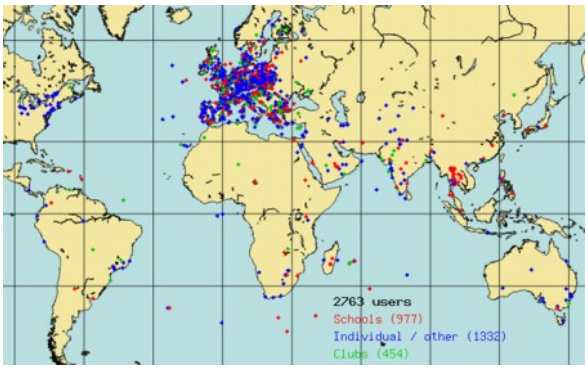
An European contract was obtained in order to support our educational project to gather pupils, students and amateur astronomers for measuring the Earth-Sun distance through the observation of the transit of Venus on the disc of the Sun. Many documents were made and are still available for 2012.

1.1 The historical part

It was necessary to teach all the aspects of the transit of Venus. A special effort was made in order to make available what was made in the past. The first observations during the XVIIth century, then the large international projects in the XVIII and XIXth centuries were described in documents made available through Internet. More, 10000 pages of old documents and publications were scanned and published on a CD-Rom.

1.2 The proposed observations

The most important part of the project was to ask every one to observe the transit in 2004. Documents were proposed to explain how to observe, precautions to be taken and data to be sent to a central site. Fortunately, the event was visible from the East of America to Europe and Asia where most of the population of the Earth was living. More, the weather was favorable and many observations were possible. The figure below shows the sites of observation .



1.3 The calculation of the AU

The goal of the project was to obtain a value for the Astronomical Unit as it was made during the XVIII and XIXth centuries. All the observations were gathered and used in an algorithm calculating the AU. We started from the known value of the AU and modified it with all the data received. The results (cf table 1) show that the observations of the XXIst century were more accurate than the previous ones. This has several explanations: first the modern telescopes are better than the old ones, second, the UTC is easily available now (and not in the past) and third, the observations were recorded and the measurements were made several times that was not possible in the past with visual observations.

Table 1: The different values of the AU

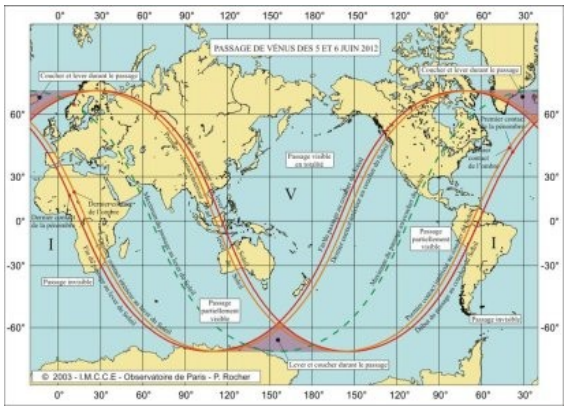
date	Value of the AU in km	Error in km	authors
1761 & 1769	151 000 000	1 402 129	Lalande & Pingré
1874 & 1882	149 670 000	72 129	Vénus: Newcomb
2000	149 597 870,691	référence	Mars: sonde Viking+radar
2004	149 608 708	10 838	VT-2004

One of the numerous drawings made by pupils:

2. The transit of 2012

The success of the educational program made in 2004 allows us to propose a similar project for 2012. Most of the documents, algorithms and data bases are still available and we just have to help the observers to participate to the project.

In 2012, the observations of the transit were more difficult since the best visibility will be in the middle of the Pacific Ocean. However, Europe, Asia and North America will see a large part of the event.



As we did in 2004, we are able to provide information to possible observers and to teachers who wish to explain the event to their students. More, we are able to open a web site gathering the data and calculating a value of the Astronomical Unit on-line.

3. Web sites and educational material

Using the same format as we did in 2004 on our web site http://www.imcce.fr/ vt2004, we will open a site http://www.imcce.fr/vt2012 including the new information about the transit of June 2012. The network organized by ESO in 2004 (cf. the site http://www.eso.org/public/outreach/eduoff/vt-2004/ vt-net/) could be used again.

At the present time, we propose the following material: CD-Roms, educational sheets on the interest of the transit of Venus, the predictions, the observation on June 5 and 6, 2012, the calculation the AU from the observation. And also, sheets on related topics as: our solar system and its members and its planetary laws; Venus – the second planet in the solar system (an overview with physical data); Venus – the Earth's sister planet (a comparison); Venus' orbit and visibility; Venus topography, geology and planetary history ; The clouds of Venus; Venus and mythology, science fiction; Life on Venus and on other worlds in the solar system; Space probes for mapping the planet Venus; Information about the Sun; eclipses and well-known kind of transits. And, of course, sheets on the history of transits of Venus, the list of the voyages made for the observations of the transits of Venus in the past centuries. Sheets on the other transits in the solar system – Mercury, Jupiter satellites and Charon are available as on searching for other worlds by using the transit method. At last, sheets on the observational techniques of the Sun, on safety and sheets on concepts as measuring distances in the universe, the astronomical unit, light, time, Universal Time. All of these documents are available in English and are translated in several European languages.

In 2004, we made a database with all the data received. So, today, it is possible to make a virtual observation of the transit of Venus using the images put in our data base. More, a software allows the user to calculate the Astronomical Unit with his own measurements. This data base will be a strong tool for teachers to prepare the observation of 2012.

4. Conclusion

In order to perform a useful program for the transit of Venus of 2012, we propose to collaborate with scientific centers wishing to use the transit for educational purpose and to share all the resources available.

Acknowledgements

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References

[1] Ros, R. M.: 2005, The Transit of Venus: an Opportunity to Promote Astronomy, EAS Publications Series, Volume 16, 2005, pp.253-262.

[2] Boffin, H.; West, R.: 2004, The ``Venus Transit Experience'', The Messenger, vol. 118, p. 69-70