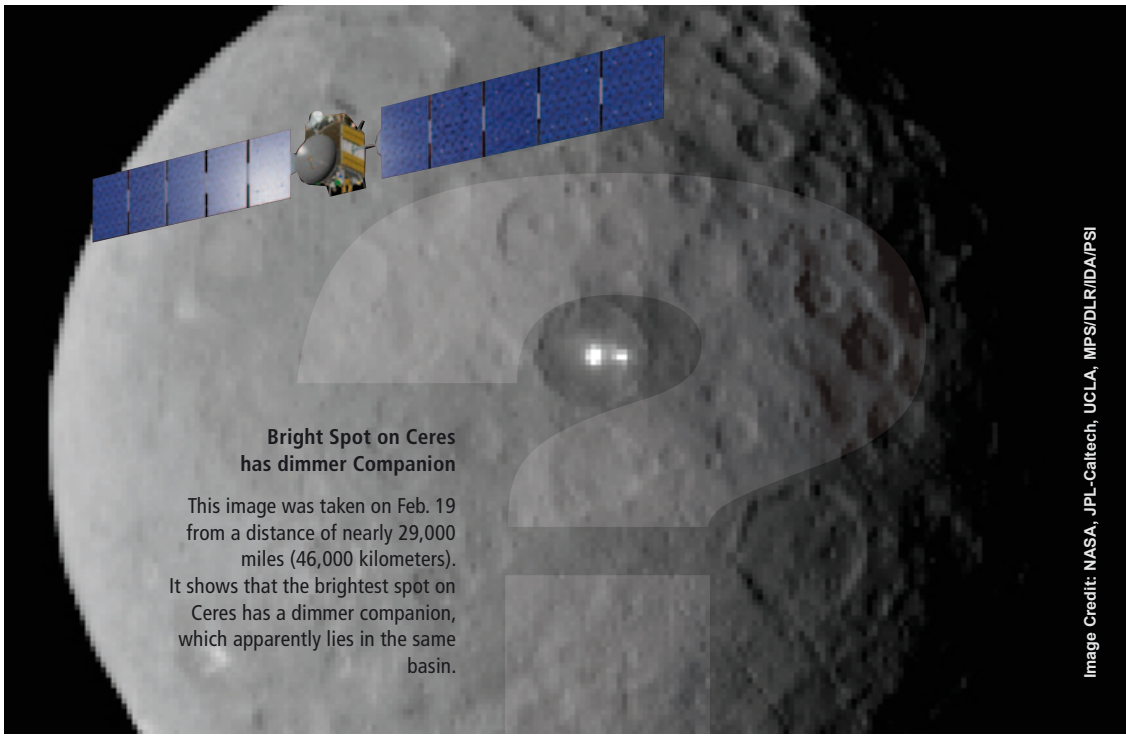
Journal for Occultation Astronomy

2015–01

Mysterious White Spots

Approaching Asteroid Ceres

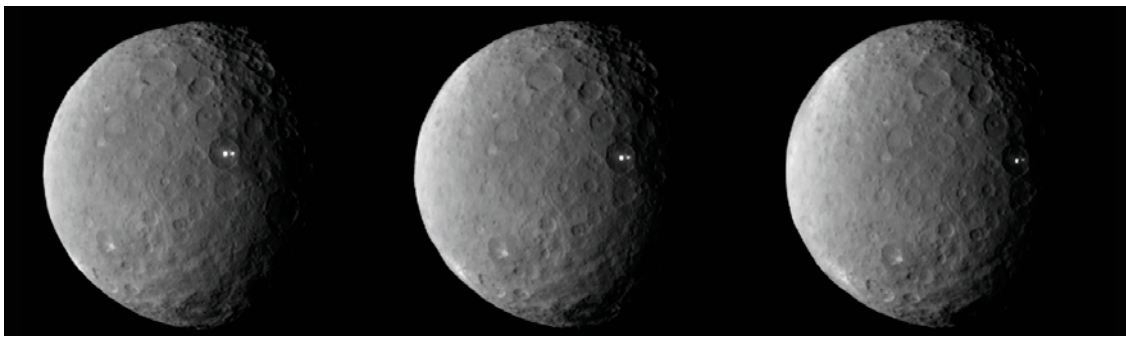
It is the largest asteroid in the asteroid belt – what secrets does it hold? To find out, NASA has sent the robotic Dawn spacecraft to explore and map this cryptic 1,000-kilometer wide world: Ceres. Orbiting between Mars and Jupiter, Ceres is officially categorized as a dwarf planet but has never been imaged in detail. Featured here is a frame taken of Dawn's approach that now rivals even the best images of Ceres ever taken by the Hubble Space Telescope. The picture shows enough surface definition to discern its 9-hour rotation period. On target to reach Ceres, Dawn will match speeds and attempt to orbit this previously unexplored body, taking images and data that may help humanity better understand not only the nature and history of Ceres but also the early history of our entire Solar System.



Bright Spot on Ceres has dimmer Companion

This image was taken on Feb. 19 from a distance of nearly 29,000 miles (46,000 kilometers). It shows that the brightest spot on Ceres has a dimmer companion, which apparently lies in the same basin.

Image Credit: NASA, JPL-Caltech, UCLA, MPS/DLR/IDA/PSI



Journal for
Occultation Astronomy

Dear reader,

On the 7th of June 1978 an occultation of a star by asteroid (532) Herculina had been predicted and observed in the USA – but a strange recording had been reported by James McMahon: an "unexplained secondary extinction" occurred! At that time nobody could and would believe that a tiny moon of Herculina occulted this star too! It lasted until the next positive minor planet moon occultation before the community was convinced.

In 2013 once more a "strange" event happened, when a star was occulted by the centaur Chariklo and several additional occultations were also recorded by different observers not concentrated on one line. The only solution could be that a ring of small particles is surrounding Chariklo.

Who knows what might be the third "strange" one!

But keep in mind to observe long before and after the time of the predicted event for "left or right" of the path could be a satellite awaiting discovery …

Unfortunately there was no occultation by Herculina until now to refine the first detection of a minor planet's moon.

■ **JOA 2015-1** · $ 5.00 · $ 6.25 OTHER · (ISSN 0737-6766)

In this issue:

Writing articles for JOA:

The rules below should be regarded while writing an article; using them will greatly facilitate the production and layout of ON!

If your article does not conform to these rules, please correct it.

There are 3 different possibilities for submitting articles:

- pdf-articles (must be editable – these can be converted)
- unformatted Word *.doc-files containing pictures/graphs or their names (marked red: <figure_01>) at the desired position(s)
- *.txt-files must contain at the desired position the name of each graph/picture

The simplest way to write an article is just use Word as usual and after you have finished writing it, delete all your format-commands by selecting within the push-down-list "STYLE" (in general it's to the left of FONT & FONTSIZE) the command "CLEAR FORMATTING". After having done this you can insert your pictures/graphs or mark the positions of them (marked red: <figure_01>) within the text.

txt-files: Details, that should be regarded

- Format-commands are forbidden
- In case of pictures, mark them within the text like <picture001> where they should be positioned

Name of the author should be written in the 2nd line of the article, right after the title of the article; a contact e-mail address (even if just of the national coordinator) should be given after the author's name.

IMPORTANT:Use only the end-of-line command (press ENTER) if it's really necessary (new paragraph, etc.) and not when you see it's the end of the line!

Sending articles to JOA:

Each country / state has a coordinator who will translate your article to English – if necessary.

In case there is no one (new country) please send a mail to the editorial staff at: **info@occultations.info**

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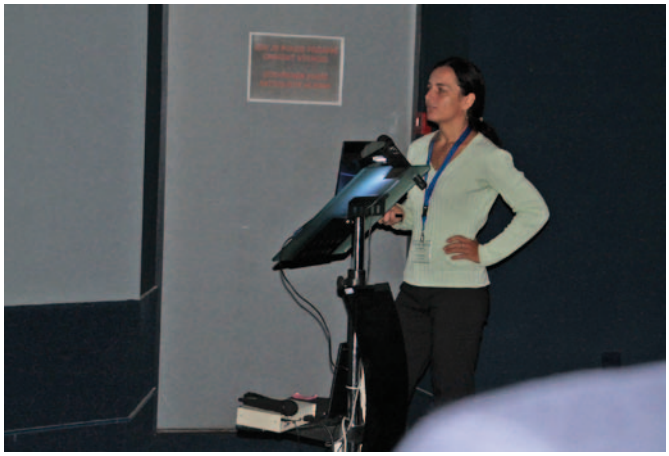
ESOP33

33rd European Symposium on Occultation Projects
Prague · August 29-31, 2014

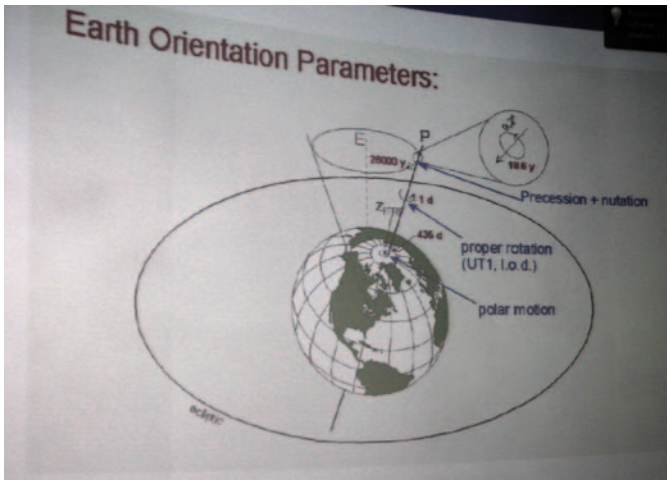
Abstracts



Martina Bohacova · Institute of Physics, AS CR

Highlights from the Pierre Auger Observatory

The Pierre Auger Observatory is the world's largest cosmic ray detector, which was built to unveil the properties of Ultra-High Energy Cosmic Rays with energies above 1017 eV. The Observatory provides measurements of cosmic ray air showers recorded simultaneously by an array of 1660 water Cerenkov surface stations, covering an area of 3000 km2, and by 24 air fluorescence telescopes that observe the longitudinal development of air showers in the atmosphere. Results obtained after ten years of operation concerning the energy spectrum, mass composition and arrival direction of cosmic rays at this energy range will be presented.



Cyril Ron · Astronomical Institute AS CR

The new astronomical reference systems and the Earth rotation

A set of resolutions that were approved at 26th General Assembly of IAU in Prague in 2006 completed the decadal common effort of astronomers and geodesists to define the new astronomical reference systems. The problem of the exact definition of the celestial (ICRS) and terrestrial reference systems (ITRS) arose with precise astrometric observations by modern space-geodetic techniques, especially Very Long Baseline Interferometry (VLBI), Satellite and Lunar Laser Ranging in 1980 and Global Navigation Satellite System (GNSS) in 1990. Ten years of experience with the new ICRS and ITRS in the Earth rotation observations will be presented.

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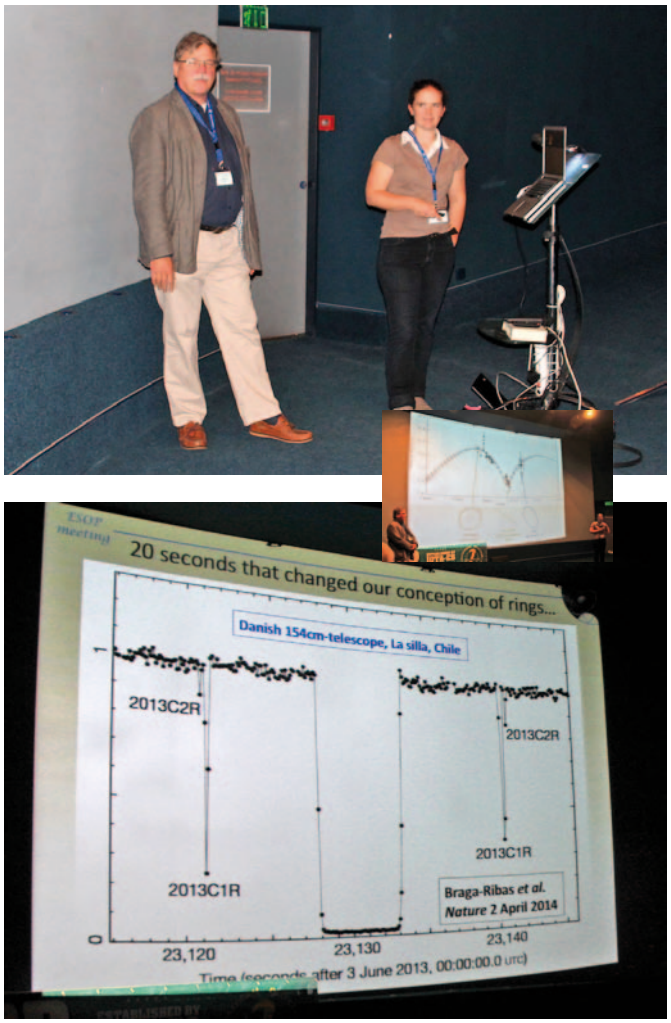


Lucie Maquet · LESIA - Paris Observatory

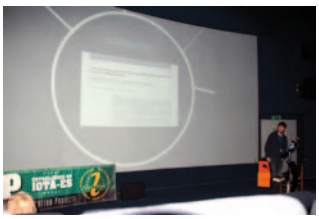
The Chariklo System

W.B.

Modelling of asteroids · Josef Durech
Charles University in Prague

How occultations improve asteroid shape models

Shapes of asteroids can be reconstructed from their disk-integrated light curves by the light curve inversion method of Kaasalainen et al. (2001). In practice, one needs tens of light curves observed during at least three apparitions to be able to derive a unique shape and spin-state model of an asteroid. Because disk-integrated light curves carry very little information about no convex details, the models are usually convex representations of the real shapes. As has been proved by adaptive optics images and occultation silhouettes, the convex models derived from photometry are good representations of the real shapes of asteroids. I will show (i) how the models derived from photometry can be combined with occultation data to scale the models and solve the pole ambiguity and (ii) how the light curves and occultations can be combined together to obtain more accurate no convex models of asteroids.



P. Bartczak, T. Michałowski, T. Santana-Ros and G. Dudzinski
Astronomical Observatory Institute, Faculty of Physics, Adam Mickiewicz University, Słoneczna 36, PL-60-286 Poznan, Poland

A new non-convex model of the binary asteroid 90 Antiope obtained with the SAGE modelling technique

We present a new non-convex model of the 90 Antiope binary asteroid, derived with a modified version of the Shaping Asteroids with Genetic Evolution (SAGE) method using disc-integrated photometry only. A new variant of the SAGE algorithm capable of deriving models of binary systems is described. The model of 90 Antiope confirms the system's pole solution (= 199 , = 38 , = ±5) and the orbital period (16.505 046 ± 0.000 005 h). A comparison betweenthe stellar occultation chords obtained during the 2011 occultation and the projected shape solution has been used to scale the model. As discussed by Herald (2012), the star occulted by Antiope (LQ Aquarii) is a 'slow red' star (LB) without direct measurements of its diameter. The main issue during the observation reduction is thus to take into account the non-negligible time needed to occult the star. Colas et al. (2012) gave an estimation of the star's diameter of1.7 ± 0.7 mas, which is equivalent to 2.2 ± 0.9 km at the asteroid level. Having this in mind, we have developed an optimization algorithm which looks for the best fit of the projected shape of the non-convex model to the occultation timings. The resulting scaled model allowed us to obtain the equivalent radii (R1 = 40.4 ± 0.9 km and R2 =40.2 ± 0.9 km) and the distance between the two system components (176 ± 4 km), leading to a total system mass of (9.14 ± 0.62) • 1017 kg. The non-convex shape description of the components permitted a refined calculation of the components' volumes, leading to a density estimation of 1.67± 0.23 g cm−3 . The intermediate-scale features of the model may also offer new clues on the components' origin and evolution.

Bernd Gährken · Bavarian Public Observatory Munich

The Metis occultation at 7.3.2014 and the shape motion

On 7.3.2014 the minor planet (9) Metis occulted a star of magnitude 7.9.

Many observers were successful.

Numerous shadow paths delivered a silhouette with very good data quality.

A week later a light curve was recorded with a 200mm telephoto lens to get more information about the celestial body.

The speech will present some results.

Lunar Occultations

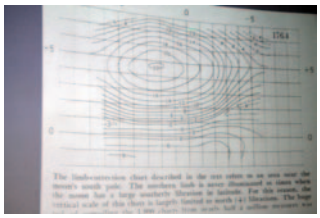
Dietmar Büttner, Germany

Lunar limb profile models in the past and today

Lunar limb profile data are needed for accurate grazing occultation predictions as well as for precise reductions of occultation observations.

Over several decades a number of important profile models were developed and used (Watts, ACLPPP and MOONLIMB). In our days, the limb profiles derived from the laser altimeter measurements by the Japanese lunar probe Kaguya are the state of the art.

The presentation gives an overview on the different profile models. Examples for predictions and reductions concerning past and modern



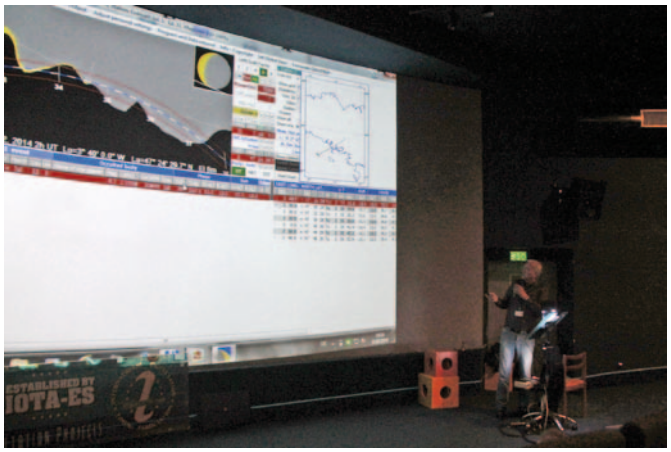
observations are shown. Furthermore the author describes his own research work on the accuracy of the today's profiles models.

Finally an outlook on his development work for an even improved Kaguya limb data set is given.

Eberhard Bredner · IOTA-ES, DOA, VdS, club-eclipse
Dolberg Observatory

GRAZPREP: Camping in Erdeven – LOW and GRAZPREP – prediction and observation -

Erdeven in southern Brittany/F (Bretagne sud) is our favoured place for a "normal" holiday with our caravan - - 1200 km from home. And that is originally no astro-excursion. But we have nowadays such a variety of software that one can have a quick look at any site - ?? are there possible highlights for an occultist ??

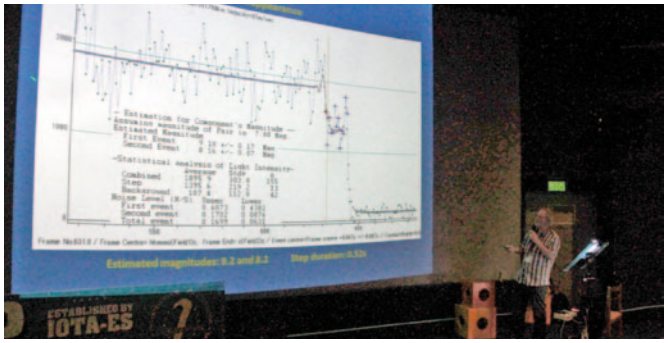


Eberhard Riedel · IOTA-ES

GRAZPREP: New features of the IOTA/ES-software for Grazing Occultation predictions and preparations

"GRAZPREP" is a freeware program for anyone wanting to successfully observe grazing occultations. It processes the grazing occultation

prediction data supplied each year by IOTA/ES. The software assists in selecting and listing individually favourable occultation events and in figuring out the best observing site in advance by graphically showing the expected apparent stellar path through the lunar limb terrain as seen from any location on earth. 'GRAZPREP' easily visualizes the complete list of all grazing occultation events in any chosen area plus the complete line data for any selected event and (simultaneously on the same screen) both the geographic circumstances on earth and the enlarged topographic situation at the lunar limb including a fairly realistic display of the sunlit lunar portion as well as the approximate sky brightness according to the sun's altitude. A global view of each graze event was added. Thus a judgment about the entire graze circumstances is easily possible at a few glances. After selecting the desired apparent stellar path this event zone can be displayed in Google Earth which makes finding the best observing location simple.



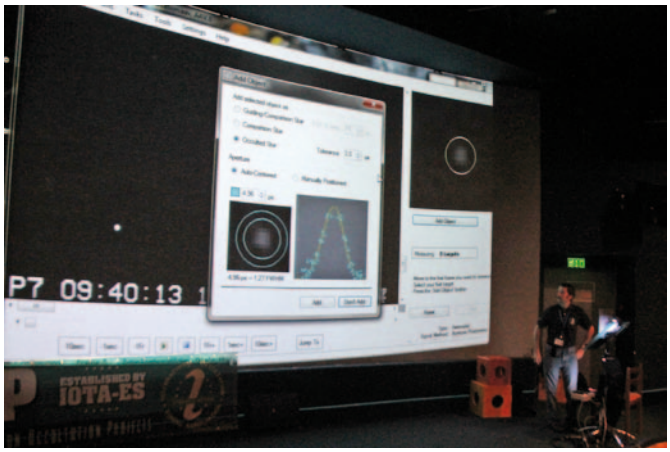
Alexander Pratt · IOTA-ES

The curious case of SAO 93967

During recording a lunar occultation disappearance of this double star I observed a near-grazing sequence of D,R,D events.

The results gave estimates of the magnitudes of the A and B components and led to an interesting discussion about their entries in the Washington Double Star catalogue and the Interferometric Catalogue.

Workshops

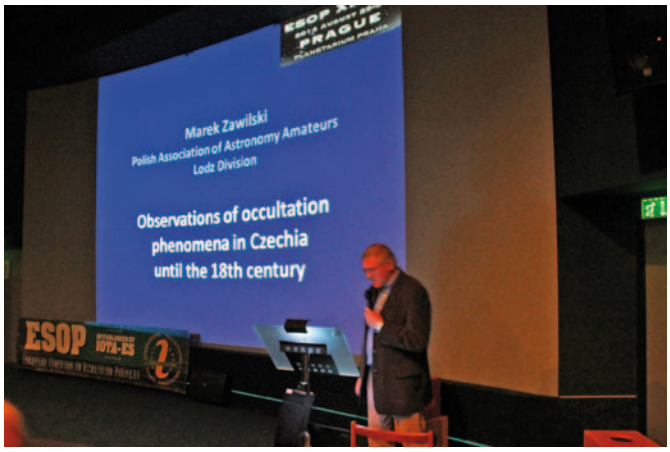


Sven Andersson · IOTA/ES

Tangra workshop

This workshop gives an introduction into the use of the software Tangra.

We discuss possibilities for the reduction of recorded occultations and which functions and options are available. Furthermore he differences to LiMovie will be pointed out briefly and in a short. Finally the analysis with the software Occult will be shown.



Historical Occultations

Marek Zawilski

Observations of occultation phenomena in Czechia until the 18th century

The first mention of observations of solar eclipses from Czech come from the 12th century. It was written by the famous Czech chronicler Kosmas (about 1045 -1125), the dean of the Prague cathedral chapter,

who recorded the eclipse of September 23, 1093 which in fact was in Prague annular and August 11, 1124 - partial one of a large phase.

Soon after, an anonymous continuator of the Kosmas' chronicle, known as the canon of Vyšehrad, noted the course of almost total eclipse of August 2, 1133, describing its constituent phases. However, his literal image of the maximum phase is wrong (as the solar crescent from the southern part; in fact the path of totality run south of Prague, so the illuminated part of the solar disk must have been seen from the north). Perhaps the eclipsed sun was observed as a reflection in water and reversed. The same author left many other descriptions of astronomical importance, among others the information about the total lunar eclipses, the first one from November 8, 1128. This eclipse was very deep (almost central) and could be seen from Prague in excellent conditions, around 22h. The text says about the appearance of numerous stars during the totality.

The Sazava continuation of the Kosmas' chronicle also mentions the eclipse of 1133.

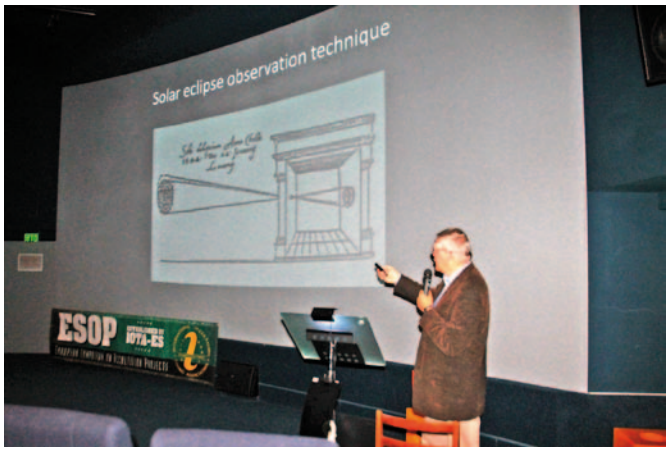
One century later, sudden twilight effects by day have been noted in the Prague annals. In the afternoon of October 6, 1241 in Prague a next almost total solar eclipse could be seen. Next in the 14th century, the Chronicon Aulae Regiae (or Kronika Zbraslavská) written in the Cistercian abbey in Zbraslav gives an account about the big partial eclipse noticed on July 16th, 1330. Also, another eclipse has been seen at the sunrise on October 7, 1344, according to the chronicle by Francis of Prague.

The first total solar eclipse was recorded in Prague by Vav inec (Laurentius) of B ezova in the morning of June 7, 1415. The appropriate description can be found in his chronicle (Husitská kronika) and some other Prague annals. An original and rare account on the total solar eclipse of June 17, 1433 left the chronicler Bartošek of Drahonice. The observation might be done from the Karlštejn castle. The big famous solar eclipse of March 16, 1485 has been seen from Prague as a partial one and saved in the old Czech annals; Vaclav Hajek gives an account about the total eclipse, however his account is not original.

Two accounts about the big solar eclipses with a remarkable reducing of daylight come from the Jihlava chronicle: on April 7, 1540 and January 24, 1544. In the 16th century i.a. Prokop Lupá of Hlava ov compiled his Rerum Bohemicarum Ephemeris and gathered many observations of eclipses from the past. Cyprianus Leovitius (or Cyprián (Karásek) Lvovický), the Czech mathematician and astronomer, prepared Tabulae ecclypsium, i.e. the eclipse prediction tables for the period 1556-1606.

In the beginning of the 17th century two famous astronomers were active in Czechia. The Emperor Rudolph II. invited the Danish astronomer Tycho Brahe to the Royal Court. After Brahe had come to Prague in 1599, he invited Johannes Kepler. The famous German astronomer arrived in 1600. Brahe observed from Prague the small partial solar eclipse on July 22, 1599 at sunrise, then the event of July 10, 1600 from the Benatky castle on the Jizera river. Next, Kepler made from Prague the observation of the solar eclipse at sunset on December 24, 1601, with the maximum phase of more than 8 digits.

The path of totality of the famous solar eclipse of May 12, 1706 crossed Czech in the forenoon. So far we have four independent entries from that day: in áslav the eclipse as nearly total with many stars around the sun observed by Jan Jind ich Jelinek, the local teacher and cantor; in íde the local chronicle says about the big darkness and stars in the sky; the Memorial Book of Stará Rudná gives an account about the total eclipse; in Ludvíkov near Vrbno the local chronicle describes the dark eclipse and stars seen in the sky. There are some suggestions that the total eclipse was observed from Prague, too.



Martin Solc · Astronomical Institute,
Charles University in Prague

Observations and theory of eclipse phenomena in Bohemian lands since 18th century

For the history of astronomy in Kingdom of Bohemia, the year 1773 was of particular importance: After the abolishment of Jesuit Order the observatory in Clementinum, the Jesuit College in Prague, became the State Observatory and its director became the Astronomer Royal. This observatory was founded in 1722 and reconstructed in ca 1750-1756; until the first decades of 19th century it was the only larger observatory in Bohemia.

Unfortunately all the not printed Jesuit documents incl. observational diaries from Clementinum disappeared in 1773, so that the history of Clementinum observations is documented only after this year. The archives of the State Observatory comprise about 250 boxes filled with documents from 1773-1950. What the eclipse phenomena concerns, observations of eclipses and occultations of Jupiter satellites were carried out, and the observations of lunar occultations of stars in order to determine the differences in longitude between Prague and Vienna, Paris, Wroclav etc. observatories. The results were published mainly in the journal Astronomische Nachrichten.

The well known „Canon der Finsternisse" by Theodor von Oppolzer (born 1841 in Prague) appeared in Vienna. in 1887. Less known is that Franz Ignatz Cassian Hallaschka (1780-1847) published in Prague 1816 a similar book „Elementa eclipsium 1816-1860" which preceded the Oppolzer´s work; however, it was based on geometrical considerations and theories of lunar motion that were available in the time about 1800, in contrast to Oppolzer, who created his own theory of lunar syzygys before starting the work on the „Canon der Finsternisse".

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Thinking about occultation of a star by another star was a pure fantasy until 1911 when Albert Einstein, during his stay in Prague, considered this phenomenon in context with the deflection of light rays passing along a source of gravitational field. He consulted the possibility of such a precise alignment of three stars in our Galaxy with the Berlin astronomer Erwin Finlay Freundlich who estimated the probability as negligible. Einstein returned to this topic in 1934, the impulse to the publication on gravitational lenses (according to modern terminology) in the journal Science gave the Czech amateur astronomer Rudi W. Mandl. However, earlier in this year, Czech astronomer František Link (1906-1984) published the same formulae for gravitational lensing in a French journal and summarized it later in his monograph „Eclipse phenomena in astronomy" (Springer 1969).

Oliver Klös · IOTA-ES

Kleopatra, Concordia & Beagle – Occultation Highlights in Europe 2015

In 2015 there are several bright asteroidal occultation events observable in Europe as every year. Three occultations are very special this time. (216) Kleopatra has an very unusual shape and two small moons. The shadow paths of these three bodies will cross Europe in March 2015.

The minor planets (58) Concordia and (656) Beagle will occult bright stars at the same evening at a weekend in May 2015. There is a chance to observe both events!

This presentation will show the specialties of these events, results of previous occultation observations and maps of the first predictions of the paths, giving hint where to go for observing.

E. Saquet (1,2), J.E. Arlot (1)
(1) IMCCE, Paris Observatory, UMR 8028 CNRS, UPMC, USTL, (2) IPSA
(arlot@imcce.fr, saquet@imcce.fr)

The Phemu 2015 campaign of observations of the mutual events of the satellites of Jupiter

Introduction

From September 2014 to June 2015 mutual events of the Galilean satellites will occur around the Jovian equinox (on February 6, 2015). The observations of these events provide very accurate information on the relative astrometry of the satellites. Past 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 will be especially favourable because of the maximum of events which will occur during the opposition between the Sun and Jupiter. More, the positive declination of Jupiter will make the observations easier in the Northern hemisphere where many observers are available.

1. Past campaigns

The first campaigns of observations occur when it was possible to make confident predictions of the events. These events are very sensitive to the accuracy of the ephemerides because of the small size of the satellites. An error of 1000 km (which was the accuracy of the ephemerides in the 1970's) may make an event inexistent.

Years Size of the telescopes Nb. obs.

< 60cm > 60 cm

(amateurs) (professionals)

1973 4 20 91

1979 3 7 18

1985 12 12 166

1991 37 19 374

1997 35 10 275

2003 34 15 361

2009 52 10 523

The table above shows the evolution of the observers from the former campaigns to the more recent ones. If the professional astronomers were more numerous at the beginning because of the poor sensitivity of the detectors needing a large telescope, the amateurs are now the majority, using the sensitive CCD detectors and small telescopes.

2. Observation of the phenomena

The observation of a mutual event is a photometric measurement of the light flux decreasing and increasing when a satellite is occulted or eclipsed by another satellite. It needs a careful photometric reduction using a photometric reference such as another satellite to eliminate biases due to light clouds. Each point of the light curve must imperatively be linked to the Universal Time UTC at the nearest 0.1 second of time. Then, it will be possible to inverse the light curve to obtain the relative positions of the two involved satellites with an accuracy close to the one of the space probes.

3. The Phemu 2015 campaign

The 2014-2015 occurrence will be the most favourable since years. The maximum of observable events will take place from December to April. Each month, about 30 to 40 events will be observable from a given site depending on its latitude and longitude. We encourage the observers to make as many observations as possible even if other observers are present in the same area in order to limit the influence of bad meteorological conditions.

Note that the predictions of the events are not perfect, so, start the observation about ten minutes in advance. More, the individual photometric measurement of each involved satellite before or after the event is necessary for the reduction. For astronomers using a telescope with an aperture larger than 30cm, eclipses of Amalthea may be observed. They are rare and their observation need to use an infra red filter at 890 nm which will darken the bright disk of Jupiter and which may also be useful for the Galilean satellites events when near of the planet.

4. Conclusion

All the needed information, all local ephemerides and configurations of the Galilean satellites are available on http://www.imcce.fr/phemu. We look forward for a fruitful observational campaign.

References

Arlot, J.E. and 63 co-authors: 2006, A catalogue of the observations of the mutual phenomena of the Galilean satellites of Jupiter made in 1997 during the PHEMU97 campaign, Astronomy and Astrophysics, Vol. 451, pp. 733

Wolfgang Beisker · International Occultation Timing Association, European Section

Important occultations by bodies of our planetary system in the near future

Up to the year 2013 planetary rings had been found exclusively around large planets. It was a great surprise, when a stellar occultation observed from stations in southern America revealed the existence of two small rings around the Centaur Chariklo. Chariklo is the largest object of the Centaurs, having a radius of about 124km (determined also from the occultation). The Danish 1.5m telescope at La Silla (Chile) showed before and after the occultation of the main body of Chariklo two short spikes. These could be identified together with results from other observing stations as the signature of two tiny rings of 7km and 3km width having a gap of about 13 km. The optical density of the rings is relatively high (0.4 and 0.6). The orbital radii of the rings were found to be 391km and 405km. Further occultations had been observed in the year after, which lead the determination of the orientation parameter of the ring and proved that the rings are not a transient phenomenon.

From spectrometric observations in the years before of the Chariklo system, it could be found, that the rings partly consist of water ice. The existence of the rings now gives an explanation for the strange disappearance of the ice signatures in the spectrum during the years 1997 to 2008, where the rings had been in an edge-on position with respect to earth.

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Occultation work from Africa

BABA AISSA Djunaï
Centre for Research in Astronomy, Astrophysics and Geophysics (CRAAG) – Algiers Observatory

Observing Asteroid occultations in Algeria

Algeria is a very large country and can be crossed by the path of several interesting asteroidal occultations during the year. Since two years, we are developing in Algiers Observatory (CRAAG) a new research team to observe asteroidal occultations in Algeria. This local observation can bring something new in the field of the study of small celestial bodies and gives more information by creating more great contribution to the community. During this period, we have observed visually only one positive asteroid occultation among many others as 1867 Deiphobus with the star HIP 141201 in 10th October 2012.

Thereafter, we established a comprehensive list of major occultations during 2013 and 2014 from Drek Breit's website and recently using OccultWatcher software.

Actually, we are focused on Algiers observations. Since our last positive observation, five others occultations were listed but unfortunately weather forcast was not favorable. We plan to undertake missions outside Algiers taking into into account of the weather and the pertinence of the occultation.

In the future, according to the positive results, we would like to purchase other kits to follow several occultations and developing our own astronomical calculations.

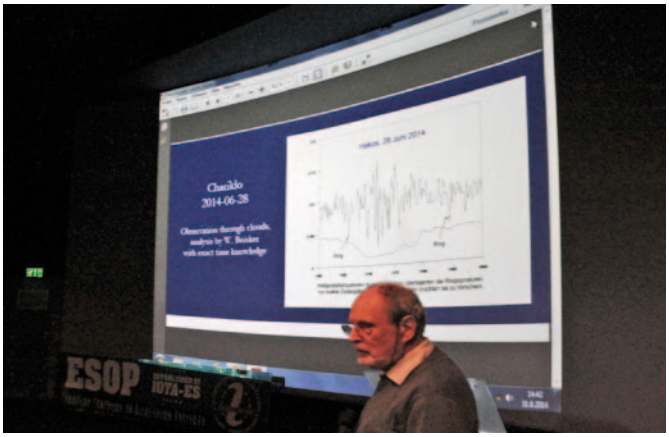
We hope to build relationships with foreign partners to develop and carry out this study theme in Algeria.

Roman Kostenko · Poltava Astronomy Club

Astrosafari trip to the total solar eclipse in Turkana, Kenya

A 30-minute film by the ASTROSAFARI team, following by the story of an amateur expedition to Lake Turkana, Kenya for observing the hybrid-total solar eclipse of November 3rd, 2013 will be presented. Totality has been clouded out, yet the movie describes the details of an overland trip,

by an international team, with an accent on the astronomy potential of different sites in Kenya.



Karl-Ludwig Bath · IAS

The IAS observatory in Namibia -- and observation of Chariklo events

The IAS amateur observatory in Namibia at 23° southern latitude under nearly perfect skies will be presented. The main instruments at the Hakos site at 1836 ASL are two 50 cm telescopes under movable roofs, a 50 cm RC in a dome and a 71 cm Newton on the 2347 m ASL Gamsberg-mountain. -- The last Chariklo events were observed, the last one succeeded in detecting the rings.

Technology

Michael Busse and Konrad Guhl · IOTA/ES

A portable 20" telescope for IOTA/ES

The observational work of IOTA is spread out on observing sites around the world. Due to focusing on occultation astronomy of TNO's and moons of the outer planets the size of the necessary telescopes have increased over the years. The standard "traveling observatory" for many years – the C8 telescope (8 inch diameter) doesn't fit the request of these observations. The signal to noise ratio of these rather small instruments does not keep up with the faint objects (up to 20th magnitude) even

if highly sensitive CCD (or EMCCD) cameras are used for detection. On a dark observation site with a 1 second exposure time, an instrument with 20 inch diameter is able to detect occultations of stars fainter than 18th magnitude.

Therefore IOTA/ES decided to buy a used 20" Dobsonian telescope and to adapt it to the requirements for occultation work. An instrument of this size gives a good balance between research capability and transportability as well. The presentation will show the different stages of the project and the instrument in the final design. The instrument will be based in Hannover (Germany, headquarter of IOTA/ES) and will be available for IOTA/ES members on request.

Wolfgang Beisker · IOTA/ES

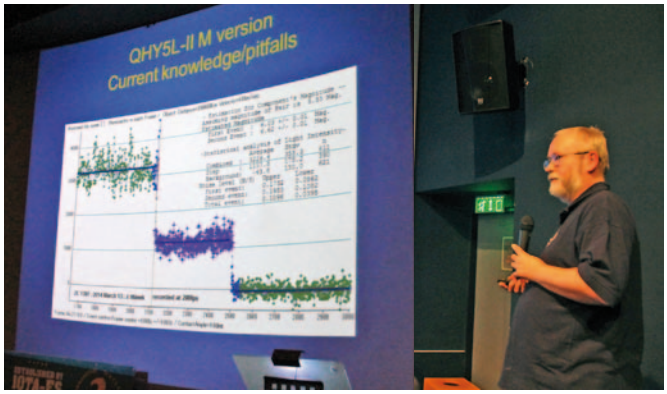
The new IOTA Occultation Camera

In the past years many attempts had been made to select a new standard system for occultation work specially focussed on the observation of occultations by outer solar system bodies. Problems had be seen in the past for the usage of different operation systems, such as the forced switch from Windows XP to Windows 7. Many cameras, which did a reasonable job under Windows XP did not run as smooth under Windows 7. Therefore the selection of a camera which runs using LINUX operating system was obvious. However, many companies do not provide sufficient support for LINUX. This limited the camera selection to a few systems. Even more a low price tag is a requirement, a new standard system should fulfil.

A commercial available camera (around the ICX445 chip) has been selected as a basis, a new housing has been constructed for forced air flow cooling and a software package under LINUX has been developed based on a SDK supplied by the company. The camera can record in 12 Bit with a maximum of 30 full images per second. It generates fits files including a precise timestamp if the system clock is either controlled by a network connection using NTP or by a "stratum 0" GPS receiver with a 1PPS signal. The 1/3 inch chip with 1.2 MPix has a readout noise of less than 8 e-. Maximum quantum efficiency is around 65%.

Jan Menk

QHY5L-IIM Monochrome Planetary & Autoguider Camera



The QHY 5L-II monochrome camera uses the 1/3 inch, 1.2 MP Aptina MT9M034 CMOS sensor. The 1280 x 960 pixel array of 3.75 um pixels are capable of video speeds of 30 frames per second at full resolution. The QHY 5L series camera has a c-mount interface for flexibility – choose from a variety of optional lenses.

As a member of the QHY5-II series, the QHY5L-II design retains the 1.25" (eyepiece size) form factor and the standard ST-4 Opto-isolated guide port. The high QE of 74 % plus the high speed USB2 port enable very fast frame rates, making this an ideal planetary camera. The camera uses a single USB port for camera control and power to provide simplicity and ease of use. The USB communication port has been updated to take advantage of the full down load speed and to eliminate noise that had been caused by the USB port in the past. This camera is an extraordinary device for both auto guiding and planetary photography, all at a very attractive price point. The QHY5L-IIM camera comes with a parfocal adjustment ring, 1.25" extension tube / filter holder, and a USB and guide cable.

QHY5L-II Mono Camera Specifications

- CMOS Sensor: MT9M034 Mono
- CMOS Size: 1/3 inch, Effective Pixels: 1280 x 960
- Pixel Size: 3.75 um x 3.75 um
- Readout Type: Progressive Scan
- Shutter: Electric Rolling Shutter
- Exposure Range: 20 microseconds to 10 minutes
- Maximum Frame Rate: 1280 x 960 @ 30 FPS,
- 1024 x 768 @ 44 FPS, 800 x 600 @ 75 FPS,
  640 x 480 @ 106 FPS, 20 x 240 @ 200 FPS
- Pixel Binning: 1x1
- Peak QE: 74 %
- AD Conversion: 8 bit/12 bit (output) , 14 bit (Internal)
- Pixel Rate: 12 / 24 / 48 / 72MHz
- Mechanical Size: 1.25" eyepiece style (31.6 mm)
- Optical Window: 22 mm AR + AR coating glas
- Back Focus: 17.5 mm (when use standard optic window)
- Power Consumption: 0.64 W
- Guider Interface: Opto-Isolated 6pin RJ11
- Computer Interface: USB 2.0

Grazing Occultations of Stars by the Moon in 2015

Eberhard Riedel · IOTA/ES

The following maps and tables show this year's grazing occultations of the brightest stars by the moon. On the European overview the limiting magnitude is 6.0 whereas for the different countries the limit is 7.0 mag.

Many of the bright star events result from this year's lunar passages through the Hyades star cluster in Taurus. Also 4 grazes of Aldebaran occur, two of them very unfavorably during daytime. The northwest coast of Iceland is the only region where a dark limb graze of Aldabaran will be visible at night on Oct. 29. Pict. 1shows the high resolution lunar limb profile of this event giving 8 contacts at that location on Iceland.

Two grazes below these magnitude limits are included during the total lunar eclipse on the early morning of Sept. 28. Pict. 2 shows the high resolution lunar limb profile of this event giving 8 contacts at a location in Northern Germany.

All tables and pictures of this article were created with the author's GRAZPREP. The newest version of this software now uses the LUNLIMB high resolution lunar profile data that was recalculated from the Kaguya data by Dietmar Büttner of Chemnitz, Gernany.

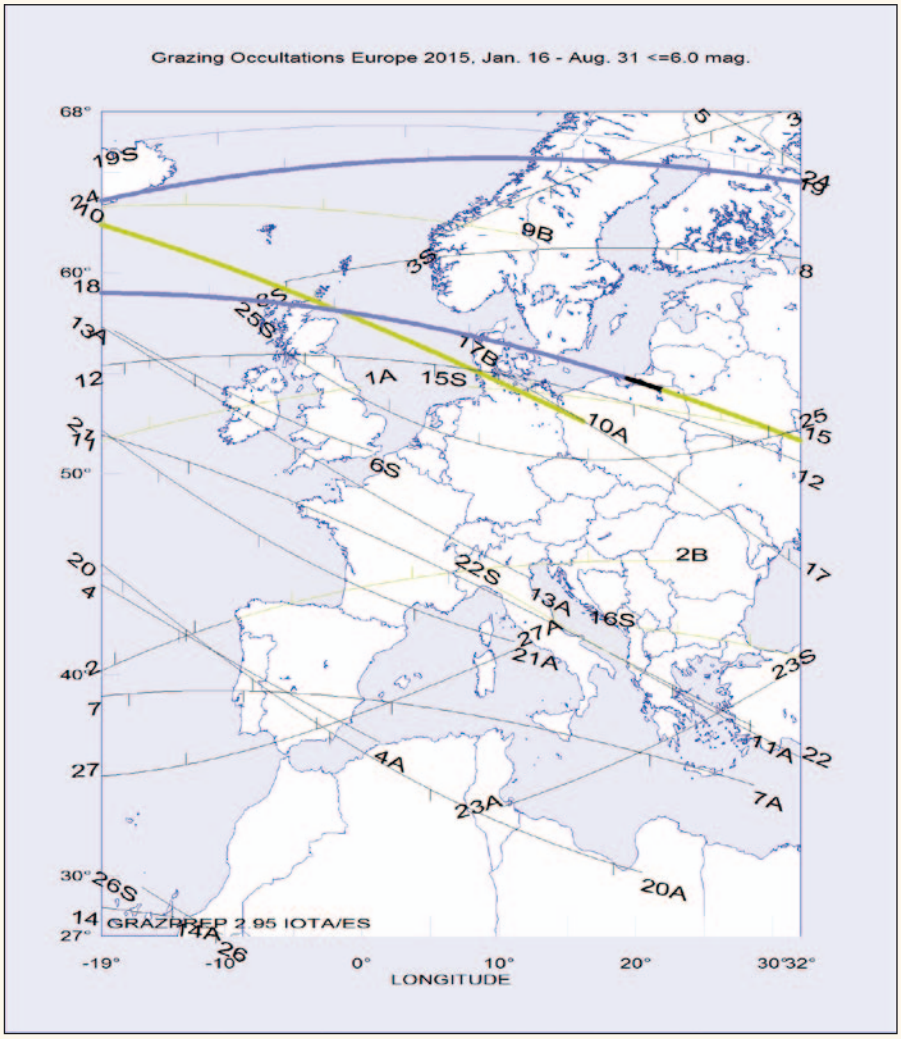
Further precise information on the local circumstances of all grazing occultations is provided by this software which can be downloaded and installed via www.grazprep.com (password: IOTA/ES). The prediction files that are needed additionally can be obtained from IOTA/ES or directly from the author.

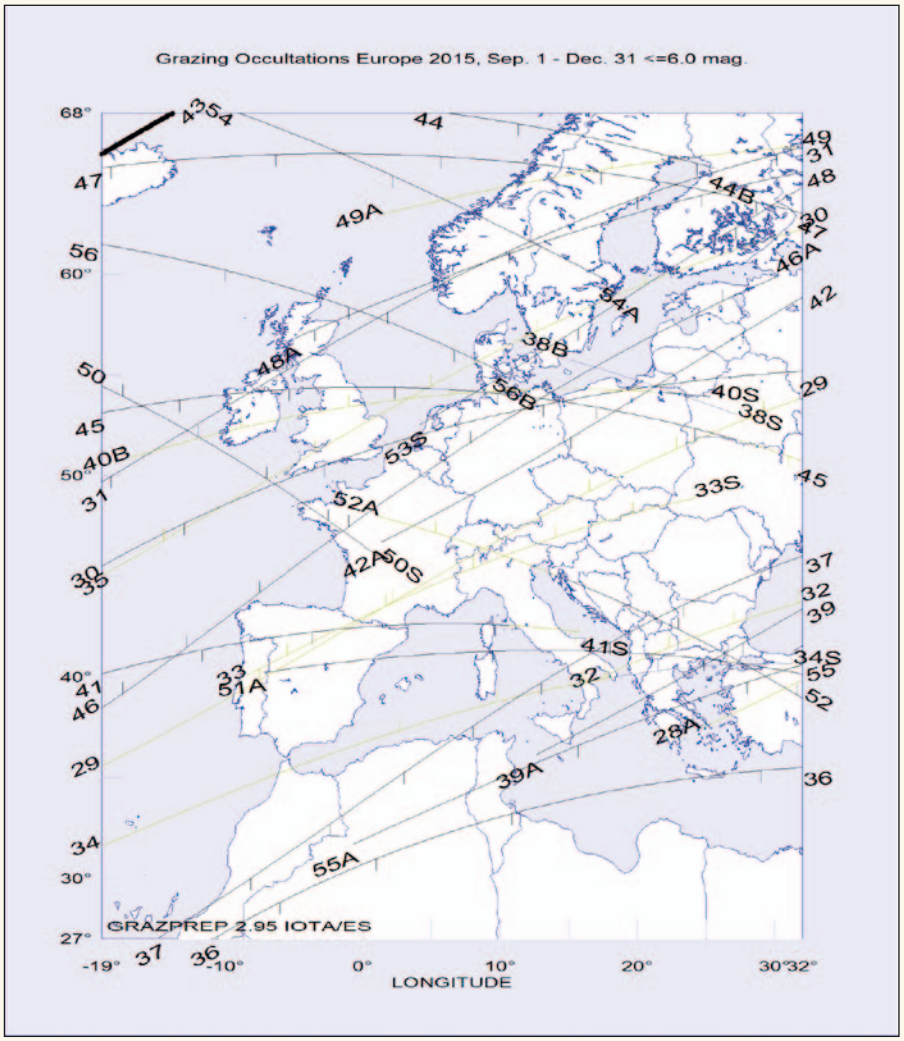
GRAZPREP assists in finding and listing individually favorable occultation events and in figuring out the best observing site in advance or even under way by graphically showing the expected apparent stellar path through the lunar limb terrain.

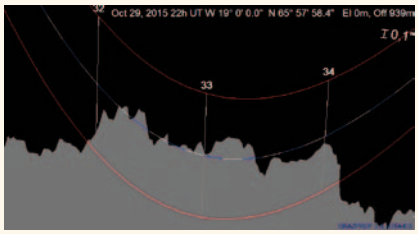
The main idea of the program is to easily visualize the complete list of all grazing occultation

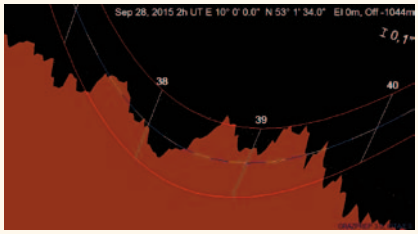
2015	Grazing Occultations Europe 2015, Jan. 16 - Dec. 31 <=6.0 mag.									GRAZPREP 3.0, IOTA/ES	
No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	LONG	LAT	STAR NAME	MAG1	MAG2
1	Jan 23	ZC 3416	146593 V	5.6	14+	S	20 8.3	-19	52	293 B. Aqr	6.4	6.4
2	Jan 25	ZC 153	109656	6.0	34+	S	19 28.4	-19	40	73 Psc		
3	Jan 30	ZC 814	94554 T	5.4	84+	N	15 52.3	4	62	115 Tau	5.7	6.6
4	Feb 01	ZC 1029	96015 V	5.2	92+	N	4 15.2	-19	44	26 Gem	5.9	5.9
5	Feb 07	ZC 1652	118831 U	5.4	92 -	N	0 35.3	26	68	79 Leo	5.9	6.5
6	Feb 15	ZC 2658	161376 V	5.8	19 -	N	6 47.5	-18	57	Y Sgr	6.2	6.2
7	Feb 23	ZC 384	93022 V	5.6	29+	N	20 7.4	-19	39	31 Ari	6.4	6.5
8	Feb 25	ZC 650	93900 J	5.6	50+	N	17 49.9	-5	60	63 Tau	5.9	7.9
9	Feb 25	ZC 667	93950 V	5.0	51+	S	20 13.7	-19	63	75 Tau	5.4	7.9
10	Feb 26	ZC 692	94027 A	0.9	52+	S	0 10.6	-19	62	87 alpha Tau (Aldebaran)	1.1	11.3
11	Feb 26	ZC 814	94554 T	5.4	62+	N	23 2.2	-19	52	115 Tau	5.7	6.6
12	Feb 27	ZC 944	95419M	5.9	71+	N	19 28.0	-19	55	124 H1. Ori	6.7	6.7
13	Mar 01	ZC 1106	96746 Y	3.6	81+	N	2 26.3	-19	57	54 lambda Gem	4.0	5.0
14	Mar 21	ZC 184	109753	6.0	3+	N	20 5.8	-19	28	88 Psc		
15	Mar 23	ZC 454	93276	5.6	15+	S	17 56.0	7	54	147 B. Ari		
16	Mar 25	ZC 741	94227 V	5.5	34+	S	17 4.4	20	42	318 B. Tau	6.5	6.5
17	Apr 06	ZC 2114	158821M	5.3	94 -	S	22 0.8	9	55	7 mu Lib	5.6	6.7
18	Apr 21	ZC 692	94027 A	0.9	11+	S	17 11.1	-19	59	87 alpha Tau (Aldebaran)	1.1	11.3
19	Apr 24	ZC 1106	96746 Y	3.6	37+	N	15 15.9	-16	67	54 lambda Gem	4.0	5.0
20	Apr 27	ZC 1465	118023 X	6.0	68+	N	23 16.9	-19	45	89 B. LEONIS	7.1	7.1
21	Apr 28	ZC 1468	118044	4.7	68+	N	0 33.4	-19	52	29 pi Leo (Yu Neu)		
22	May 21	ZC 1073	96409	5.9	14+	S	18 55.6	10	44	41 H1. Gem		
23	Jun 13	ZC 354	92932 K	5.5	14 -	S	2 12.6	10	33	24 xi Ari	6.3	6.3
24	Jun 15	ZC 692	94027 A	0.9	2 -	S	11 16.4	-19	64	87 alpha Tau (Aldebaran)	1.1	11.3
25	Jun 27	ZC 2114	158821M	5.3	81+	S	21 36.2	-6	57	7 mu Lib	5.6	6.7
26	Jul 23	ZC 1962	139490	5.0	46+	N	20 3.3	-16	29	82 m Vir		
27	Aug 22	ZC 2271	159563 X	4.1	50+	S	21 20.8	-19	35	46 theta Lib	5.1	5.1
28	Sep 04	ZC 635	93868 K	3.6	55 -	S	21 11.3	24	37	54 gamma Tau (Hyadum I)	4.7	4.7
29	Sep 05	ZC 669	93955 V	3.8	53 -	S	0 53.3	-19	36	77 theta1 Tau	4.0	7.8
30	Sep 05	ZC 671	93957 V	3.4	53 -	S	1 7.1	-19	45	78 theta2 Tau	4.0	5.0
31	Sep 05	ZC 667	93950 V	5.0	53 -	N	1 19.6	-19	50	75 Tau	5.4	7.9
32	Sep 05	ZC 677	93975 X	4.8	53 -	S	2 29.5	17	40	264 B. Tau	5.6	5.6
33	Sep 06	ZC 820	94573	5.8	42 -	S	2 46.5	-8	40	117 Tau		
34	Sep 08	ZC 1106	96746 Y	3.6	22 -	S	3 42.1	-19	32	54 lambda Gem	4.0	5.0
35	Sep 28	X 226	109080	9.2	10CE	N	2 12.5	-19	45			
36	Sep 28	X 211	109068	9.3	10CE	N	2 11.9	-10	27			
37	Sep 30	ZC 454	93276	5.6	88 -	N	23 10.8	-14	27	147 B. Ari		
38	Oct 02	ZC 635	93868 K	3.6	77 -	S	7 25.0	14	56	54 gamma Tau (Hyadum I)	4.7	4.7
39	Oct 02	ZC 741	94227 V	5.5	70 -	N	20 53.3	12	36	318 B. Tau	6.5	6.5
40	Oct 05	ZC 1073	96409	5.9	47 -	S	3 21.0	-16	51	41 H1. Gem		
41	Oct 06	ZC 1197	97399	5.8	36 -	N	4 2.5	-19	40	1 Cnc		
42	Oct 29	ZC 667	93950 V	5.0	92 -	N	19 4.4	1	47	75 Tau	5.4	7.9
43	Oct 29	ZC 692	94027 A	0.9	91 -	N	22 33.0	-19	66	87 alpha Tau (Aldebaran)	1.1	11.3
44	Oct 31	ZC 878	94858 K	5.5	82 -	N	4 36.2	6	68	130 Tau	5.6	9.0
45	Nov 01	ZC 1029	96015 V	5.2	73 -	N	2 53.3	-19	53	26 Gem	5.9	5.9
46	Nov 18	ZC 3131	164364	5.5	44+	S	18 26.9	-19	38	18 Aqr		
47	Nov 28	ZC 944	95419M	5.9	94 -	N	1 29.5	-19	65	124 H1. Ori	6.7	6.7
48	Nov 29	ZC 1197	97399	5.8	81 -	N	20 39.8	-5	57	1 Cnc		
49	Dec 01	ZC 1428	98709W	3.5	62 -	S	21 57.1	1	63	14 omicron Leo (Subra)	4.4	4.6
50	Dec 02	ZC 1458	118001	5.8	60 -	S	6 27.5	-19	54	83 B. Leo		
51	Dec 03	ZC 1549	118376 K	5.1	52 -	N	0 15.9	-7	40	48 Leo	6.0	6.0
52	Dec 07	ZC 1962	139490	5.0	16 -	S	3 39.1	1	48	82 m Vir		
53	Dec 23	ZC 667	93950 V	5.0	96+	N	15 33.5	4	53	75 Tau	5.4	7.9
54	Dec 24	ZC 741	94227 V	5.5	97+	N	4 55.1	-9	68	318 B. Tau	6.5	6.5
55	Dec 26	ZC 1141	96985	5.5	97 -	N	18 53.8	0	32	162 B. Gem		
56	Dec 29	ZC 1409	98627 V	5.0	86 -	N	2 31.7	-19	61	5 xi Leo	5.3	7.2

EUROPE







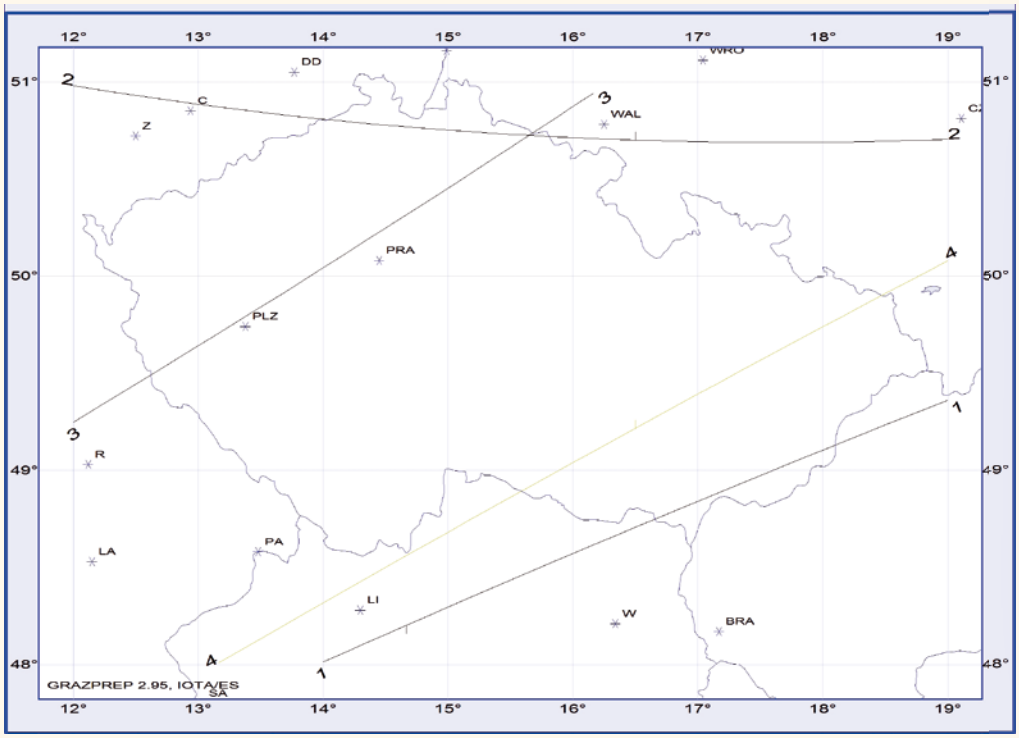


events in an area plus the complete line data for any selected event and (simultaneously on the same screen) both the geographic circumstances on earth and the enlarged topographic situation at the lunar limb including a fairly realistic display of the sunlit lunar portion as well as the approximate sky brightness due to the sun's altitude. Thus a judgment about the entire graze circumstances is easily possible at a few glances and a selection of the best events quick and easy. Any graze line for any selected favorable offset to the predicted limit can be displayed in Google Earth.

Besides that the software assists in creating one or several individual observing stations with any center and radius, that way filtering out the most suitable local events according to a variety of personal preferences.

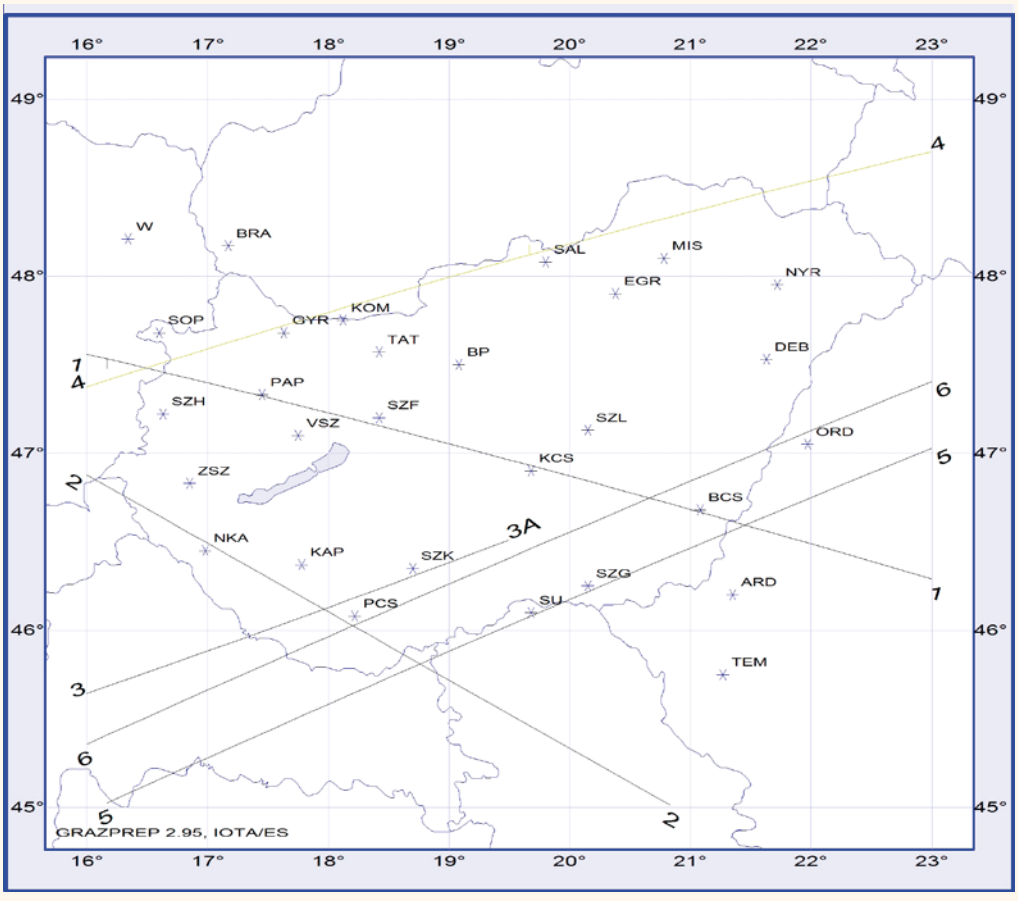
CZECH REPUBLIC

2015	Grazing Occultations Czech Republic 2015 - 7.0 mag.								GRAZPREP 2.95, IOTA/ES		
No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	CUSP-A T	STAR NAME	MAG1	MAG2
1	**Jan 22**	ZC 3247	145905 K	7.0	6+	N	16 39.7	3.2 D A	36 Aqr	7.8	7.8
2	**Jun 27**	ZC 2114	158821 M	5.3	81+	S	22 4.8	4.7 D A	7 mu Lib	5.6	6.7
3	**Sep 02**	ZC 360	92952 D	6.7	76 -	N	21 43.8	2.3 D C	VW Ari	6.8	8.3
4	**Sep 05**	ZC 669	93955 V	3.8	53 -	S	1 25.1	4.4 B A	77 theta1 Tau	4.0	7.8

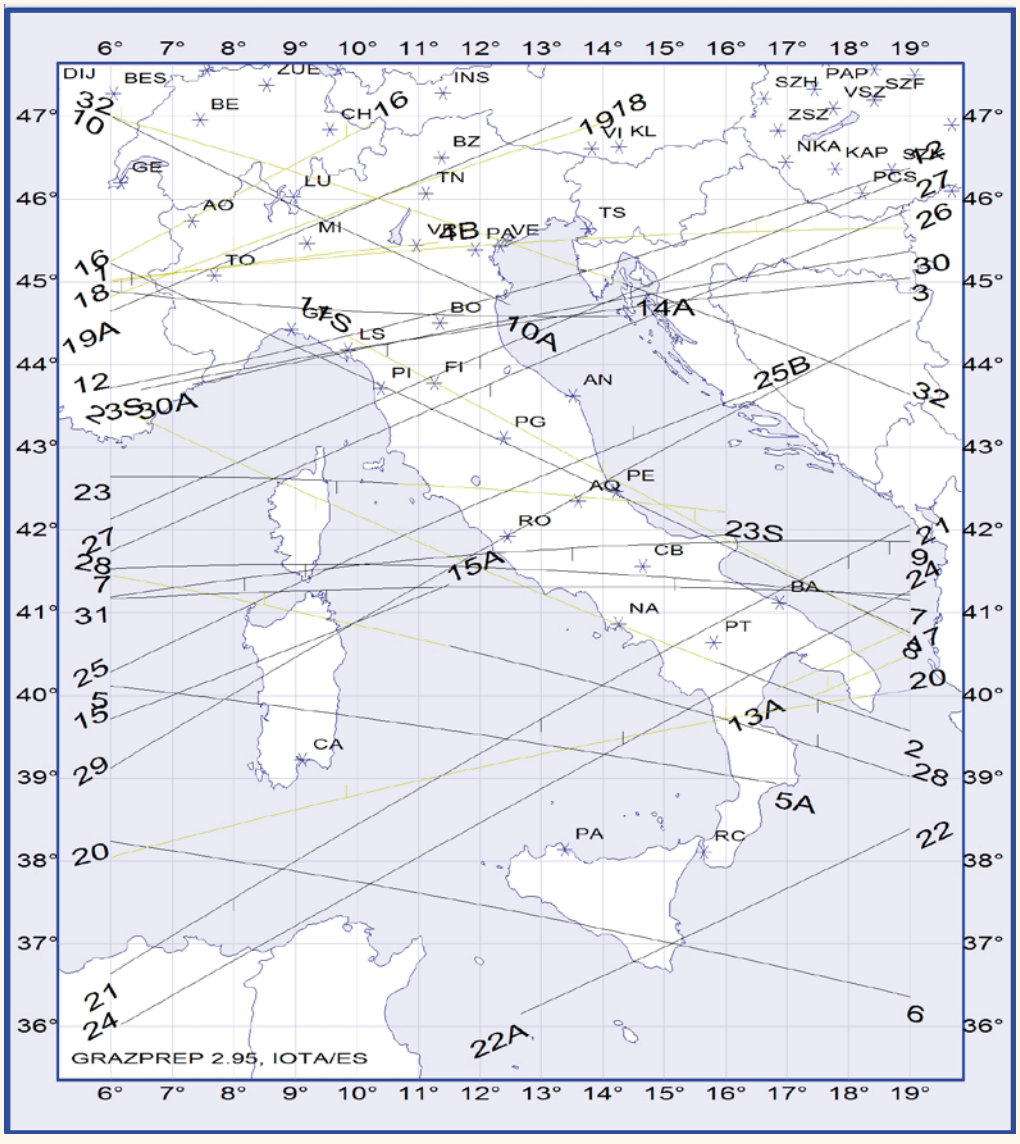


HUNGARY

2015	Grazing Occultations Hungary 2015 - 7.0 mag.								GRAZPREP 2.95, IOTA/ES		
No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	CUSP-A T	STAR NAME	MAG1	MAG2
1	**Feb 25**	X 5735	93938	6.9	51+	N	20 20.5	6.3 D A			
2	**Feb 28**	ZC 970	95572	6.3	72+	N	0 13.5	9.3 D B	292 B. (Ori)/Gem		
3	**Jul 25**	ZC 2193	159191 C	6.1	66+	S	22 8.9	7.4 D C	29 omicron Lib	6.1	8.3
4	**Sep 06**	ZC 820	94573	5.8	42 -	S	3 23.7	2.8 B C	117 Tau		
5	**Okt 31**	ZC 1003	95795 Y	6.3	75 -	N	22 3.2	9.6 D B	21 Gem	8.0	8.0
6	**Okt 31**	ZC 1002	95794 S	6.9	75 -	N	22 3.2	9.6 D B	20 Gem		

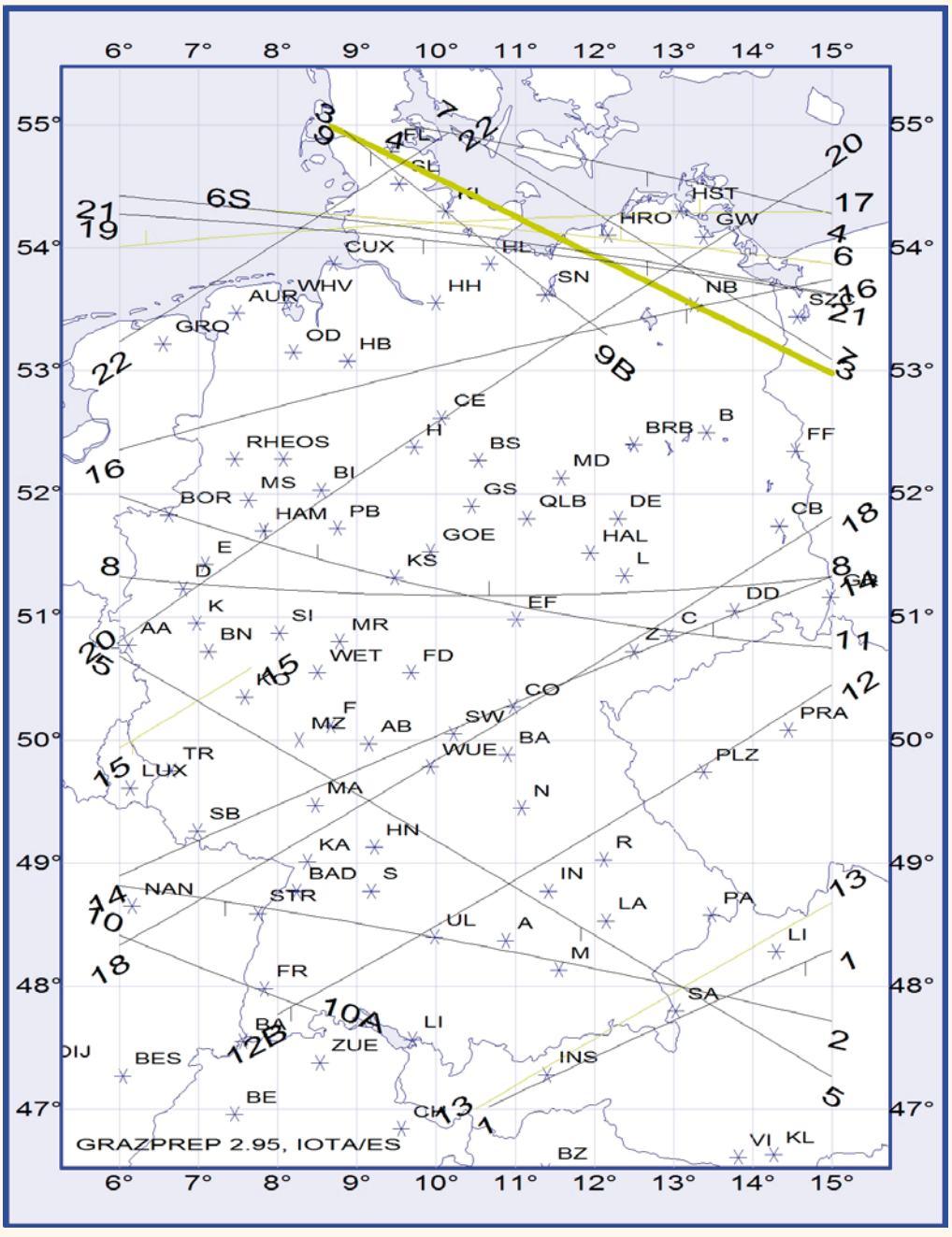


2015	Grazing Occultations Italy 2015 - 7.0 mag.									GRAZPREP 2.95, IOTA/ES	
No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	CUSP-A T	STAR NAME	MAG1	MAG2
1	**Jan 25**	ZC 153	109656	6.0	34+	S	20 2.2	2.7 B C	73 Psc		
2	**Feb 15**	ZC 2649	161278 G	6.7	19 -	N	5 7.3	0.9 B C		6.6	9.6
3	**Feb 22**	X 2205	109990	7.0	19+	N	17 25.7	0.1 T B			
4	**Feb 22**	ZC 238	110011	6.4	19+	S	18 1.6	1.1 B C	278 B. Psc		
5	**Feb 22**	ZC 247	110046	6.3	19+	N	20 23.8	5.5 D A	288 B. Psc		
6	**Feb 23**	ZC 384	93022 V	5.6	29+	N	20 32.8	5.7 D A	31 Ari	6.4	6.5
7	**Feb 25**	X 5691	93913 V	7.0	51+	N	18 44.6	2.1 D A		7.6	10.6
8	**Feb 26**	ZC 814	94554 T	5.4	62+	N	23 29.8	9.0 D A	115 Tau	5.7	6.6
9	**Feb 27**	ZC 934	95337	6.4	71+	N	17 46.2	0.4 T A			
10	**Mrz 01**	ZC 1106	96746 Y	3.6	81+	N	2 46.3	8.7 D A	54 lambda Gem	4.0	5.0
11	**Mai 21**	ZC 1073	96409	5.9	14+	S	18 55.6	0.1 B C	41 H1. Gem		
12	**Jul 25**	ZC 2193	159191 C	6.1	66+	S	22 2.8	6.2 D B	29 omicron Lib	6.1	8.3
13	**Aug 11**	ZC 1003	95795 Y	6.3	11 -	N	1 35.5	0.2 B C	21 Gem	8.0	8.0
14	**Aug 18**	ZC 1814	138885 C	6.7	14+	S	19 0.8	4.0 D C	71 G. Vir	7.0	9.7
15	**Aug 22**	ZC 2271	159563 X	4.1	50+	S	21 45.3	7.3 D A	46 theta Lib	5.1	5.1
16	**Sep 05**	ZC 669	93955 V	3.8	53 -	S	1 14.9	4.7 B A	77 theta1 Tau	4.0	7.8
17	**Sep 05**	ZC 677	93975 X	4.8	53 -	S	2 29.5	5.0 B B	264 B. Tau	5.6	5.6
18	**Sep 06**	ZC 820	94573	5.8	42 -	S	3 6.8	4.0 B C	117 Tau		
19	**Sep 08**	ZC 1091	96611 K	6.5	23 -	N	1 4.2	3.4 D C		7.5	7.5
20	**Sep 08**	ZC 1106	96746 Y	3.6	22 -	S	4 4.5	2.7 B A	54 lambda Gem	4.0	5.0
21	**Sep 30**	ZC 454	93276	5.6	88 -	N	23 46.0	9.7 D A	147 B. Ari		
22	**Okt 02**	ZC 741	94227 V	5.5	70 -	N	20 53.3	6.7 D C	318 B. Tau	6.5	6.5
23	**Okt 06**	ZC 1197	97399	5.8	36 -	N	4 34.2	1.1 D A	1 Cnc		
24	**Okt 19**	ZC 2745	161935 A	6.8	38+	S	19 44.2	5.7 D A		6.9	11.8
25	**Okt 23**	ZC 3334	146273	6.4	82+	S	22 51.9	3.6 D B	67 Aqr		
26	**Okt 31**	ZC 1003	95795 Y	6.3	75 -	N	21 56.0	10.0 D B	21 Gem	8.0	8.0
27	**Okt 31**	ZC 1002	95794 S	6.9	75 -	N	21 56.2	10.0 D C	20 Gem		
28	**Nov 07**	ZC 1692	118981 M	6.9	17 -	S	4 7.9	1.0 B C	438 B. (Leo)/Vir	7.0	10.0
29	**Nov 17**	ZC 2986	163612	6.4	33+	S	19 1.3	4.2 D A	31 B. Cap		
30	**Dez 01**	ZC 1433	98731	7.0	62 -	N	22 25.7	8.7 D C			
31	**Dez 03**	ZC 1549	118376 K	5.1	52 -	N	0 18.6	5.8 D A	48 Leo	6.0	6.0
32	**Dez 07**	ZC 1962	139490	5.0	16 -	S	3 40.2	1.2 B C	82 m Vir		



ITALY

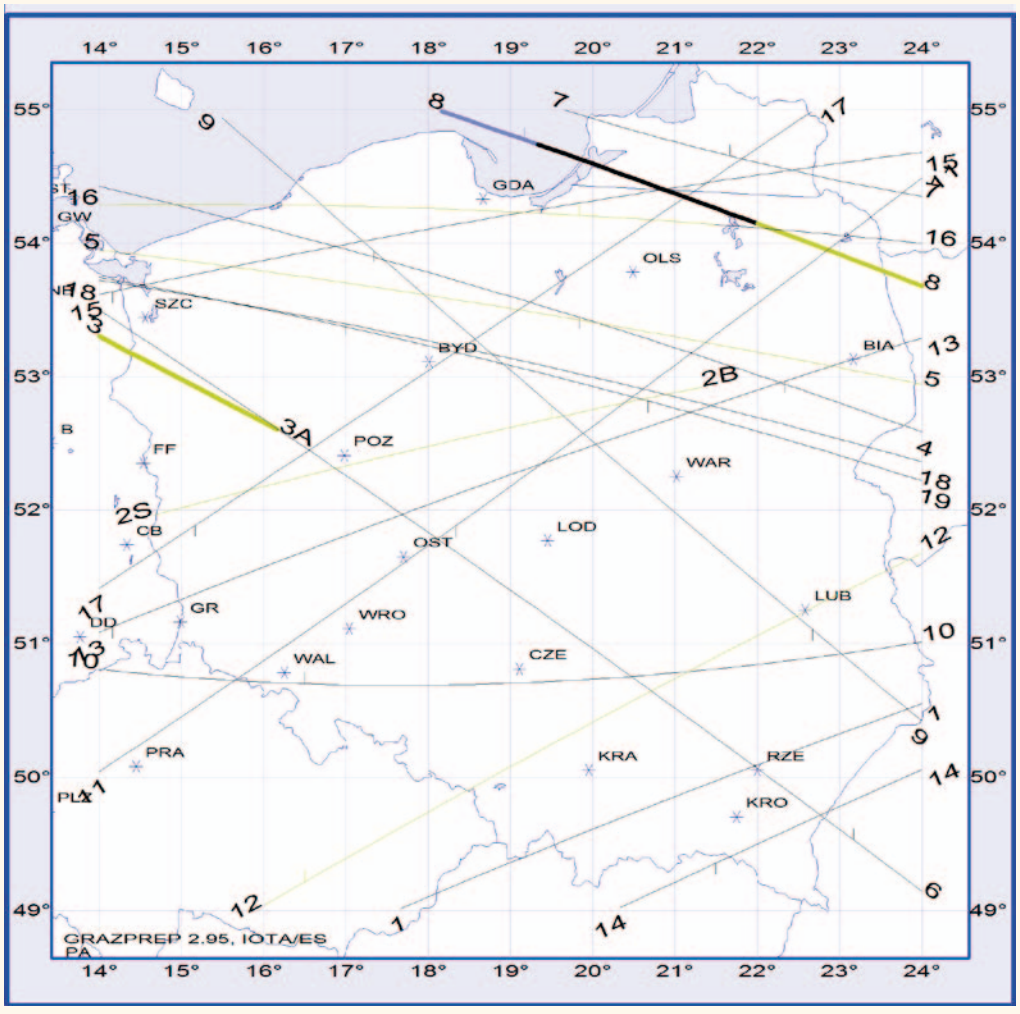
2015	Grazing Occultations Germany 2015 - 7.0 mag.								GRAZPREP 2.95, IOTA/ES		
No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	CUSP-A T	STAR NAME	MAG1	MAG2
1	Jan 22	ZC 3247	145905 K	7.0	6+	N	16 38.1	2.8 D B	36 Aqr	7.8	7.8
2	Feb 25	X 5735	93938	6.9	51+	N	20 8.3	4.9 D A			
3	Feb 26	ZC 692	94027 A	0.9	52+	S	0 24.7	7.2 B A	87 alpha Tau (Aldebaran)	1.1	11.3
4	Feb 27	ZC 944	95419 M	5.9	71+	N	20 6.0	5.6 D A	124 H1. Ori	6.7	6.7
5	Feb 28	ZC 970	95572	6.3	72+	N	0 4.5	9.1 D A	292 B. (Ori)/Gem		
6	Mrz 23	ZC 454	93276	5.6	15+	S	17 56.0	1.1 B C	147 B. Ari		
7	Apr 06	ZC 2114	158821 M	5.3	94 -	S	22 1.0	6.0 D B	7 mu Lib	5.6	6.7
8	Apr 14	ZC 3137	164388	6.7	27 -	S	3 47.0	2.5 D B			
9	Apr 28	ZC 1565	118449 F	6.2	76+	N	23 9.5	2.2 D B	35 SEXTANTIS	6.3	7.4
10	Mai 24	ZC 1429	117851 X	6.8	42+	S	23 4.2	1.6 D C		7.6	7.6
11	Jun 27	ZC 2114	158821 M	5.3	81+	S	21 56.3	3.7 D A	7 mu Lib	5.6	6.7
12	Sep 02	ZC 360	92952 D	6.7	76 -	N	21 40.7	2.0 D C	VW Ari	6.8	8.3
13	Sep 05	ZC 669	93955 V	3.8	53 -	S	1 21.1	4.6 B A	77 theta1 Tau	4.0	7.8
14	Sep 07	ZC 970	95572	6.3	32 -	N	2 32.4	3.4 D A	292 B. (Ori)/Gem		
15	Sep 21	ZC 2640	161227 A	6.0	55+	N	20 30.3	5.0 B C	64 B. Sgr	6.1	11.8
16	Sep 28	X 226	109080	9.2	10CE	N	2 36.3	TOT.ECL.			
17	Okt 05	ZC 1073	96409	5.9	47 -	S	3 49.6	2.3 B C	41 H1. Gem		
18	Okt 29	ZC 667	93950 V	5.0	92 -	N	19 5.6	11.1 D B	75 Tau	5.4	7.9
19	Nov 01	ZC 1029	96015 V	5.2	73 -	N	3 25.0	3.1 D A	26 Gem	5.9	5.9
20	Nov 18	ZC 3131	164364	5.5	44+	S	19 8.3	2.4 D A	18 Aqr		
21	Dez 01	ZC 1344	98278	6.5	71 -	N	1 42.6	4.3 D A	177 B. Cnc		
22	Dez 23	ZC 667	93950 V	5.0	96+	N	15 34.2	10.5 D C	75 Tau	5.4	7.9

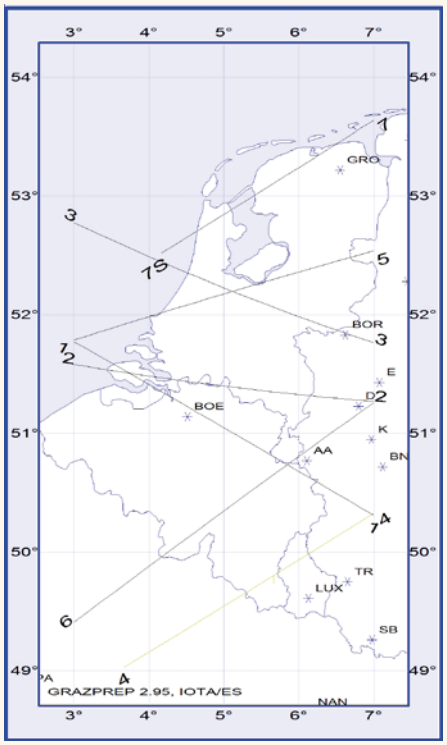


GERMANY

POLAND

2015	Grazing Occultations Poland 2015 - 7.0 mag.									GRAZPREP 2.95, IOTA/ES	
No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	CUSP-A T	STAR NAME	MAG1	MAG2
1	Jan 22	ZC 3247	145905 K	7.0	6+	N	16 41.2	3.6 D A	36 Aqr	7.8	7.8
2	Feb 21	ZC 81	109315	6.4	10+	S	16 36.4	1.1 B C	127 B. Psc		
3	Feb 26	ZC 692	94027 A	0.9	52+	S	0 25.7	7.3 B A	87 alpha Tau (Aldebaran)	1.1	11.3
4	Feb 27	ZC 944	95419 M	5.9	71+	N	20 11.9	6.2 D A	124 H1. Ori	6.7	6.7
5	Mrz 23	ZC 454	93276	5.6	15+	S	18 1.5	1.8 B C	147 B. Ari		
6	Apr 06	ZC 2114	158821 M	5.3	94 -	S	22 3.0	6.4 D B	7 mu Lib	5.6	6.7
7	Apr 11	ZC 2687	161571 T	6.6	61 -	S	2 28.0	2.3 D B	U Sgr	6.6	7.2
8	Apr 21	ZC 692	94027 A	0.9	11+	S	17 49.2	0.3 T A	87 alpha Tau (Aldebaran)	1.1	11.3
9	Mai 25	ZC 1518	118269	6.1	51+	N	19 46.8	1.6 D A	43 Leo		
10	Jun 27	ZC 2114	158821 M	5.3	81+	S	22 7.3	5.1 D A	7 mu Lib	5.6	6.7
11	Sep 02	ZC 360	92952 D	6.7	76 -	N	21 45.6	2.4 D C	VW Ari	6.8	8.3
12	Sep 05	ZC 669	93955 V	3.8	53 -	S	1 29.4	4.3 B A	77 theta1 Tau	4.0	7.8
13	Sep 07	ZC 970	95572	6.3	32 -	N	2 40.7	2.8 D A	292 B. (Ori)/Gem		
14	Sep 08	ZC 1091	96611 K	6.5	23 -	N	1 9.4	3.0 D A		7.5	7.5
15	Sep 28	X 226	109080	9.2	10ŒE	N	2 40.4	TOT.ECL.			
16	Okt 05	ZC 1073	96409	5.9	47 -	S	4 1.2	1.1 B C	41 H1. Gem		
17	Okt 29	ZC 667	93950 V	5.0	92 -	N	19 9.4	11.4 D A	75 Tau	5.4	7.9
18	Nov 01	ZC 1029	96015 V	5.2	73 -	N	3 35.9	1.9 D A	26 Gem	5.9	5.9
19	Dez 01	ZC 1344	98278	6.5	71 -	N	1 51.6	3.1 D A	177 B. Cnc		

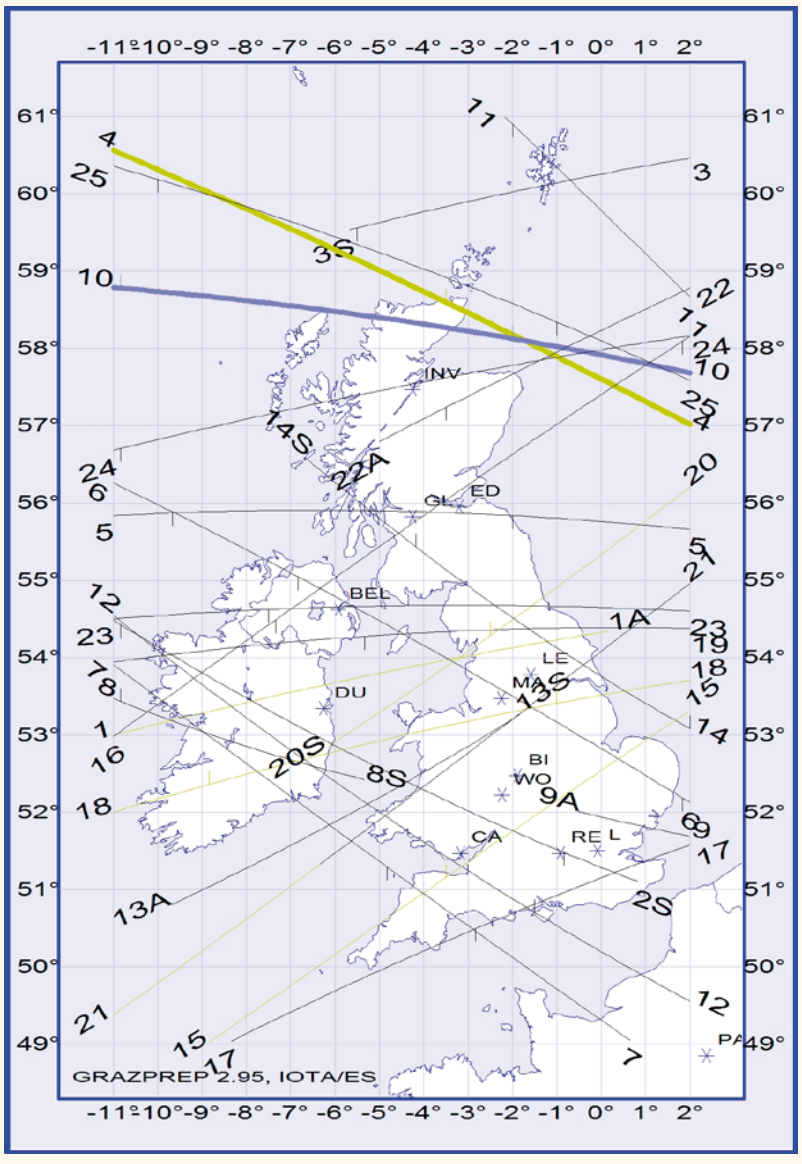




2015	Grazing Occultations BeNeLux 2015 - 7.0 mag.									GRAZPREP 2.95, IOTA/ES	
No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	CUSP-A T	STAR NAME	MAG1	MAG2
1	Feb 28	ZC 970	95572	6.3	72+	N	0 1.4	8.9 D A	292 B. (Ori)/Gem		
2	Apr 14	ZC 3137	164388	6.7	27 -	S	3 45.5	2.8 D B			
3	Jun 27	ZC 2114	158821 M	5.3	81+	S	21 51.6	3.2 D A	7 mu Lib	5.6	6.7
4	Sep 21	ZC 2640	161227 A	6.0	55+	N	20 28.4	4.9 B C	64 B. Sgr	6.1	11.8
5	Sep 28	X 226	109080	9.2	10ŒE	N	2 34.4	TOT.ECL.			
6	Nov 18	ZC 3131	164364	5.5	44+	S	19 5.1	2.7 D A	18 Aqr		
7	Dez 23	ZC 667	93950 V	5.0	96+	N	15 33.5	10.5 D C	75 Tau	5.4	7.9

2015	Grazing Occultations England 2015 - 7.0 mag.								GRAZPREP 2.95, IOTA/ES		
No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	CUSP-A T	STAR NAME	MAG1	MAG2
1	**Jan 23**	ZC 3416	146593 V	5.6	14+	S	20 11.7	3.1 B C	293 B. Aqr	6.4	6.4
2	**Feb 15**	ZC 2658	161376 V	5.8	19 -	N	6 50.8	0.8 T A	Y Sgr	6.2	6.2
3	**Feb 25**	ZC 650	93900 J	5.6	50+	N	17 49.9	0.2 T A	63 Tau	5.9	7.9
4	**Feb 26**	ZC 692	94027 A	0.9	52+	S	0 15.8	6.4 B A	87 alpha Tau (Aldebaran)	1.1	11.3
5	**Feb 27**	ZC 944	95419 M	5.9	71+	N	19 38.3	2.6 D A	124 H1. Ori	6.7	6.7
6	**Feb 27**	ZC 970	95572	6.3	72+	N	23 45.2	8.0 D A	292 B. (Ori)/Gem		
7	**Mrz 01**	ZC 1106	96746 Y	3.6	81+	N	2 34.7	9.1 D A	54 lambda Gem	4.0	5.0
8	**Mrz 15**	ZC 2755	162001	6.6	34 -	S	6 0.2	0.7 T B			
9	**Apr 14**	ZC 3137	164388	6.7	27 -	S	3 44.2	3.2 D C			
10	**Apr 21**	ZC 692	94027 A	0.9	11+	S	17 20.3	3.0 D A	87 alpha Tau (Aldebaran)	1.1	11.3
11	**Apr 28**	ZC 1565	118449 F	6.2	76+	N	22 50.3	2.3 D B	35 SEXTANTIS	6.3	7.4
12	**Mai 24**	ZC 1429	117851 X	6.8	42+	S	22 50.8	0.3 T B		7.6	7.6
13	**Jun 13**	ZC 360	92952 D	6.7	13 -	S	3 24.6	5.5 D C	VW Ari	6.8	8.3
14	**Jun 27**	ZC 2114	158821 M	5.3	81+	S	21 36.2	2.1 D B	7 mu Lib	5.6	6.7
15	**Sep 05**	ZC 671	93957 V	3.4	53 -	S	1 14.8	3.8 B A	78 theta2 Tau	4.0	5.0
16	**Sep 05**	ZC 667	93950 V	5.0	53 -	N	1 26.5	3.4 D A	75 Tau	5.4	7.9
17	**Sep 28**	X 226	109080	9.2	10ŒE	N	2 25.2	TOT.ECL.			
18	**Okt 05**	ZC 1073	96409	5.9	47 -	S	3 27.5	4.4 B C	41 H1. Gem		
19	**Nov 01**	ZC 1029	96015 V	5.2	73 -	N	3 3.1	5.5 D A	26 Gem	5.9	5.9
20	**Nov 15**	ZC 2699	161635	6.8	15+	S	16 46.5	1.4 B C	110 B. Sgr		
21	**Nov 15**	X 25588	161665 A	7.0	15+	S	17 42.8	0.2 B C		7.2	13.0
22	**Nov 29**	ZC 1197	97399	5.8	81 -	N	20 39.8	10.7 D C	1 Cnc		
23	**Dez 01**	ZC 1344	98278	6.5	71 -	N	1 27.3	6.5 D B	177 B. Cnc		
24	**Dez 01**	X 14721	98747	6.9	62 -	N	23 40.7	7.8 D C			
25	**Dez 29**	ZC 1409	98627 V	5.0	86 -	N	2 39.1	4.6 D A	5 xi Leo	5.3	7.2

ENGLAND



Journal for Occultation Astronomy

DOA-member honoured

Harrie Rutten · President DOA (Dutch Occultation Association)

Roelof Boschloo and his fellows at the Astrodag 2014 in Goirle (NL): Lower row: Henk de Groot, Erik Bellaard, middle row: Harrie Rutten, Roelof Boschloo, Henk Bril, Adri Gerritsen, upper row: Henk Masselink, Jan Maarten Winkel, Eltjo Wubbena, Wim Nobel.

Roelof Boschloo, the nestor of DOA. Roelof receives the Dr. J. van der Biltprijs from Dr. Niek de Kort, Chairman of the KNVWS (Royal Dutch Association for Meteorology and Astronomy)

All pictures: Berry Hamers

The Dutch Occultation Association (DOA) was founded in 1943 during WW II, but due to the occupation it was forbidden. Activities continued however in secret missions. In September 1946 the association was connected to the NVWS = Nederlandse Vereniging voor Weer- en Sterrenkunde (Dutch Society for Meteorology and Astronomy) and continued as Werkgroep Sterbedekkingen (Working group on Occultations of Stars). Though, DOA is one of the first associations to promote observations by amateur astronomers of celestial occultation events. At the moment DOA counts about 55 members. About 10 actively observe occultation, in former times nearly all occultations by the moon, now the interest is changed to occultations by minor planets. Since the society was founded the number of reports of occultations by the moon is about 15,000 and by minor planets more than 300. Three members reported more than 1000 observations.

One of these members is Roelof Boschloo from Almen. But he is not honoured for his number of occultations only, but also for his long period he did his observations: 50 years! Roelof started his official observation 50 years ago. Already in the years before he observed without reporting, more accidently he observed occultations by the moon. For his long term of official observations, Roelof was honoured with the Dr. Jan van der Bilt-prijs, the highest honour an amateur astronomer in the Netherlands for amateur astronomical activities can receive. On November 15th 2014 Roelof received this award by Dr. Niek de Kort, chairman of the Dutch Association for Meteorology and Astronomy during the yearly autumn meeting in Goirle in the South of the Netherlands.

Roeloef did all his observation with self-made telescopes. First a 300 mm Kutter telescope, later a 300 mm Newton telescope. He did his observation from a self-made observatory (52°09'50.3"N 6°18'57.4"E) at the property of his farm, now a farmer's camping run by his eldest daughter. But this is not the main reason why he received the Dr. Jan van der Bilt-prijs. Thanks to him, the association continued in 1965. The period the total number of observation of all members of the association was increased to less than 50 per year! He inspired members to pick up observations again by doing many observations. And so, the number of observers increased and the number of observations increased rapidly. So, the Dutch Occultation Association grew to one of the most active associations in the world in observing these phenomena. The number of observation increased from 43 in 1964 to 595 in 2001 and 569 in 2008 (note that mostly the weather in our country is not friendly to do astronomical observations!). In 1967, 1968, 1971, 1975, 1981, 1984, 1985, 1987 and 1988 Roelof was the observer with the highest number of observations. With growing age the number went down but to do visual observation to an age of 82 years is rare, very rare.

After 2008 the number reduced because the need of observations had been reduced but Roelof continued his activities in his old manner. The number of occultations by minor planets grew since, mainly due to the introduction of high sensitive video cameras (Watec 120N).

Roelof is not the first member of DOA whom received the Dr. Jan van der Bilt award. For activities related to occultations: Arie Mak (1951, calculations of prediction of occultations), Johan van der Meulen and Berend Vastenholt (1954, design and building of very accurate electro-mechanical pendulum clocks), Dik Schmidt (1978, observing and popularising occultations), Cor Booy (1981, observing occultations), Adri Gerritsen (1994, calculations of predictions and reduction of occultations), Eric Limburg (2003, publishing the world wide known Lunar Occultations Workbench). Other members of DOA which received the award for other than occultations activities were Jean Meeus (1965, doing astronomical calculations including predictions of occultations), Henk Feijth and Georg Comello (1970, observing variable stars, occultations are bycatch), Harrie Rutten (1989, research on telescope optics and publication of "Telescope Optics"), Peter Bus and Alex Scholten (1997, observing comets, occultations are bycatch), Peter Louwman (1999, promoting amateur astronomy), Ton Spaninks and Erik Bellaard (2001, popularising astronomy and sometimes observing occultations) and Erwin van Ballegoij and Reinder Bouma (2011, observing variable stars, occultations are bycatch).

Graham Lindsay Blow

1954 to 2014

John Talbot and Brian Loader
brian.loader@clear.net.nz

It is with great sadness that we mark the death of Graham Blow on 31 December 2014 at the age of 60. He was born 5 August 1954 in Auckland, New Zealand.

Graham died peacefully at home on the last day of 2014 following a second heart attack on December 24. He had been diagnosed with kidney cancer five years previously when he was given only 6 months to live. Despite this, with the help of his oncologist and Graham's positive outlook he continued an active life for 5½ years.

Graham suffered an initial severe heart attack on November 14. He attended the last 2014 meeting of the Wellington, New Zealand, Astronomical Society on December 3 when he seemed in good spirits. The December 24 heart attack was enough to weaken him over the next 7 days until heart failure occurred.

Graham had an interest in astronomy from an early age. For his 15th birthday his parents bought him a 2.5" refractor. Shortly after, in 1970, he joined the Auckland Astronomical Society and "ended up becoming a fixture at the observatory for most of the following decade". He joined the Variable Star Section and was able to make observations of variable stars using his refractor.

Although his first interest was in variable stars, he soon became involved in observing total and grazing lunar occultations. The interest in occultations resulted in the Auckland Occultations Programme being set up to maintain interest in and observations of both types of occultations

In 1973 Graham assisted in forming the Auckland based National Junior Coordinating Committee (NJCC) involving young astronomers. The NJCC provided a national focal point bringing together student activities throughout New Zealand. Within a year there were associate members in many part of New Zealand.

The NJCC became the National Committee for Student Astronomy (NCSA) in 1974 with Graham as Chairman. Observing programmes were organised, some of which were integrated with the observing sections of the Royal Astronomical Society of New Zealand (RASNZ). The NCSA was wound up in early 1977 when it ran out of money.

Graham became a member of the RASNZ in February 1974 and remained a loyal supporter of New Zealand's national astronomical society until his death. He has elected to the RASNZ council in 1980 and remained on council until 1992. He was Vice President of the Society May 1986/88, President 1988/1990 and then Senior Vice President 1990/1992. After retiring from the Council in 1992 he continued to take an active interest in the affairs of the RASNZ.

In 1978 Graham joined the staff of the Carter Observatory in Wellington which entailed his move to that city. He was scientific officer at the observatory until it was restructured 17 years later. Soon after joining the staff of the observatory he completed his Master's thesis on the high speed recording of occultations to infer stellar diameters.

In his role as scientific officer at Carter observatory Graham co-edited a handbook for the appearance of Halley's Comet in 1985. This was published and copies sold throughout New Zealand and Australia. Graham also appeared on a segment of a children's television programme "What Now?" performing his own design of a science experiment that emulated the gases and matter of a comet. This science experiment brought astronomy to the front page of the Wellington Press.

During his time at Carter Observatory, Graham also edited the annual Carter Observatory Astronomical Handbook.

Graham had encouraged occultation observations with the NCSA observing programme. In October 1977 this resulted in the formation of the RASNZ Occultation Section absorbing the Auckland Occultations Programme. Graham Blow was appointed the director of the section. He remained the section's director up to the time of his death, that is for 37 years and this was one of his three proudest achievements in his life.

Through the RASNZ Occultation Section, Graham was able to inspire a large number of

amateur astronomers to take an active role in the science of occultation observing. This, and his enthusiastic promotion of the observation and timing occultations resulted in the section becoming one of the most successful in the RASNZ, giving the section an international reputation so that it became effectively the Australasian Occultation organisation.

Over the years Graham led numerous groups to observe lunar grazing occultations. A number of these involved considerable travelling, including to the South Island of New Zealand. Grazes are of value in validating the shape of the lunar profile in its polar region.

At first the emphasis of the Section was on the observation and timing of lunar occultations, both total and, more particularly, grazing occultations. Occultations by asteroids featured as well but success with these was initially rare due both to the sparsity and to the low accuracy of the predictions. Despite that Graham observed his first asteroidal occultation in 1983. On August 8 of that year he timed a very brief occultation of a 9.6 magnitude star by (10) Hygeia from Mt John Observatory at Tekapo in New Zealand's South Island.

One of Graham's greatest achievements was in 1988 when Pluto occulted a 12th magnitude star. Graham encouraged several observers with photo-electric equipment to observe the event. It happened that NZ was at the southern edge of the occultation track. Seen from Mt John the star just grazed Pluto's atmosphere, till then unknown. Observers further north at Black Birch and Auckland saw the star occulted by the planet. These observations contributed to the first accurate determination of Pluto's size. The occultation also started studies of Pluto's atmosphere that continue today.

In 1998 Graham established the RASNZ Occultation Section website, now at http://www.occultations.org.nz aimed at promoting occultation observations. A number of section members assist in the maintenance of the site which contains much information on occultation observation, predictions of special events and now records over 300 asteroidal events observed by members since 1998.

Particularly during the current century, the main emphasis of the Section has moved from lunar to asteroidal occultations. The increase in both number and accuracy of the predictions together with the use of video cameras with high accuracy GPS time insertion has led to a greater interest in this type of event and a far higher success rate. Again Graham was very active in promoting this type of observing leading as it does to far more reliable results. Graham has at times organised groups of observers to travel considerable distances to observe some of these events. Some have resulted in multiple chords being timed across the asteroid as it passes in front of the star, so giving a measure of the size and shape of the body.

One of the results of the changes in observing technique to the use of video was the first Trans Tasman Symposium on Occultations (TTSO) which was organised by Graham Blow and held in conjunction with the 2007 RASNZ conference. Since then TTSO meetings have been held annually, alternating between New Zealand and Australia. These have been a factor in leading to increasing cooperation between observers in the two countries. The TTSO meetings have presented guidance in observing and timing occultations for beginners as well as information on advances in hardware and software for the more advanced observer.

The 9th TTSO symposium will be held at Tekapo, following the RASNZ conference in May 2015. Tekapo is the site of New Zealand's Mount John observatory, the site of Graham's first asteroidal occultation observation.

Graham's work in astronomy has been recognised in the astronomical community by asteroid number 19582 being named Blow for his promotion and coordination of minor-planet occultation observations for the Australasian region.

In 2008 he was elected a fellow of the RASNZ in recognition of his leadership of the Occultation Section and contributions to both the RASNZ and to Occultation science.

International recognition came in 2013 when Graham received the International Occultation Timing Association's Homer F. DaBoll award for his dedicated leadership, the establishment of TTSO and the editorship and promotion associated with Occultations, Grazes and Eclipses.

Most recently, in 2014 Graham Blow was made an Officer of the New Zealand Order of Merit for services to astronomy, an appointment announced in the NZ New Years Honours list for 2014. On Tuesday 18th March 2014 Graham was presented with his NZ Honours Medal, the ONZM by His Excellency, Governor-General of New Zealand at Government House in Wellington.

Graham maintained his enthusiasm for occultation astronomy after being diagnosed with cancer right to the end. His last successful asteroidal occultation was on 25 October 2013 when (8) Flora occulted an 11.27 magnitude star. Graham observed from Carter Observatory in Wellington. There were four other observations of the event spread from Porirua to the north of Wellington down to Canterbury in the South Island. Thus 5 chords were obtained. Possibly his last act as Occultation Section director was to email members advising of the availability of the latest issue of the Journal of Occultation Astronomy. The email was sent on the morning of December 24, the day of his final heart attack.

The work of Graham with the Occultation Section has assisted in lifting Australasian occultation observing to the forefront of the science internationally. A new section director will be appointed soon and the work he initiated will continue.

Graham's other passion and for many years his profession was photography.

He had served on the Council and been President of the Wellington Photographic Society.

He was well known for his motorsport and landscape images. He excelled and had won awards in both fields. Graham was held in high esteem by his photographic colleagues.

Graham Lindsay Blow, the son of Stan and Mena, was born 5 August 1954 at Auckland and died 31 December 2014 at Wellington. He is survived by his sister Andrea and her husband Murray, and was uncle to Philippa and Michael. His funeral celebrating his life was held on Monday 5 January 2015. Typically much of the form of the event had been arranged by Graham himself.

John Talbot and Brian Loader, January 2015

Acknowledgments

We would like to thank Graham's sister, Andrea Clemens for checking and correcting a number of facts in the obituary.

Graham Blow's 2011 RASNZ Fellow's lecture was a valuable source of information and contains much of Graham's thoughts about astronomy and the role of the RASNZ. It was published in the RASNZ journal Southern Stars under the title "Reflections of an Astronomer", Volume 50, Number 2, 2011 June Pp 14 to 19.

Journal for Occultation Astronomy

The annual meeting of IOTA/ES

Michael Busse · IOTA/ES · secretary@iota.es

General Assembly on 8 March 2014 at the Sternwarte Geschwister Herschel, Hannover. The General Assembly had been called in time at the 5th of February 2014.

TOP 1 – General Remarks

1 General Remarks

The General Assembly was opened by the President. He and the Treasurer wished to resign from their offices, but this was unanimously rejected by the participants.

This situation was preceded by a longer dispute between the President and an IOTA-ES member (who was not attending the General Assembly) on the subject of a conference visit organised by the Middle East section of IOTA (IOTA/ME). The situation was caused by a cancellation of the President's travel and participation in an IOTA/ME conference in Teheran. The particular IOTA-ES member, who has engaged himself a lot in building close relations with IOTA/ME, asked that the IOTA-ES President should apologise to the President of IOTA/ME for this cancellation. On the part of IOTA-ES the President did not see any reason for such an apology, even more so after a letter of explanation for the cancellation had been written to IOTA/ME by the particular member in agreement with the President. The relationship between IOTA/ME and IOTA-ES has not been affected by this cancellation. The vigorous reaction was caused only by the special personal relationship of the member with Iran and the IOTA/ME.

The IOTA/ME has not given any statement on this issue. These circumstances and the emergence of disputes were discussed by the participants of the General Assembly. It was seen as unacceptable by the participants that details of a private communication have been distributed to a wider group of IOTA-ES members, who did not have any knowledge of the background so far. It was unanimously decided to include this in the protocol of the General Assembly. Further, it was stated that the relations between IOTA/ME and IOTA-ES are not affected and that IOTA/ME does not have any preferential position within IOTA. IOTA-ES of course is always interested in very open cooperation with all professional and non-professional organisations with similar scientific goals.

1.1 – Date of the General Assemblies in the future

A proposal has been made to schedule the General Assembly far ahead in the future and to fix a final data on the yearly ESOP conference. It was proposed in the future to hold the assembly always on the the third Saturday in March. For the year 2015 this would be the 21st of March.

1.1 Date of future General Assemblies

A proposal has been made to schedule the General Assembly far ahead in the future and to fix a final date on the yearly ESOP conference. It was proposed in future to always hold the assembly on the third Saturday in March. For the year 2015 this would be the 21st of March.

1.2 Berlin Colloquium

An "Observation Planning" colloquium will be held on the 17th of May 2014 from 11:00 hrs at the Archenhold Observatory, Berlin.

1.3 The Bye-laws

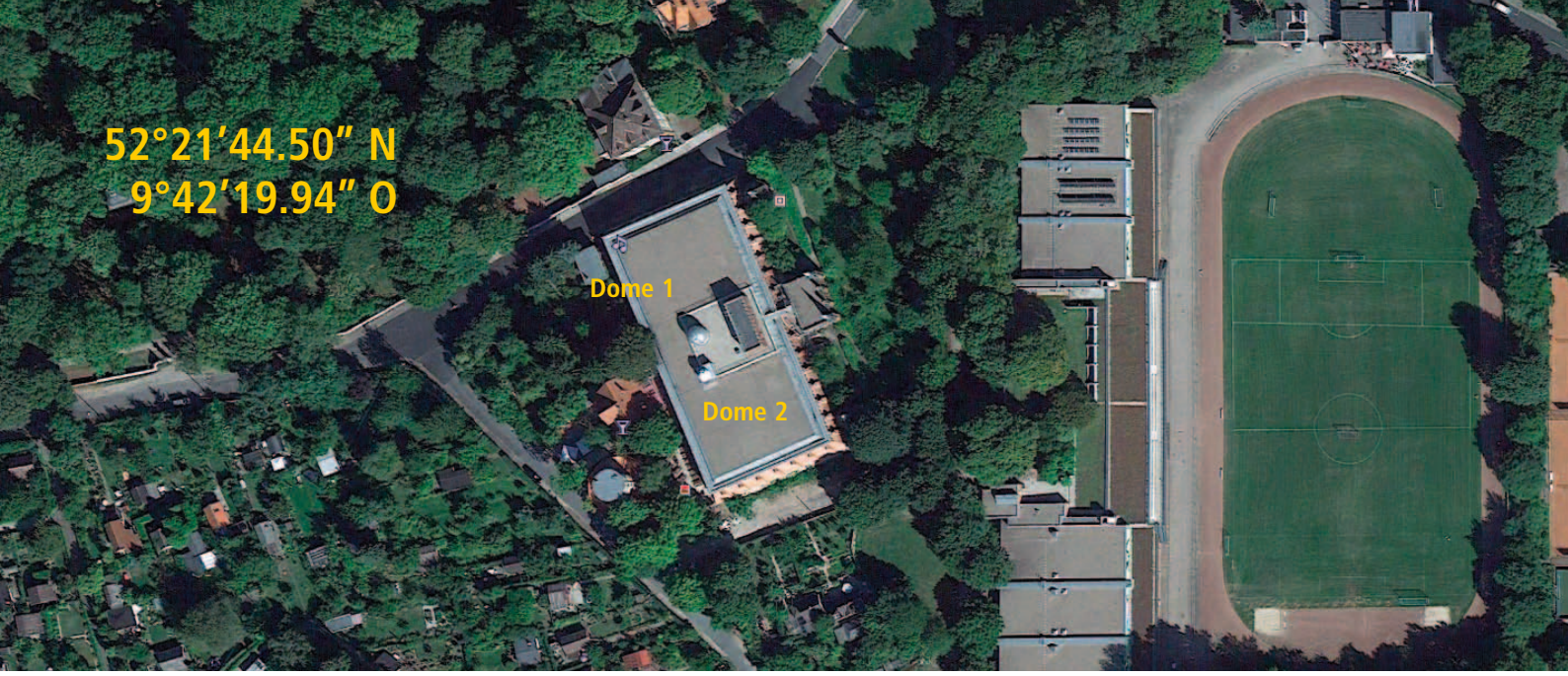
The Bye-laws of the IOTA-ES should be translated into the English language.

Top 2 – Research and Development

Wolfgang Beisker reported on the observing activities of last year that were marked by several failures due to meteorological problems. Outstanding events would have been an occultation by Uranus and later in the year by (10199) Chariklo. An international campaign was set up with observating sites in Italy, the Greek mainland, and Crete for the Uranus event. All sites were clouded out. Plans to observe the event from eastern South Africa could not be realised, because Uranus was too low for the observatories in Boyden and Pretoria and for other technical reasons.

Chariklo was observed too, however, the data are still under evaluation.

Overall, the planning of expeditions far in advance is very difficult. Astrometry obtained months ahead of the event is not very precise for TNO occultations. Changes of only 30 mas in position may result in shifts of the occultation track of far more than 1000km. Therefore excellent last minute predictions are necessary, which only a few observatories in the world can provide. Travel plans have to be changed often just a week before the event. It is a very unfortunate situation that IOTA-ES



does not operate its own astrometric facility with the required accuracy of less than 50 mas.

It was discussed which software could be used for total lunar occultations. Besides the Occult program, the Dutch program LOW can also be used. This should be published in the JOA.

2.1 Projects 2014

Furthermore, it was decided to contribute to the PHEMU (Mutual events of Jovian satellites) campaign of the IMCCE. A corresponding lecture for this subject should be given by our French colleagues at this year's ESOP in Prague. The PHEMU events will be announced on Planoccult . The PHEMU website is already active. Contributing to the Regulus occultation coverage in the New York area, two members (Eberhard Bredner and Konrad Guhl) will be participating. One of the scientific goals is to search for a possible companion star of Regulus .

2.2 JOA (Journal for Occultation Astronomy)

Members should be encouraged to write more articles for the JOA . Alexander Pratt (GB) was added to the editorial team .

TOP 3 – Financial situation

On the PayPal account, there is a positive balance of 400, - Euro . The financial status of the Association's account is currently 4.000, - . The cost of the JOA amounts annually to 800, - .

3.1 Financial contributions of the corporate membership of other organisations

The membership fees of corporate organisations should be 3 to 5 times the standard rate of membership. The Dutch organisation (DOA) is excluded from it - here it remains at 20 per year (decided unanimously).

3.2 Investments

After the 20-inch Dobsonian was rebuilt last year there are still some problems with the azimuthal axis. Therefore a conversion is planned to start with a new, flatter mirror cell. This should reduce the resulting torque and give a better balancing of the instrument. Michael Busse showed a 3-D design drawing and a dimensioned sketch to the General Assembly. The remodelling of the instrument was agreed on; the necessary financial support will be given to finish the instrument.

3.3 ESOP 2015

The organisers have started to establish contacts with venues and sponsors in Hannover. As a venue, the "Schloss Herrenhausen" in Hannover has been discussed, or a historic lecture hall of the University of Hannover or the Planetarium in Wolfsburg. The sponsor could be the Volkswagen Foundation, to which a letter of inquiry has been written. The programme for accompanying persons is still under discussion.

3.4 ESOP travel assistance and general ESOP support

Konrad Guhl donated 500,- Euro, part of it will be used for reimbursement of the expedition for the occultation by Regulus this year.

However, this kind of fund has to be discussed in the future in general. This also affects the organisation of the ESOP conference. Financial support from IOTA-ES cannot be given. The conference must be financed completely by the organisers. If the costs are rising too high, the ESOP conference has to be downgraded a little, for example, cheaper localities could be selected. An appropriate article will be placed in one of the next JOAs.

TOP 4 – Public Relations

Konrad Guhl reported on the activities and efforts to acquire the 1-metre instrument of the "Hoher List" observatory. To this end, several institutions and possible sponsors were contacted. It was planned to move the instrument to Namibia to operate it in cooperation with the University of Namibia. The Hoher List observatory, however, underwent a complicated situation, it was declared an historic monument. This stopped all processes of the bidding of the University of Bonn, who is the owner. A different situation may arise in the future, if currently active patrons will not receive (provide?) further financial support and have to cease its activities.

TOP 5 – Secretary

The list of members of IOTA-ES has been updated as far as possible.

A request to complete the addresses and other data of the Italian members was directed to an Italian member, who wishes to take care of the missing addresses or data.

The President closed the General Assembly at 15:00 hrs.
Hannover, 23 March 2014
Secretary (Michael Busse), President (Hans-Joachim Bode)

Journal for
Occultation Astronomy

IOTA's Mission

The International Occultation Timing Association, Inc. was established to encourage and facilitate the observation of occultations and eclipses. It provides predictions for grazing occultations of stars by the Moon and predictions for occultations of stars by asteroids and planets, information on observing equipment and techniques, and reports to the members of observations made.

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(IOTA maintains the following web site for your information and rapid notification of events.)

http://www.occultations.org
http://www.iota-es.de

This site contains information about the organization known as IOTA and provides information about joining

IOTA and IOTA/ES, including topics related to the Journal of Occulation Astronomy (JOA), and also has an on-line archive of all issues of Occultation Newsletter, IOTA's predecessor to JOA. On the right side of the main page of this site are included links to IOTA's major technical sites, as well as to the major IOTA sections, including those in Europe, Asia, Australia/New Zealand, and South America. The technical sites include definitions and information about observing and reporting, and results of, lunar, planetary, and asteroidal occultations, and of eclipses and other timely phenomena, including outer planet satellite mutual events and lunar meteor impact flashes.

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JOA will always try to produce an article as soon as possible based to date & time of other articles it received – but actual announcements have the priority!

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