Journal for Occultation Astronomy

2012–04

FORMERLY OCCULTATION NEWSLETTER

# Leaving Vesta

## Explanation

Next stop: Ceres. The robotic Dawn spacecraft ended its year-long mission to asteroid Vesta, becoming the first spacecraft ever to visit this far off world located between Mars and Jupiter, in the Solar System's main asteroid belt. Many of the best images taken by Dawn at Vesta have been compiled into the above encompassing view. Vesta shows evidence of being a leftover from the early years of our Solar System, a building block for rocky planets like Earth. Vesta's ancient surface shows heavy cratering and long troughs likely created by huge impacts. The minor planet's low gravity allows for surface features like huge cliffs and a large mountain that reaches twice the height of Earth's Mount Everest, visible at the image bottom. Vesta, however, spanning about 500 kilometers across, is only the second most massive object in the asteroid belt. And so, two weeks ago, Dawn fired its gentle ion rockets and has begun chasing the most massive: Ceres. If everything goes as planned, Dawn will reach Ceres in 2015. Ceres looks quite different to the distant telescope – but what will Dawn find?

APOD (Astronomy Picture Of the Day), 2012 September 19
Image Credit: NASA, JPL-Caltech, UCLA, MPS, DLR, IDA

Journal for
Occultation Astronomy

# Dear reader,

last weekend of August another yearly IOTA/ES scientific meeting, ESOP XXXI, was held – this time prepared and very well organized by Costantino Sigismondi in Pescara/Italy. For some unfortunate reasons quite a few members were held back from attending this remarkable event. As seen by the abstracts on the following pages a lot of interesting reports were given. Among them was the one of Andrea Richichi, Tailand, about the ongoing value of observations of total occultations of stars by the moon. He pointed out the scientific interest of professional astronomers to obtain more data of newly discovered double star systems and of the stellar diameters. The equipment needed for that is a high speed recording system and a telescope "as big as possible". Somewhat disappointing information was given by Andrea Raponi, Italy, concerning solar diameter measurements by satellite observations that yielded a stable solar size. Regarding this it was decided that IOTA will continue solar diameter-measurements until 2017 using standardized equipment so the data can be reduced to the same scale. The article of Susanne Hoffmann was added to the list of abstracts because she succeeded in integrating young students in an astronomy project – a well known and serious general problem!

Next year's ESOP will be held in Barcelona from August 23rd to 28th. Please consider this event!

Hans-J. Bode

■ **JOA 2012-4** · $ 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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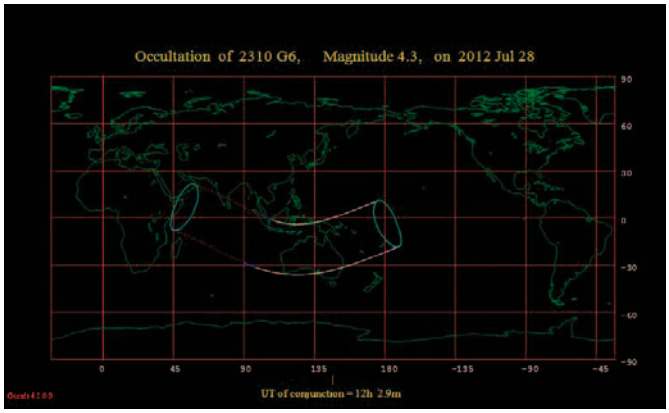
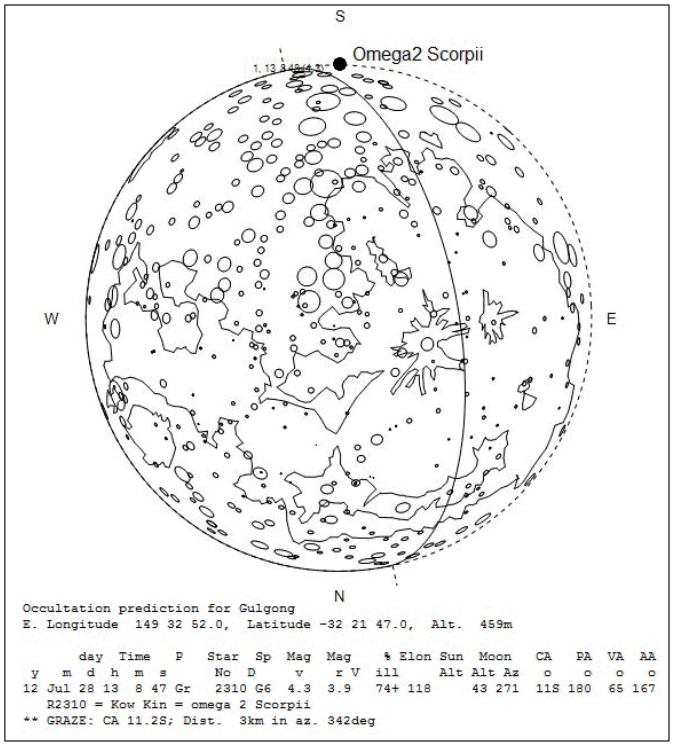
# Observing the Graze of Omega 2 Scorpii 28th July 2012

Dave Gault of Team Occultation




There are usually less than two or three grazing occultation events per year that involve a star brighter than mag.5 and are observable at a convenient place and time. The Graze of Omega2 Scorpii was one such event we were keenly anticipating. As can be seen from the world map, the path of the moon's shadow cast upon the Earth from the star, commences in daylight east of Africa and swept over Western Australia and Indonesia around sunset and continued across Australia and finished over the Coral Sea. Events at the northern limit would have occurred at the sunlit cusp, so were probably unobservable, however events at the southern cusp were against the unlit limb so were observable anywhere along the southern limit, from Adelaide to Port Macquarie.



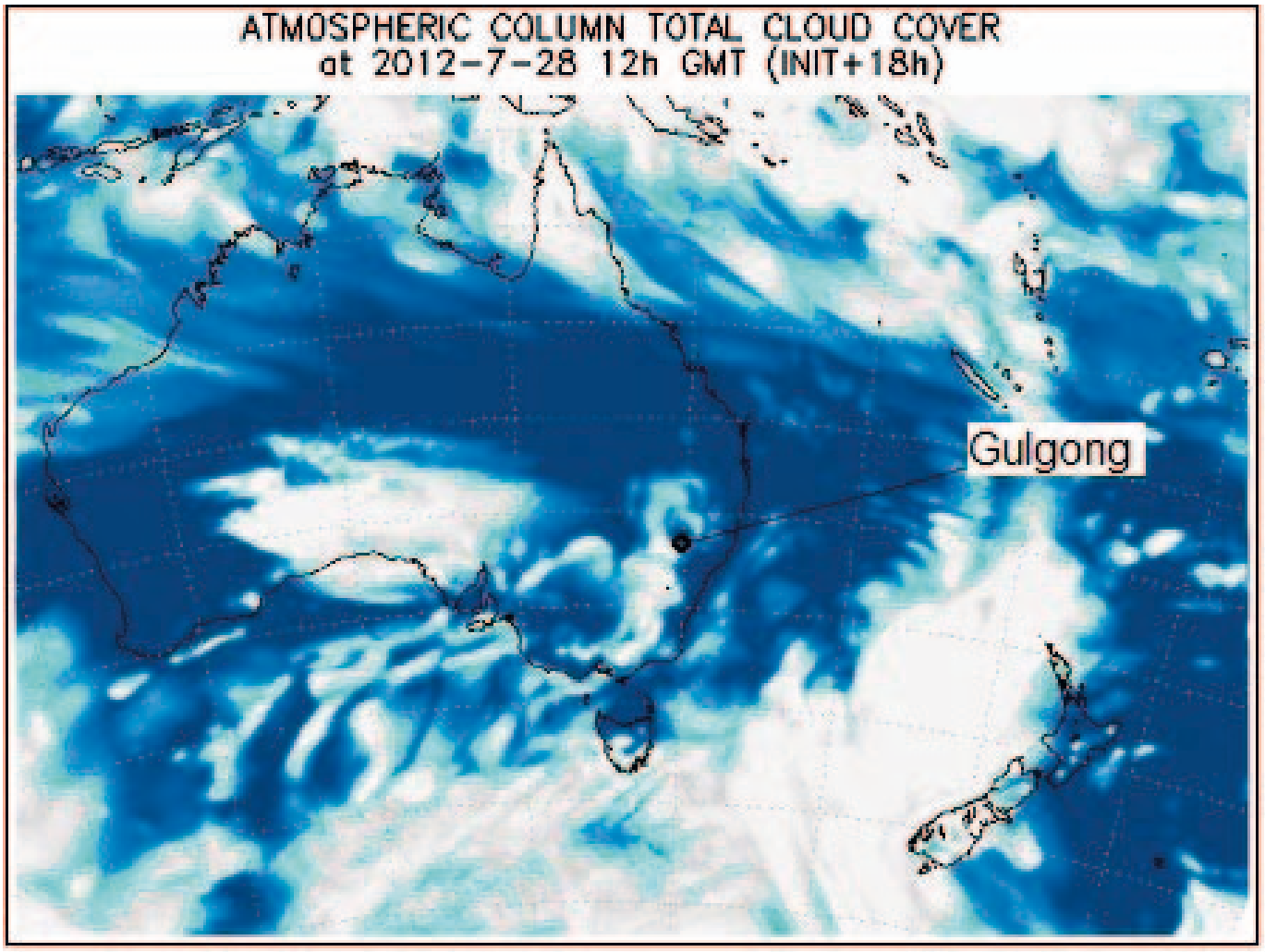

The Occult[1] prediction and MoonMap depicts the event nicely. The important attributes being:

- The events would occur on Saturday evening 28th July
- The central time being 13:08:47 UT = 11:08:47 pm
- The star is mag. 4.3 and mag. 3.9 in red which is were most video cameras are most sensitive.
- The moon is 74% lit and waxing
- The events occur at a Cusp Angle (CA) of 11.2, meaning 11.2 from the southern cusp.
- The central time being 13:08:47 UT = 11:08:47 pm

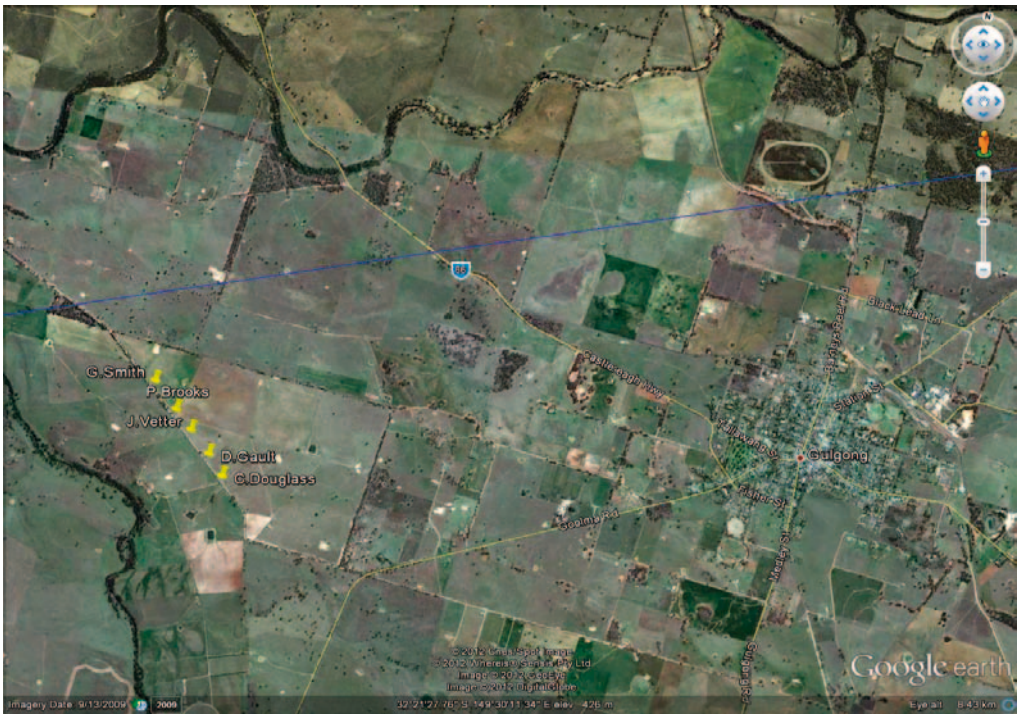
By studying of Google Earth is was noted that the southern limit would pass close to Gulgong NSW, so Peter Brooks was contacted with the aim of seeing if local observers would be willing to help with the observation. Spring Ridge Road, west of Gulgong was selected as the site, and being dirt, it was unlikely to have much traffic at 11pm.

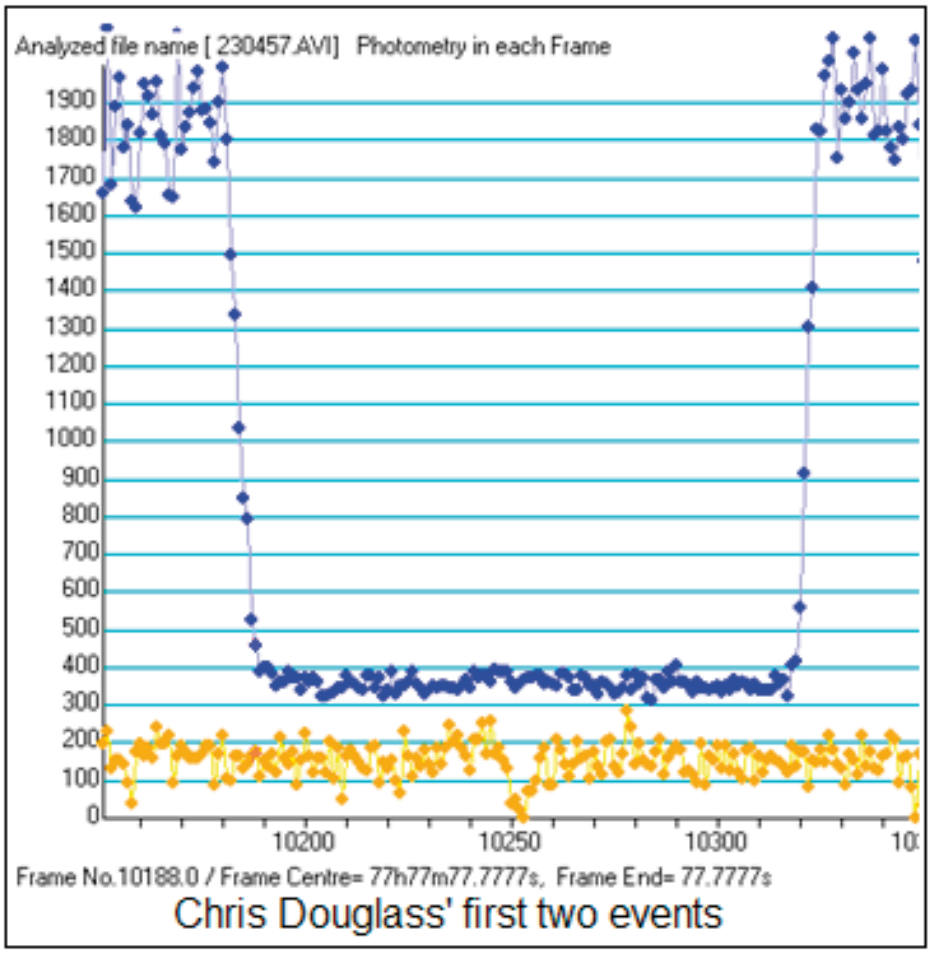
Observation of grazes can be a social occasion, and many a pre or post graze dinners or a post graze BBQ breakfast has been organised in the past. The circumstances of the graze suited a pre-graze dinner which was organized by Peter Brooks and the venue was the very nice Galangha Thai Restaurant in Mudgee. Attendees at the dinner were Peter Brooks, Chris Douglass, John Vetter, Steve Quirk, Gerry and Wanda Aarts and Dave Gault. Due to a prior engagement , Gerry and Wanda were unable to observe. Also by prior arrangement George Smith and Jerry Parveliet arrived after the dinner and before the observing team left town.As usual, weather played an important part of planning for the event. Shown here is the 7Timer – Total cloud cover plot for 18hours before event time, and it proved to be spot-on. The weather experienced was:

- 100% cloud on the drive to Mudgee
- 60% cloud during the site visit at 4pm
- 100% cloud at the end of the dinner,
- 100% thin cloud at the site, 1 hour before the first event.
- Thinning cloud by the time the telescopes were setup. The moon and star could be seen through the cloud.
- The clouds were steaming through moving south to north, but a patch of clear was seen in the north-east and it was apparent the edge of the clear patch was moving west. We deployed along Spring Ridge Road and commenced setting up.




By 10:45pm, the zenith was clear and by 11pm so was the moon and target star. All events were observed in clear sky.






Shown here is the observed profile plot.
Red are disappearance events Green are reappearance events.

All 5 stations were successful. The tally of observed events from the most southerly were;

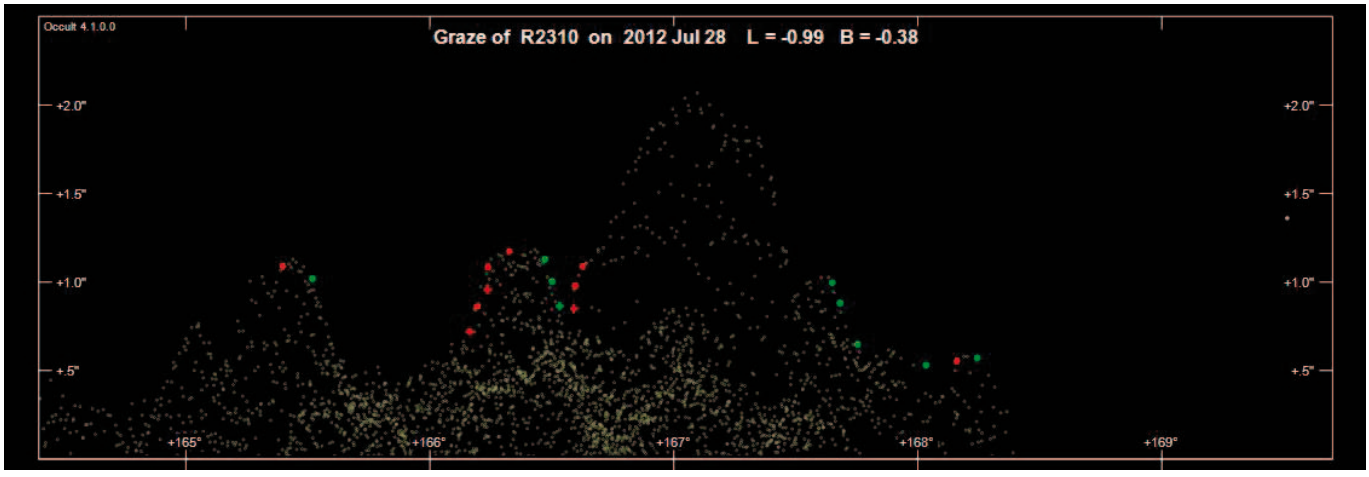
- Chris Douglass[2]; 4 events
- Dave Gault[3]; 4 events
- John Venter[4]; 3 events
- Peter Brooks[5]; 2 events
- George Smith[6], 6 events

Peter Brooks was aided by Steve Quirk
George Smith was aided by Jerry Parveliet

According to CHARM/CADARS, the projected diameter of the star was 3metres at the moon's limb as seen from earth, so slow events might have been visible.

Chris Douglass reported this phenomenon during his first D-R sequence and the duration of events were 0.28 seconds and 0.24 seconds respectively.

Dave Gault also reported slow events but not as slow as Chris'.




All told, it was a successful observation and a thoroughly pleasant evening. All events will be incorporated into the Archive of Lunar Occultations (1623-now).

Till we meet again one dark night on a country lane somewhere, intent on observing stars and the cusp of the moon, I remain, a member of Team Occultation (Sydney Chapter).

1) Occult Software – by Dave Herald
2) Chris Douglass; Astronomical Society of New South Wales
3) Dave Gault; Western Sydney Amateur Astronomy Group
4) John Vetter; Mudgee Observatory
5) Peter Brooks; Western Sydney Amateur Astronomy Group
6) George Smith, Western Sydney Amateur Astronomy Group

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# Grazing Occultations 2013 to mag 5.0

Eberhard Riedel IOTA/ES

| 2013 | Grazing Occultations Australia 2013 to mag. 5.0 | | | | | | | | | GRAZPREP 2.2 IOTA/ES | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | M D | USNO | SAOPPM D | MAG | %SNL | L. | W.UT | LONG | LAT | STAR NAME | MAG1 | MAG2 |
| 1 | Jan 05 | ZC 1925 | 157923 Z | 1.0 | 43- | N | 18 29.5 | 119 | -10 | 67 alpha Vir (Spica) | 1.3 | 4.5 |
| 2 | Jan 08 | ZC 2353 | 159892 | 4.5 | 12- | N | 19 33.2 | 133 | -10 | 4 psi Oph | | |
| 3 | Jan 24 | ZC 995 | 78423 B | 4.1 | 95+ | N | 18 33.0 | 120 | -10 | 18 nu Gem | 4.3 | 6.0 |
| 4 | Feb 03 | ZC 2118 | 158840 V | 2.8 | 50- | N | 13 25.5 | 150 | -30 | 9 alpha Lib (Zuben Elg.) | 3.4 | 3.8 |
| 5 | Feb 04 | ZC 2302 | 159682 H | 2.6 | 35- | S | 20 26.8 | 110 | -26 | 8 beta1 Sco (Acrab) | 3.2 | 4.2 |
| 6 | Feb 04 | ZC 2303 | 159683 B | 4.8 | 35- | S | 20 27.2 | 110 | -26 | 56 B. beta2 Sco | 5.2 | 7.6 |
| 7 | Feb 18 | | | -2.0 | 57+ | N | 12 3.0 | 110 | -25 | Jupiter | | |
| 8 | Feb 22 | ZC 1158 | 97120 K | 5.0 | 88+ | N | 9 9.4 | 139 | -13 | 74 m Gem | 6.0 | 6.0 |
| 9 | Mar 19 | ZC 847 | 77336 J | 3.0 | 47+ | N | 7 37.8 | 110 | -32 | 123 zeta Tau | 3.2 | 5.2 |
| 10 | Mar 20 | ZC 995 | 78423 B | 4.1 | 57+ | N | 8 50.7 | 139 | -20 | 18 nu Gem | 4.3 | 6.0 |
| 11 | Mar 28 | ZC 1925 | 157923 Z | 1.0 | 98- | S | 13 42.7 | 120 | -10 | 67 alpha Vir (Spica) | 1.3 | 4.5 |
| 12 | May 05 | ZC 3501 | 128374 | 5.0 | 16- | N | 20 31.1 | 110 | -40 | 19 TX Psc | 5.0 | 5.2 |
| 13 | May 13 | ZC 894 | 77705 V | 4.4 | 10+ | S | 8 43.1 | 126 | -33 | 54 chi1 Ori | | |
| 14 | May 22 | ZC 1925 | 157923 Z | 1.0 | 90+ | S | 9 47.7 | 124 | -10 | 67 alpha Vir (Spica) | 1.3 | 4.5 |
| 15 | Jun 01 | ZC 3453 | 128186 V | 5.0 | 40- | N | 16 3.3 | 135 | -17 | 8 kappa Psc | 5.7 | 5.7 |
| 16 | Jun 13 | ZC 1341 | 98267 Y | 4.3 | 20+ | S | 9 45.5 | 114 | -21 | 65 alpha Cnc (Acubens) | 5.1 | 5.1 |
| 17 | Jun 21 | ZC 2322 | 159764 Y | 4.1 | 95+ | S | 17 2.9 | 110 | -34 | 14 nu Sco (Jabbah) | 4.9 | 6.9 |
| 18 | Jun 24 | ZC 2826 | 162512 X | 3.9 | 98- | S | 13 38.1 | 110 | -11 | 44 rho1 Sgr | 4.2 | 6.7 |
| 19 | Jun 25 | ZC 2969 | 163481 I | 3.0 | 93- | S | 12 48.5 | 134 | -10 | 9 beta Cap (Dabih major) | 3.5 | 4.8 |
| 20 | Jul 26 | ZC 3494 | 128336 | 4.5 | 80- | S | 14 7.9 | 113 | -22 | 18 lambda Psc | | |
| 21 | Aug 15 | ZC 2322 | 159764 Y | 4.1 | 61+ | S | 9 1.3 | 133 | -11 | 14 nu Sco (Jabbah) | 4.9 | 6.9 |
| 22 | Aug 19 | ZC 2969 | 163481 I | 3.0 | 96+ | S | 9 29.2 | 126 | -11 | 9 beta Cap (Dabih major) | 3.5 | 4.8 |
| 23 | Sep 15 | ZC 2913 | 163141 | 5.0 | 79+ | S | 8 53.7 | 134 | -37 | 61 g Sgr | | |
| 24 | Sep 26 | ZC 894 | 77705 V | 4.4 | 55- | N | 15 47.4 | 137 | -37 | 54 chi1 Ori | | |
| 25 | Sep 26 | ZC 915 | 77911 L | 4.6 | 52- | N | 21 7.9 | 110 | -22 | 62 chi2 Ori | 5.5 | 6.3 |
| 26 | Oct 27 | ZC 1341 | 98267 Y | 4.3 | 42- | S | 19 14.2 | 138 | -10 | 65 alpha Cnc (Acubens) | 5.1 | 5.1 |
| 27 | Nov 05 | ZC 2361 | 159918 | 4.2 | 5+ | N | 11 24.0 | 110 | -25 | 7 chi Oph | 4.2 | 5.0 |
| 28 | Nov 14 | ZC 105 | 109474 | 4.4 | 90+ | S | 8 24.7 | 150 | -28 | 63 delta Psc | | |
| 29 | Nov 20 | ZC 915 | 77911 L | 4.6 | 92- | N | 12 23.5 | 138 | -40 | 62 chi2 Ori | 5.5 | 6.3 |

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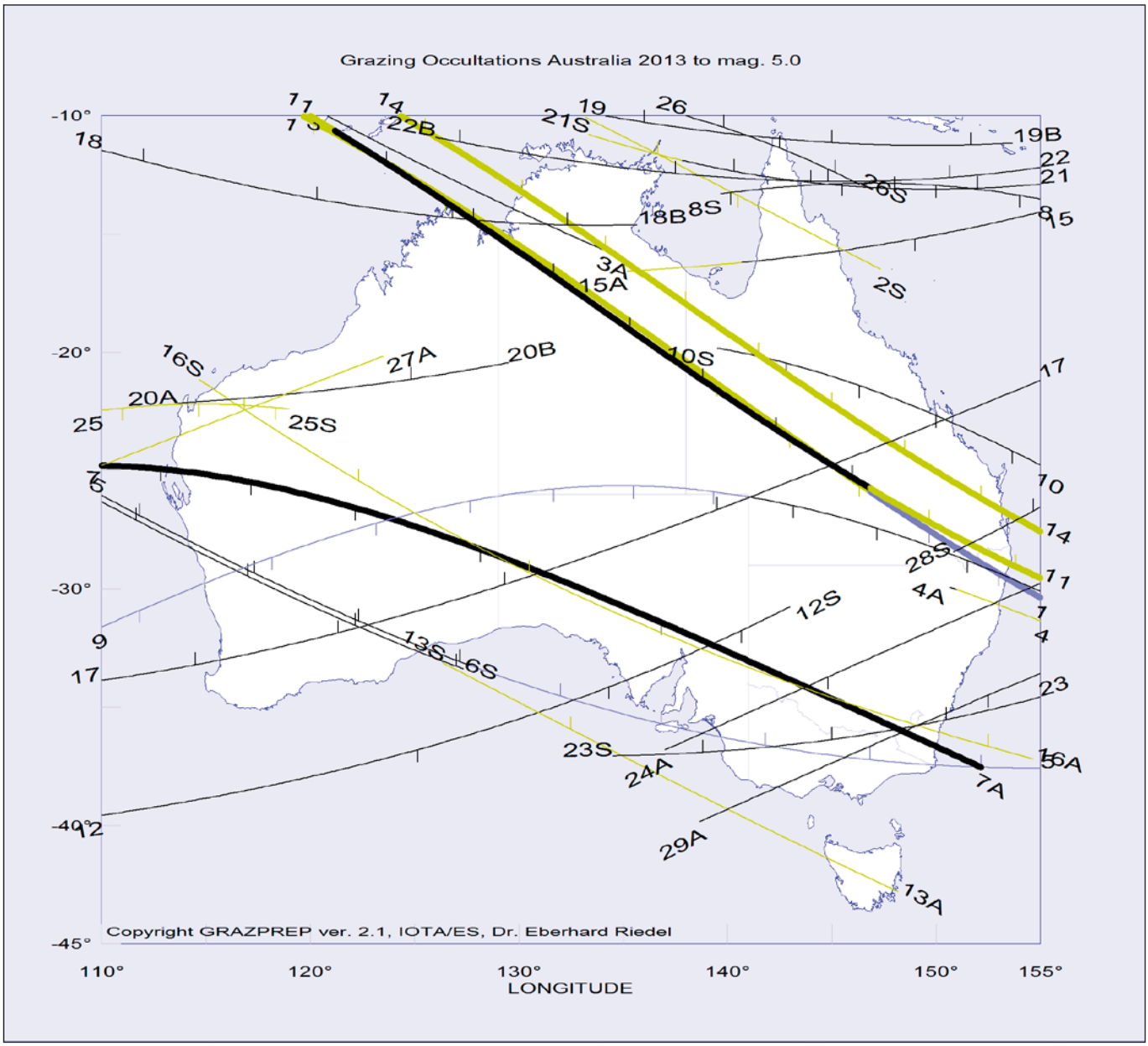


# Australia

| 2013 | Grazing Occultations Europe 2013 to mag. 5.0 | | | | | | | | GRAZPREP 2.2 IOTA/ES | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | M D | USNO | SAOPPM D | MAG | %SNL | L. | W.UT | LONG LAT | STAR NAME | MAG1 | MAG2 |
| 1 | Jan 08 | ZC 2241 | 159442 V | 4.8 | 17- | N | 3 38.6 | 5 38 | 43 kappa Lib | 5.8 | 5.8 |
| 2 | Jan 23 | ZC 894 | 77705 V | 4.4 | 90+ | N | 1 35.5 | -11 45 | 54 chi1 Ori | | |
| 3 | Feb 06 | ZC 2498 | 185296 | 4.4 | 22- | N | 1 52.3 | 29 39 | 40 xi Oph | | |
| 4 | Mar 04 | ZC 2307 | 184123 | 3.9 | 58- | S | 2 43.3 | -11 52 | 9 omega1 Sco (Kow Kin) | | |
| 5 | Mar 06 | ZC 2633 | 186497 T | 3.8 | 35- | S | 5 25.8 | -11 56 | 13 mu Sgr | 4.1 | 7.0 |
| 6 | Mar 13 | ZC 105 | 109474 | 4.4 | 3+ | S | 15 6.0 | 43 46 | 63 delta Psc | | |
| 7 | Mar 30 | ZC 2241 | 159442 V | 4.8 | 83- | S | 22 33.2 | 8 48 | 43 kappa Lib | 5.8 | 5.8 |
| 8 | Apr 17 | ZC 1106 | 96746 Y | 3.6 | 42+ | S | 17 32.6 | 39 65 | 54 lambda Gem | 4.0 | 5.0 |
| 9 | Apr 28 | ZC 2498 | 185296 | 4.4 | 86- | S | 20 33.6 | 27 38 | 40 xi Oph | | |
| 10 | May 28 | ZC 2826 | 162512 X | 3.9 | 87- | N | 5 51.2 | -11 40 | 44 rho1 Sgr | 4.2 | 6.7 |
| 11 | May 29 | ZC 2969 | 163481 I | 3.0 | 78- | N | 5 24.8 | -11 47 | 9 beta Cap (Dabih major) | 3.5 | 4.8 |
| 12 | May 30 | ZC 3093 | 164182 | 4.5 | 68- | N | 1 15.6 | 24 34 | 13 nu Aqr | | |
| 13 | Jun 01 | ZC 3494 | 128336 | 4.5 | 36- | N | 23 56.8 | 18 46 | 18 lambda Psc | | |
| 14 | Jun 17 | ZC 1815 | 138892 V | 4.7 | 63+ | N | 0 25.3 | -11 41 | 26 chi Vir | 4.8 | 8.8 |
| 15 | Jun 28 | ZC 3320 | 146210 T | 5.0 | 72- | N | 0 12.1 | -11 40 | 63 kappa Aqr (Situla) | 6.1 | 6.1 |
| 16 | Jul 05 | ZC 668 | 93954 | 3.5 | 8- | N | 2 8.5 | -2 55 | 74 epsilon Tau (Ain) | | |
| 17 | Jul 18 | ZC 2302 | 159682 H | 2.6 | 80+ | N | 23 58.0 | -11 54 | 8 beta1 Sco (Acrab) | 3.2 | 4.2 |
| 18 | Aug 12 | ZC 1925 | 157923 Z | 1.0 | 29+ | S | 7 49.2 | 43 34 | 67 alpha Vir (Spica) | 1.3 | 4.5 |
| 19 | Sep 01 | ZC 1106 | 96746 Y | 3.6 | 17- | S | 0 39.8 | 10 53 | 54 lambda Gem | 4.0 | 5.0 |
| 20 | Sep 03 | ZC 1341 | 98267 Y | 4.3 | 5- | N | 1 41.3 | 36 34 | 65 alpha Cnc (Acubens) | 5.1 | 5.1 |
| 21 | Sep 11 | ZC 2353 | 159892 | 4.5 | 40+ | S | 21 1.5 | 10 34 | 4 psi Oph | | |
| 22 | Sep 14 | ZC 2826 | 162512 X | 3.9 | 73+ | N | 18 30.2 | -11 46 | 44 rho1 Sgr | 4.2 | 6.7 |
| 23 | Oct 13 | ZC 3093 | 164182 | 4.5 | 71+ | N | 23 18.7 | -11 53 | 13 nu Aqr | | |
| 24 | Oct 23 | ZC 764 | 94332 O | 4.9 | 84- | S | 3 30.8 | 10 57 | 104 m Tau | 5.6 | 5.6 |
| 25 | Nov 02 | ZC 1925 | 157923 Z | 1.0 | 2- | S | 5 44.5 | 0 48 | 67 alpha Vir (Spica) | 1.3 | 4.5 |
| 26 | Nov 11 | ZC 3320 | 146210 T | 5.0 | 67+ | N | 20 27.9 | 14 52 | 63 kappa Aqr (Situla) | 6.1 | 6.1 |
| 27 | Nov 22 | ZC 1106 | 96746 Y | 3.6 | 83- | S | 1 36.5 | 26 45 | 54 lambda Gem | 4.0 | 5.0 |
| 28 | Dec 01 | ZC 2118 | 158840 V | 2.8 | 4- | N | 4 45.8 | 14 49 | 9 alpha Lib (Zuben Elg.) | 3.4 | 3.8 |
| 29 | Dec 06 | ZC 2969 | 163481 I | 3.0 | 18+ | N | 13 52.8 | 9 43 | 9 beta Cap (Dabih major) | 3.5 | 4.8 |
| 30 | Dec 11 | ZC 146 | 109627 K | 4.3 | 73+ | S | 22 38.3 | -11 40 | 71 epsilon Psc | 5.2 | 5.2 |
| 31 | Dec 27 | ZC 1925 | 157923 Z | 1.0 | 34- | S | 2 1.0 | 16 65 | 67 alpha Vir (Spica) | 1.3 | 4.5 |
| 32 | Dec 30 | ZC 2353 | 159892 | 4.5 | 7- | S | 5 26.0 | 16 56 | 4 psi Oph | | |

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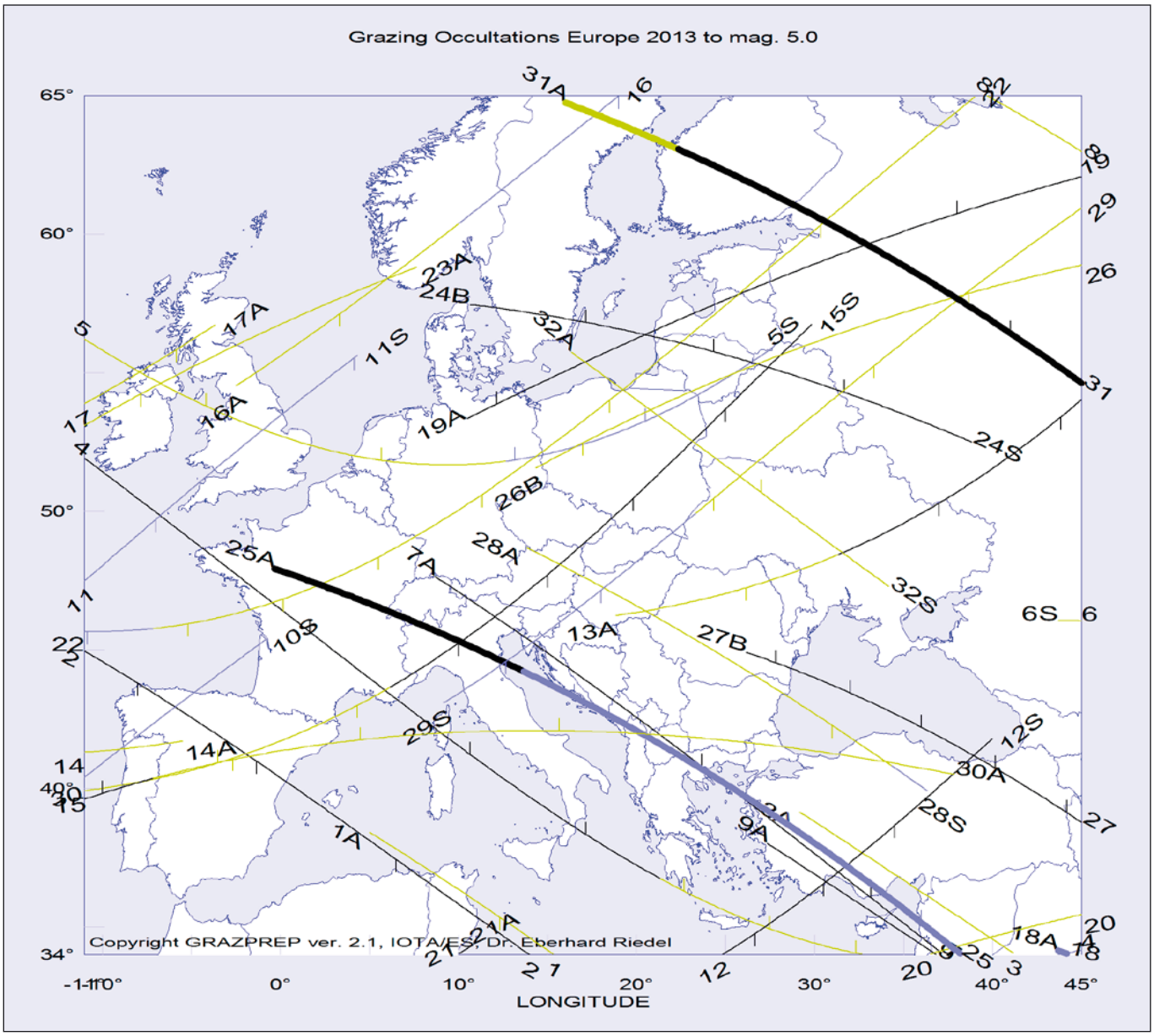
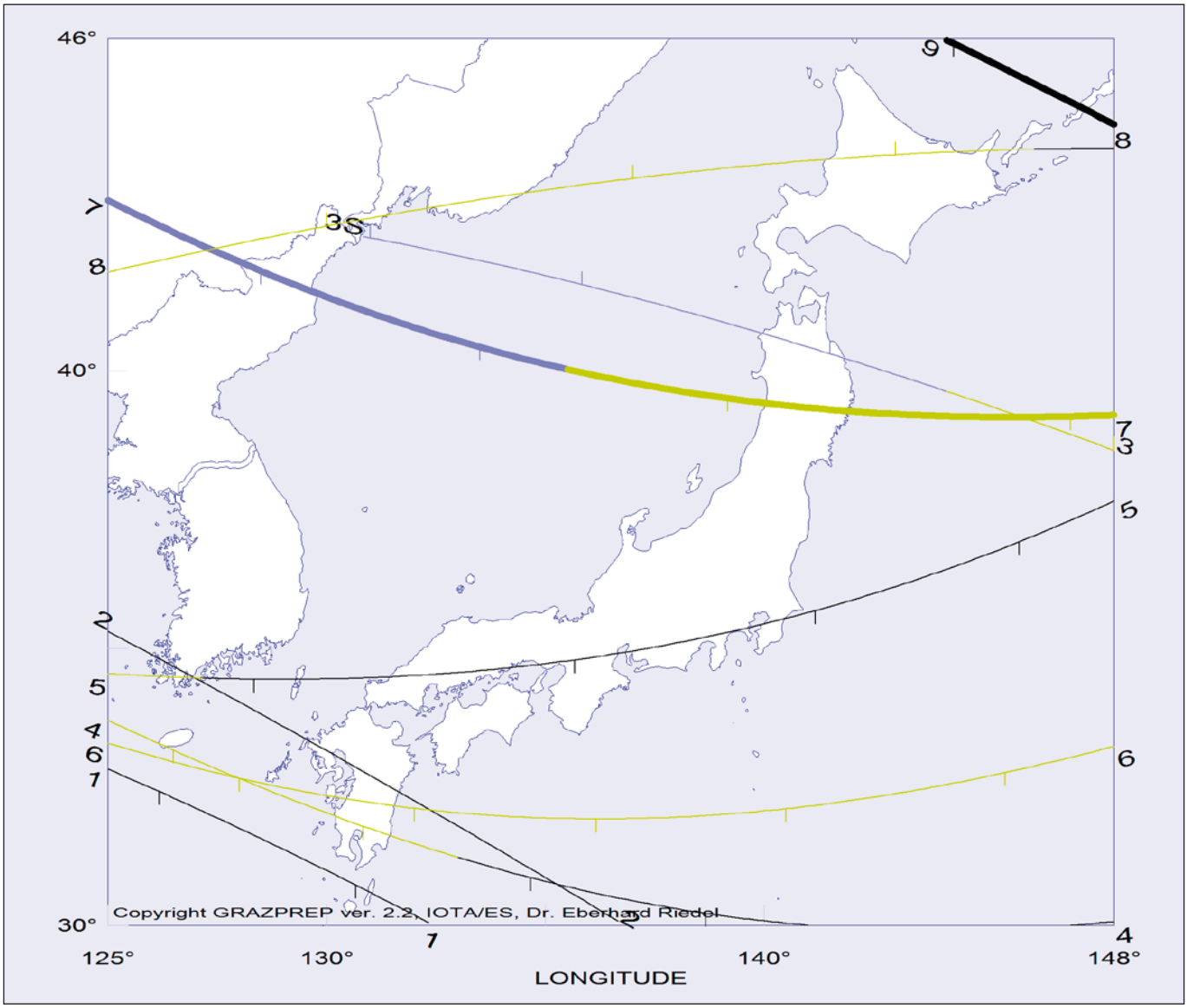



# Europe

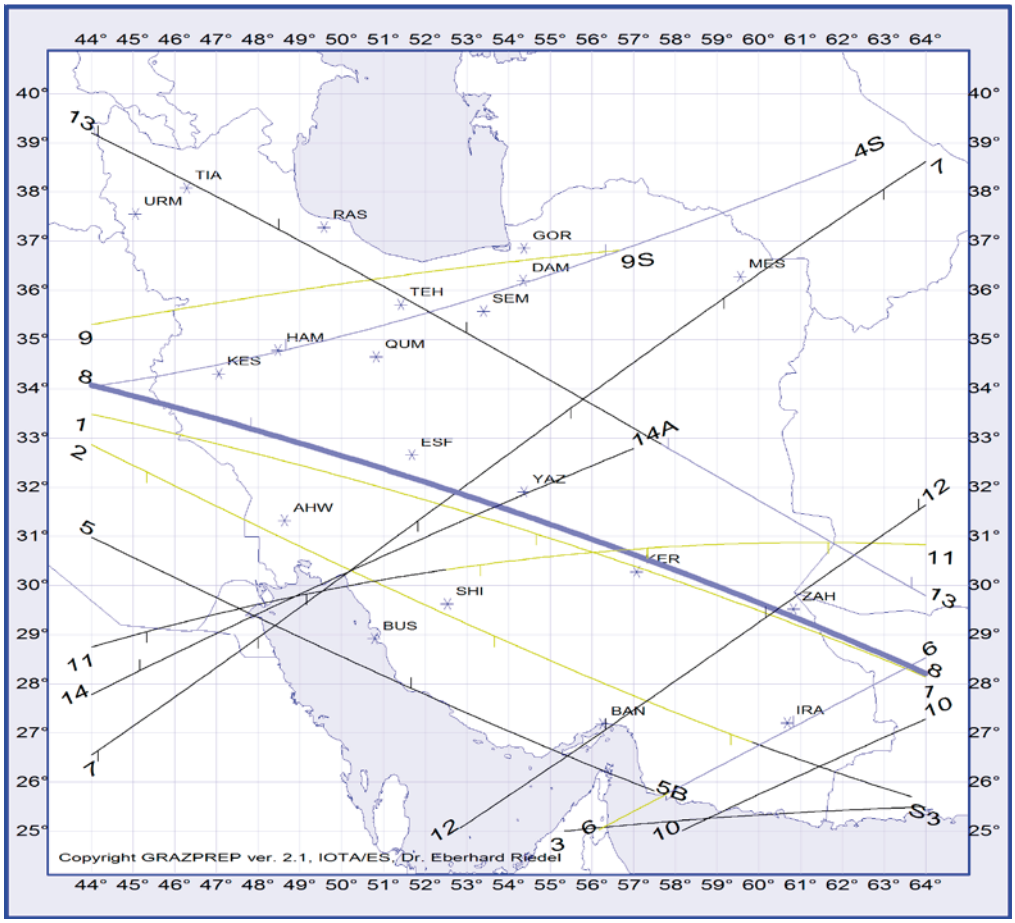
Journal for Occultation Astronomy

| 2013 | Grazing Occultations Japan 2013 to mag. 5.0 | | | | | | | | | GRAZPREP 2.2 IOTA/ES | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | M D | USNO | SAOPPM D | MAG | %SNL | L. | W.UT | LONG | LAT | STAR NAME | MAG1 | MAG2 |
| 1 | **Feb 20** | ZC 915 | 77911 L | 4.6 | 75+ | N | 13 37.6 | 125 | 33 | 62 chi2 Ori | 5.5 | 6.3 |
| 2 | **Mar 03** | ZC 2241 | 159442 V | 4.8 | 63 - | S | 16 13.3 | 125 | 35 | 43 kappa Lib | 5.8 | 5.8 |
| 3 | **Apr 14** | ZC 668 | 93954 | 3.5 | 15+ | S | 8 30.6 | 130 | 42 | 74 epsilon Tau (Ain) | | |
| 4 | **Apr 27** | ZC 2302 | 159682 H | 2.6 | 95 - | N | 16 26.9 | 125 | 34 | 8 beta1 Sco (Acrab) | 3.2 | 4.2 |
| 5 | **May 02** | ZC 3093 | 164182 | 4.5 | 47 - | N | 17 56.7 | 125 | 35 | 13 nu Aqr | | |
| 6 | **Jun 21** | ZC 2302 | 159682 H | 2.6 | 95+ | N | 13 42.9 | 125 | 33 | 8 beta1 Sco (Acrab) | 3.2 | 4.2 |
| 7 | **Aug 12** | ZC 1925 | 157923 Z | 1.0 | 29+ | N | 9 32.3 | 125 | 43 | 67 alpha Vir (Spica) | 1.3 | 4.5 |
| 8 | **Oct 25** | ZC 1106 | 96746 Y | 3.6 | 62 - | S | 16 33.8 | 125 | 42 | 54 lambda Gem | 4.0 | 5.0 |
| 9 | **Dec 01** | | | -0.6 | 2 - | N | 21 10.5 | 144 | 46 | Mercury | | |



| 2013 | Grazing Occultations Iran 2013 to mag. 5.0 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | M D | USNO | SAOPPM D | MAG | %SNL | L. | W.UT | LONG | LAT | STAR NAME | MAG1 | MAG2 |
| 1 | Jan 04 | ZC 1815 | 138892 V | 4.7 | 52- | N | 21 37.4 | 44 | 33 | 26 chi Vir | 4.8 | 8.8 |
| 2 | Feb 06 | ZC 2498 | 185296 | 4.4 | 22- | N | 1 58.9 | 44 | 33 | 40 xi Oph | | |
| 3 | Feb 12 | ZC 3453 | 128186 V | 5.0 | 6+ | N | 15 5.0 | 55 | 25 | 8 kappa Psc | 5.7 | 5.7 |
| 4 | Mar 04 | ZC 2307 | 184123 | 3.9 | 58- | S | 4 2.7 | 44 | 34 | 9 omega1 Sco (Kow Kin) | | |
| 5 | Apr 28 | ZC 2498 | 185296 | 4.4 | 86- | S | 20 41.7 | 44 | 31 | 40 xi Oph | | |
| 6 | Jul 05 | ZC 668 | 93954 | 3.5 | 8- | S | 1 23.7 | 56 | 25 | 74 epsilon Tau (Ain) | | |
| 7 | Jul 27 | ZC 105 | 109474 | 4.4 | 67- | N | 22 39.8 | 44 | 27 | 63 delta Psc | | |
| 8 | Aug 12 | ZC 1925 | 157923 Z | 1.0 | 29+ | S | 7 49.2 | 44 | 34 | 67 alpha Vir (Spica) | 1.3 | 4.5 |
| 9 | Sep 03 | ZC 1341 | 98267 Y | 4.3 | 5- | N | 1 43.1 | 44 | 35 | 65 alpha Cnc (Acubens) | 5.1 | 5.1 |
| 10 | Sep 14 | ZC 2826 | 162512 X | 3.9 | 73+ | S | 20 15.7 | 58 | 25 | 44 rho1 Sgr | 4.2 | 6.7 |
| 11 | Sep 24 | ZC 668 | 93954 | 3.5 | 69- | N | 0 17.0 | 44 | 29 | 74 epsilon Tau (Ain) | | |
| 12 | Nov 14 | ZC 146 | 109627 K | 4.3 | 92+ | S | 15 11.8 | 52 | 25 | 71 epsilon Psc | 5.2 | 5.2 |
| 13 | Nov 22 | ZC 1106 | 96746 Y | 3.6 | 83- | S | 2 19.6 | 44 | 39 | 54 lambda Gem | 4.0 | 5.0 |
| 14 | Dec 05 | ZC 2826 | 162512 X | 3.9 | 10+ | S | 15 29.4 | 44 | 28 | 44 rho1 Sgr | 4.2 | 6.7 |

# Japan and Iran



| 2013 | Grazing Occultations USA 2013 to mag. 5.0 | | | | | | | | | GRAZPREP 2.2 IOTA/ES | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | M D | USNO | SAOPPM D | MAG | %SNL | L. | W.UT | LONG | LAT | STAR NAME | MAG1 | MAG2 |
| 1 | Jan 08 | ZC 2307 | 184123 | 3.9 | 15- | N | 13 49.1 | -119 | 55 | 9 omega1 Sco (Kow Kin) | | |
| 2 | Jan 10 | ZC 2633 | 186497 T | 3.8 | 3- | S | 12 58.3 | -106 | 27 | 13 mu Sgr | 4.1 | 7.0 |
| 3 | Jan 16 | ZC 3453 | 128186 V | 5.0 | 23+ | N | 5 5.6 | -125 | 37 | 8 kappa Psc | 5.7 | 5.7 |
| 4 | Jan 23 | ZC 894 | 77705 V | 4.4 | 90+ | N | 23 51.0 | -81 | 49 | 54 chi1 Ori | | |
| 5 | Jan 24 | ZC 915 | 77911 L | 4.6 | 91+ | N | 4 48.4 | -125 | 51 | 62 chi2 Ori | 5.5 | 6.3 |
| 6 | Feb 01 | ZC 1853 | 139033 V | 4.8 | 73- | N | 11 2.6 | -125 | 54 | 40 psi Vir | 5.0 | 8.3 |
| 7 | Feb 04 | ZC 2241 | 159442 V | 4.8 | 40- | N | 11 10.6 | -118 | 55 | 43 kappa Lib | 5.8 | 5.8 |
| 8 | Feb 06 | ZC 2547 | 185660 X | 4.9 | 20- | S | 10 57.2 | -89 | 50 | 58 Oph | 5.1 | 6.9 |
| 9 | Feb 23 | ZC 1341 | 98267 Y | 4.3 | 96+ | N | 23 10.2 | -83 | 41 | 65 alpha Cnc (Acubens) | 5.1 | 5.1 |
| 10 | Feb 28 | ZC 1815 | 138892 V | 4.7 | 93- | N | 11 27.6 | -93 | 27 | 26 chi Vir | 4.8 | 8.8 |
| 11 | Mar 06 | ZC 2666 | 186794 M | 4.9 | 34- | S | 9 22.3 | -98 | 34 | 21 Sgr | 5.0 | 7.5 |
| 12 | Mar 17 | ZC 668 | 93954 | 3.5 | 33+ | S | 23 10.5 | -125 | 50 | 74 epsilon Tau (Ain) | | |
| 13 | Mar 31 | ZC 2302 | 159682 H | 2.6 | 81- | N | 7 36.2 | -125 | 46 | 8 beta1 Sco (Acrab) | 3.2 | 4.2 |
| 14 | Apr 03 | ZC 2826 | 162512 X | 3.9 | 46- | N | 15 20.8 | -125 | 27 | 44 rho1 Sgr | 4.2 | 6.7 |
| 15 | Apr 04 | ZC 2969 | 163481 I | 3.0 | 34- | N | 16 39.2 | -125 | 43 | 9 beta Cap (Dabih major) | 3.5 | 4.8 |
| 16 | Apr 05 | ZC 3093 | 164182 | 4.5 | 25- | N | 12 23.4 | -125 | 27 | 13 nu Aqr | | |
| 17 | Apr 08 | ZC 3494 | 128336 | 4.5 | 4- | N | 12 28.0 | -115 | 45 | 18 lambda Psc | | |
| 18 | Apr 24 | ZC 1815 | 138892 V | 4.7 | 96+ | N | 3 45.1 | -104 | 55 | 26 chi Vir | 4.8 | 8.8 |
| 19 | May 09 | | | 1.5 | 0- | N | 12 42.3 | -115 | 35 | Mars | | |
| 20 | May 15 | ZC 1106 | 96746 Y | 3.6 | 21+ | S | 1 14.5 | -78 | 55 | 54 lambda Gem | 4.0 | 5.0 |
| 21 | Jun 21 | ZC 2241 | 159442 V | 4.8 | 92+ | S | 5 15.7 | -97 | 32 | 43 kappa Lib | 5.8 | 5.8 |
| 22 | Jun 26 | ZC 3093 | 164182 | 4.5 | 88- | N | 10 26.5 | -121 | 28 | 13 nu Aqr | | |
| 23 | Jun 29 | ZC 3494 | 128336 | 4.5 | 60- | N | 6 9.6 | -101 | 28 | 18 lambda Psc | | |
| 24 | Jul 20 | ZC 2498 | 185296 | 4.4 | 90+ | S | 3 57.1 | -112 | 28 | 40 xi Oph | | |
| 25 | Jul 21 | ZC 2666 | 186794 M | 4.9 | 96+ | S | 3 51.7 | -114 | 48 | 21 Sgr | 5.0 | 7.5 |
| 26 | Jul 28 | ZC 146 | 109627 K | 4.3 | 65- | S | 4 48.2 | -94 | 40 | 71 epsilon Psc | 5.2 | 5.2 |
| 27 | Aug 01 | ZC 668 | 93954 | 3.5 | 26- | N | 7 56.3 | -104 | 37 | 74 epsilon Tau (Ain) | | |
| 28 | Aug 28 | ZC 668 | 93954 | 3.5 | 48- | N | 17 26.2 | -125 | 42 | 74 epsilon Tau (Ain) | | |
| 29 | Sep 08 | ZC 1925 | 157923 Z | 1.0 | 11+ | S | 13 28.0 | -63 | 45 | 67 alpha Vir (Spica) | 1.3 | 4.5 |
| 30 | Sep 26 | ZC 832 | 94628 | 4.3 | 59- | S | 5 28.9 | -114 | 52 | 119 CE Tau | 4.3 | 4.5 |
| 31 | Sep 28 | ZC 1106 | 96746 Y | 3.6 | 39- | S | 8 12.6 | -121 | 40 | 54 lambda Gem | 4.0 | 5.0 |
| 32 | Sep 30 | ZC 1341 | 98267 Y | 4.3 | 21- | N | 9 41.5 | -112 | 25 | 65 alpha Cnc (Acubens) | 5.1 | 5.1 |
| 33 | Oct 09 | ZC 2353 | 159892 | 4.5 | 19+ | S | 2 5.7 | -125 | 37 | 4 psi Oph | | |
| 34 | Oct 13 | ZC 2969 | 163481 I | 3.0 | 62+ | N | 0 58.7 | -125 | 52 | 9 beta Cap (Dabih major) | 3.5 | 4.8 |
| 35 | Nov 10 | ZC 3093 | 164182 | 4.5 | 48+ | N | 4 36.3 | -125 | 52 | 13 nu Aqr | | |
| 36 | Dec 09 | ZC 3320 | 146210 T | 5.0 | 43+ | N | 2 9.3 | -100 | 41 | 63 kappa Aqr (Situla) | 6.1 | 6.1 |
| 37 | Dec 28 | ZC 2118 | 158840 V | 2.8 | 20- | N | 16 9.4 | -125 | 40 | 9 alpha Lib (Zuben Elg.) | 3.4 | 3.8 |

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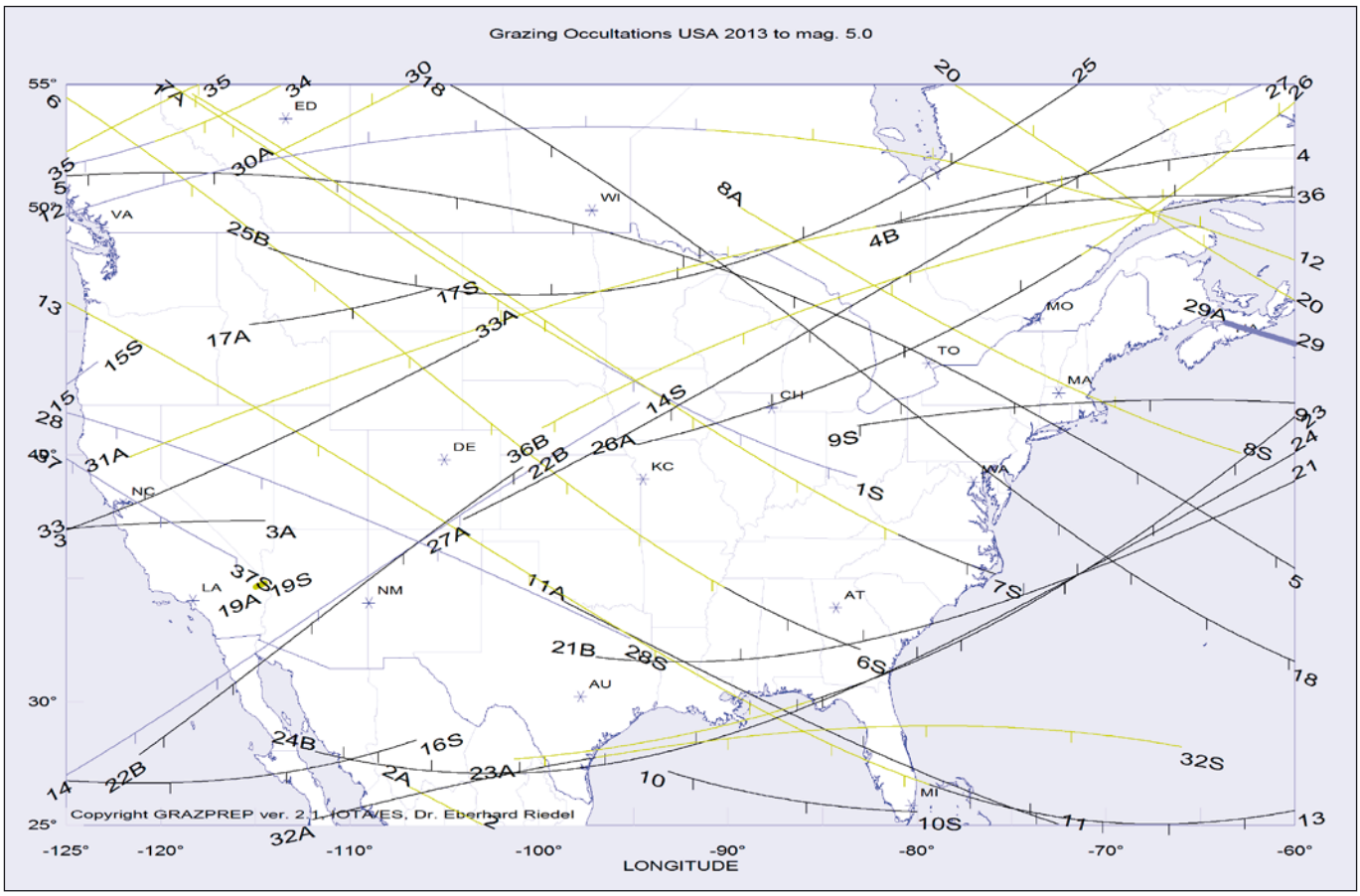


# USA

## Dr. Rainer Lohmann

On September 30th Rainer Lohmann died at the age of 75 after a long time of physical suffering. He could not be active any more during the past years but was still sponsoring our association. I first met him in 1979 when we were preparing our first solar eclipse expedition trying to observe at the edges of the path. In February 1980 we left for Kenya together without having the luck though to make successful observations at the edges.

We will always remember the inspiring meetings we had with Rainer Lohmann and the interesting discussions with him.

Hans-J. Bode

Journal for Occultation Astronomy

# ESOP 2012: Science meets Music

Wolfgang Beisker, IOTA-ES

An unprecedented ESOP conference took place in Pescara (Italy) this year. Whereas all ESOP conferences in the decades before where interesting and inspiring events for our scientific and social life, this one was special. A unique combination of scientific talks and get-together with three evenings of classical music, brought a feeling of spirit and enlightment.

Prof. Costantino Sigismondi, who organized this meeting, combined the commemoration of the 400th year of death of Christopher Clavius, the ESOP meeting and the close neighborhood of the institute of ICRANET (where the conference was held), of the hotels and of a church. Costantinos connections to the musical world allowed him to create a real "Spirit of Pescara". After dinner, we all had the chance to go to the nearby church Chiesa del Sacro Cuore and listen to a program of classical music arranged by M° Giuliano Mazzoccante. The music was put into an astronomical context by our organizer Costantino. M° Guiliano Mazzocante is a well known pianist. Just to give an example of his reputation, he just recently has given a concert with the Collegium Musicum Pommersfelden this year in July in the Prinzregententheater in Munich, where he could be heard at an "Italian Evening" with music of Casella and Pilati, both italian composers of the 20th century.

The concert began on Friday evening with music for transverse flute and piano of Briccialdi, Paganini, Bazzini and Rossini, the flute played by M° Rita d' Arcangelo. The second part on Friday night after pieces of Bassi and Schumann ended with the famous Rhapsody in Blue of Gershwin in a transcription for clarinet. The clarinet was played by M° Antonio Tonelli. G. Mazzocante was playing the piano and accompanied the flute and clarinet music with great feeling and wunderful intonation. This all was a real treat to everybody sympathizing with classical music.

Every evening, on Saturday and Sunday other students of the masterclass of Mazzocante give performances in this church, just across the institute ICRANET and our hotels. It was a very unique and inspiring conference setup.

The conference itself, as it can be seen from the abstracts, opened our mind wide beyond the pure aspects of occultation astronomy to modern develpoment in optics and astronomy. With these concepts, such as shown by Professor Cesare Barbieri from the university of Padua with his talk about orbital angular momentum of light beams, the future of astronomy is opened. First experiments to use this idea are already in preparation.

The balance between occultation work and other outlooks into the scientific world were given by experts ranging from Andrea Richichi to Bruno Sicardy, who was with us by SKYPE. G. Sconti from the Specola Vaticana set the historical context with a talk about the legacy of the Jesuit Christopher Clavius, whose fourth centennial was celebrated. He lived from 1538 to 1612 and taught mathematics and astronomy at the Collegio Romano for four decades.

During the conference the president of the US IOTA David Dunham was honored by the "Dr. Niels Wieth-Knudsen Award" for his outstanding work for five decades of pionieering occultation work. With a few introductory words, our secretary Eberhard Bredner handed him over the award. A talk of David himself followed, where he showed results from 50 years of occultation work.

The very hot weather during the conference days was cooled down a little during an excursion to the old roman city of Lanciano on Sunday afternoon by local train. Not to let us use the umbrellas too much, but enough to be prepared again for another music part in Pescara after dinner..

Alltogether, the unique setup of ESOP XXXI will be remineded in the future. A big thank to our host Costantino and his collegues at ICRANET, without their help this all would not have happened.

Journal for Occultation Astronomy

# ESOP XXXI

## CLAVIUS 2012 Pescara · Abstracts

»» Andrea Richichi (NARIT), andrea@narit.or.th

### Lunar occultations at the ESO Very Large Telescope

I will report on a recent program of lunar occultations observed with the ESO VLT, which has produced so far about 1,000 light curves. The program is mostly based on a filler strategy, trying to make use of small slots not claimed by other observers. Several papers have been published with results in the area of binary stars, IR sources with extended circumstellar emission, and angular diameters.

The quality of the resulting light curves is arguably the best ever obtained with the occultation technique. Time permitting, I will also present some plans to carry out high time resolution observations at other present and future telescopes.

»» Jean-Pierre Rozelot (OCA)

### « Une brève histoire de la mesure du diamètre solaire au cours des âges: quelle finalité astrophysique? »

A brief history of the solar diameter measurements since immemorial days: which relevant astrophysics?

The measurement of the solar diameter has a rich history extending well back into the past. Tackled by Greek astronomers from a geometric point of view, an estimate, although incorrect, has been first determined, not truly called into question for several centuries. One must wait up to the XVII th century to get the first precise determinations made by the French school of astronomy. Gradually, as the techniques were more and more sophisticated, many other solar diameter measurements were carried out, notably in England, Germany, Italy and US.

The possible temporal variability of the size of the Sun, as first advocated at the end of the XIXth century by the Italian school, opened the way to a possible changing roundness of the Sun, in shape and in time. Today, accurate observations of this solar shape made from space, seem to achieve the required sensitivity to measure faint deviations to sphericity and their temporal changes. A shrinking or an expanding shape is ultimately linked to solar activity, as gravitational or magnetic fields, which are existing mechanisms for storing energy during a solar cycle, lead to distinct perturbations in the equilibrium solar structure and changes in the diameter. We will here give a brief review of some of the most remarkable techniques used in the past, emphasizing how incorrect measurements have driven new ideas. We will emphasize the advent of high sensibility instruments on board satellites, such as SDO, which allows accurate determination of the shape of the Sun. It turns out that such modern measurements are one of the ways we have now for peering into the solar interior, learning empirically about flows and motions there that would otherwise only be guessed from theoretical considerations, developing more precise ephemerids and ultimately building possible alternative gravitational theories.

»» Alex Pratt (IOTA/UK)

### The Occultation Machine of HM Nautical Almanac Office

100 years ago the predictions of lunar occultations were carried out by human computers. The invention of an ingenious Occultation Machine simplified the process. This talk describes its history and achievements.

»» Eberhard Riedel (IOTA/ES)

### Grazing Occultations: Why do we still observe?

Abstract: The lunar topography is well known in the meantime as a result of direct ranging by spacecraft. The presentation briefly points out,

why observations of grazing occultations still can be meaningful and gives an idea of the possible precision of earthbound measurements.

»» Eberhard Riedel (IOTA/ES)

## GRAZPREP: Advances in Grazing Occultation predictions and preparations

GRAZPREP is a rather new software to access the grazing occultation prediction data supplied each year by IOTA/ES. The software presented here assists in selecting and listing individually favorable 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. GRAZPREP easily visualizes the complete list of all grazing occultation 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 according to the Sun's altitude. Thus a judgment about the entire graze circumstances is easily possible at a few glances. A display of any limit line in Google Earth is also possible.

»» Anas Salman Taha , Fuad Mahamood Abdullah (University Of Baghdad / College Of Science / Department of Astronomy) anas_taha@scbaghdad.edu.iq

## Atmospheric Drag effect on the Satellite Orbit

One of the most important perturbation effects on the satellites orbits its drag of atmosphere. When satellite moved around the earth there are many forces effecting on this motion like Earth Gravitational effect, Drag effect, Solar Radiation effect, Moon effect, and other attractive force. The important and common effect it's the atmospheric drag effect because this effect entering directly on the equation of calculation life time of satellite specially on the low orbit. In this work we study and calculation the drag effect and life time of satellite on the low satellite orbit on rang altitude between (200-500) km and building software for calculation lifetime for satellite with different altitude and different cross section area.

»» David W. Dunham (IOTA/US) dunham @ starpower.net

## Fifty years of lunar grazing occultations

Although in 1957, I saw a very close miss of beta2 Capricorni by the southern edge of the Moon and realized that lunar grazing occultations might be interesting to observe, it wasn't until five years later that I really did something about it, doing something new that started my astronomical career. I'll discuss what happened in 1962, how I first computed predictions of lunar grazing occultations and started to encourage observers around the world to observe them. I will briefly describe how the observation and analysis of grazing occultations evolved during the following years, up to the current era of lunar profiles derived from Kaguya and LRO data. Although in recent years, our observational emphasis has shifted more to occultations of stars by asteroids and more distant solar system objects, some new things can still be done with lunar grazes, including multiple station deployments by a single person for the more favorable brighter events.

»» David W. Dunham (IOTA/US) dunham @ starpower.net

## Multiple station deployments for asteroidal occultations

I will describe the first successful efforts to video record occultations of stars by asteroids, starting with the occultation by (9) Metis on 2001 September 7. Scotty Degenhardt's invention of the "mighty mini" allowed a significant expansion of multiple station deployments starting in 2008. The successful efforts depend on having several hours of darkness before an occultation to allow time to pre-point several mighty mini's or other small telescopes. A good example was the occultation of

6th-mag. LQ Aquarii by the binary asteroid (90) Antiope in the western USA in July 2011. But often there are occultations that occur rather early in the evening, with only enough dark time to pre-point maybe just one other system. In these cases, it is better to try to train others to use mighty mini's to deploy across a predicted occultation path. I will describe how this was partly done for the occultation of delta Ophiuchi by the asteroid Roma in Iberia in July 2010. Then I'll describe lessons learned during an attempt to record another early evening occultation, of a 6th-mag. star by the asteroid (28) Bellona last May, with observers from Khabarovsk, Russia.

»» Casare Barbieri (Dept. of Physics and Astronomy, University of Padova, Italy) cesare.barbieri @ unipd.it

## Aqueye and Iqueye, the fastes astronomical photometers

The Extremely Large Telescopes of the future will open the way to novel utilizations of light, allowing to reach the shortest time resolutions possible in Astrophysics with a fair number of photons from the brightest stars. It will be an entirely new domain for Astronomy, one we have called 'Quantum Astronomy' in a report prepared for ESO (QuantEye, Dravins, Barbieri et al. 2005).

To open the way to such ambitious program, we have built two instruments capable to time tag the arrival time of celestial photons to better

than 100 picoseconds, for hours of uninterrupted observations tied to the UTC scale. One instrument is Aqueye for the 18.8 m telescope at Cima Ekar (Barbieri et al., 2008), the other is Iqueye for the 3.5m ESO NTT (Naletto et al., 2009).

The core detectors of both instruments are Single Photon Avalanche PhotoDiodes (SPADs) operated in Geiger mode, whose output is fed to a Time-to-Digital Converter Board. The Pulses from a GPS unit are read by the same electronics and treated as photon pulses, so to avoid any instrumental mismatch between photon arrivals and time tags.

The instruments have been used on a series of celestial objects, from lunar occulatations to exoplanets transits, but the paper will concentrate on data obtained on optical pulsars. To date, Aqueye and Iqueye are the best 'time machines' available to astronomy.

Data reduction provided several provocative issues, e.g. to cope with strings of enormous length. Another most interesting problem was to understand the subtle relativistic effects entering in the definition of time and their different realizations in different Institutions. Below the nanosecond barrier all tiny details count. At the end, ongoing improvements will be illustrated.

**Cesare Barbieri (Dept. of Physics and Astronomy, University of Padova, Italy)**

## Orbital Angular Momentum (OAM) of light beams and photons

Among the properties of light still poorly exploited in Astronomy, is the Orbital Angular Momentum (OAM) and associated Optical Vorticity (OV), which is instead already used in Chemistry, Biology, and Quantum and classical Communications.

M. Harwit (2003, The Astrophys. J.) was the first to point out the interest of OAM for Astronomy, but his paper was largely ignored.

We took up some of his ideas, and shall show in the following that OAM can actually be used in Astronomy, e.g. in the optical domain to overcome the Rayleigh criterium of angular resolution and for coronagraphic applications.

In the radio domain it can be used for interstellar and interplanetary plasma physics diagnostic, for radio interferometry from the Moon, and for measuring the rotation of Black Holes.

In our presentation, we shall illustrate in a very simplified way some properties of OAM and recall our main results and plans.

**Andrea Raponi (IAPS-INAF), andr.raponi@gmail.com**

## Measuring the solar diameter with Baily beads observations: an improvement of the method

The measurement method of the solar diameter through observation of eclipses is revised. It has to take into account the whole shape of the Limb Darkening Function (LDF). It is shown how the first derivative of the light curve of the Baily's Bead gives the shape of the LDF from which is obtainable the position of its inflection point, that is the conventional definition of the solar edge position.

»» Wolfgang Beisker (IOTA/ES) Ortiz, J.-L.; Renner, S.; Sicardy, B. and the "European Pluto Occultation Team"

## The Occultation by Pluto on the 14th of June 2012: Observation Campaign and Results with Respect to Pluto's Atmosphere

The Occultation of a 14th mag star on 14th of June 2012 was a remarkable event visible from western Europe, the Canaries, northern Africa, and the eastern USA. We report from observations made from Marocco, Spain and southern Portugal.

Data have been taken with a 60cm instrument in Marrakesch as well as of a 1.5 m telescope at the Observatorio de Sieerra Nevada and with the Albox 40 cm telescope (Almeria). The occultation was also observed from a station (14 inch intelescope) in Mina de Sao Domingos, at the observatory of the Sao Domingo Hotel in the province of Alentejo, Portugal. Here the event was more than marginal, its still doubtful, if an occultation had been observed there.

Astrometric reduction have been done with the observed occultation tracks as well as a fit of Pluto's atmosphere, which confirmed the atmospheric conditions of the last few years. So at the moment Pluto's atmosphere seems to be stable.

› Pere Closas – ASTER. Agrupació Astronòmica de Barcelona
Carles Schnabel – Agrupació Astronòmica de Sabadell

## ESOP XXXII in Barcelona

Work is being done for the organization for the next ESOP in Barcelona. ASTER and the Sabadell Astronomical Association, the most important two in our area, are working together to prepare the second ESOP ever held in Spain.

The main sessions will be developed in CosmoCaixa, a big Science Centre owned by one of the most important banks in Spain. Further on, contacts with the City Hall and the Royal Academy of Sciences are underway to ensure the success of the symposium.

The presentation will show the work in progress.

»» Costantino Sigismondi – ICRA, Sapienza University of Rome and Regina Apostolorum University

## The transit of Venus and the measure of the solar diameter

Preliminary data on the 2012 Venus transit's measurement of the solar diameter are presented from the Italian, French, Chinese and IOTA Collaboration. The seeing effects are reduced statistically to their minimal influence on the determination of the ingress/egress times. The photospheric and H-alpha diameters are proportional to the ratio between the observed total transit durations, and the duration is calculated with the ephemerides for the standard solar photospheric radius of 959.63 arcsec, at the observing location. This method, by using alignments of planets, attains precision on the solar diameter measurement of space-based quality. A comparison with previous Mercury and Venus' transits is made, in view of a better comprehension of the Solar diameter's long term evolution.

»» Costantino Sigismondi – ICRA, Sapienza University of Rome and Regina Apostolorum University

## Clavius: paving the way to new science

Clavius as astronomer leaved at the gateway between the time before and after the use of the telescope. His observation of the solar eclipse of 1567 shows the modernity of the scientific approach: the parameters of Ptolemy's model are not object of dogmatism. Thanks to Clavius' Commentary to the Sphere of John Holywood the study of Astronomy in the Universities of Europe became more robust.

»» Gabriele Gionti, S.J. (Vatican Observatory)

## Christopher Clavius Jesuit and Scientist and his legacy at the Roman College

The purpose of this talk is to review, briefly, the key influence that Clavius had in establishing the scientific tradition of the Society of Jesus. Thanks to Clavius, science was thought at the Roman College as an integral part of the curriculum as well as in all Jesuit Colleges in Europe and the World. This had a huge apostolic impact since famous Jesuit missionaries, like Matteo Ricci, succeded in their mission using their scientific knowledge.

»» Wolfgang Beisker (IOTA/ES)

## The Occultation Simulator Software OCCSIM

In order to evaluate the influence of camera parameters on registering light curves of astronomical objects, specially for occultations, a software has been written. The OCCSIM software allows to simulate occultation lightcurves under many conditions, such as stellar magnitudes, stellar color, transparency of the earths atmosphere. even more, it allows to vary the quantum efficiency of the used camera, the telescope size and focal length and a lot of other parameters as well.

The package generates the simulated lightcurve and displays it in a GUI. All parameters can be set up by slider bars. The report describes the main use of the paackage as well as a comparison with real occultation and stellar data.

OCCSIM is written in Fortran 90 and uses the DISLIN GUI package.

»» Bruno Sicardy (Observatoire de Paris et Université Pierre et Marie Curie)

## Recent Observations of the Pluto System for Probing Pluto's Atmosphere, Charon's Size and Orbital Elements

Recent events involving the occultation of the same star by both Pluto and Charon have been used to measure the distance of the satellite to the dwarf planet with an accuracy of 20-30 km. Those distances provide in turns constraints on the orbital elements of Charon,in particular its orbital eccentricity. The accuracy obtained by such measurements are such that they provide useful comparison with recent observations by the Hubble Space Telescope.

Also, the Charon occultations yield its size with an accuracy of a few km, and provide upper limit on its oblateness.

Finally, a high signal-to-noise-ratio occultation observation achieved on 18 July 2012 at the Very Large Telescope of the European Southern Observatory reveals with new details a dynamical activity in Pluto's atmosphere. This could be related to gravity waves propagating in Pluto's atmosphere, with an interesting asymmetry between the winter and summer hemispheres.

»» Alexandre Humberto Andrei (Osservatorio Astronomico di Torino/Observatorio Nacional, Rio de Janeiro)

## International Program of Stellar Occultations by Trans-neptunian Objects The Contribution of the Aosta Valley Astronomical Observatory

The analysis of light curves from stellar occultations by trans-neptunian ojects (TNOs) observed from many sites can provide a direct measurement of TNOs' size/shape, as well as valuable information on atmosphere presence and profile down to the nanobar level. Since TNOs angular sizes do not exceed 50mas, such events are rare and of short duration (minutes or even seconds), therefore quite challenging to observe. For these reasons, astrometric catalogs along the TNOs' paths are compiled well ahead, and a substantial effort is put weeks before the event to narrow down the TNO/star positions and on the timing of the encounter. The event itself is followed from several locations, not only because more information can be gained from multiple observations, but also to account for the unpredictability of precise chord boundaries due to uncertainties in the astrometry of both the TNO and the star.

Recently, the Osservatorio Astronomico di Torino (OATo) and the Osservatorio del Valle d'Aosta (OVdA) joined the consortium coordinated by B. Sicardy from the Observatoire de Paris-Meudon. The OVdA seats at the NW of Italy, 1.6km altitude, and with about 250 cloudless nights per year. We review the aims, methods, and previous results of the whole program, and focus on the Italian observatories facilities and plans.

### VIRTUAL POSTER SESSION

Cyril Bazin (LAM Marseille, IAP et UPMC Paris)

The solar edge and the mesosphere layers between the photosphere, the chromosphere and the corona from total eclipse flash spectra. [pdf]

Alexandre Humberto Andrei (Observatorio Nacional, Rio de Janeiro, Brasil) V. d'Avila, E. Reis Neto, J. Penna, S. Boscardin, A. Coletti, L. C. Oliveira and C. Sigismondi

First year results and challanges from the heliometer at Observatorio Nacional, Rio de Janeiro. [pdf]

Gert Schubring (Universitaet Bielefeld, Germany)

Clavius Algebra [pdf]

Paul Schweitzer, S. J. (Pontificia Universidade Catolica, Rio de Janeiro)

Clavius Mathematics [pdf]

Clavius Fourth Centennial Committee (Costantino Sigismondi, Renzo Lay, Maria Carmen Beltrano, Gert Schubring, Paul Schweitzer S.J., Gabriele Gionti S. J.)

Clavio e il Collegio Romano [pdf, IT]

L'Algebra di Clavio [pdf, IT]

Clavio e la Matematica [pdf, IT]

L'eclissi del 1567 [pdf, IT]

Ratio Studiorum Via Librorum [pdf, IT]

Selenografia [pdf, IT]

## 30th Annual Meeting of the International Occultation Timing Association, Las Vegas, Nevada, 2012 Oct. 19-21

The 2012 meeting of IOTA will be held on October 19 – 21 at the College of Southern Nevada in North Las Vegas, Nevada. There is no charge and all interested in occultations are invited to attend. Remote attendance will be possible using the EVO system. Details of the meeting can be found at:

http://www.asteroidoccultation.com/observations/NA/2012Meeting/

Right after the meeting, just after local midnight of Oct. 21/22, those in Nevada will try to observe the occultation of 10.9-mag. (that's the new APASS mag.) TYC 1312-00848-1 by the 122-km asteroid (521) Brixia, predictions of which are at:

http://www.asteroidoccultation.com/2012_10/1022_521_26981.htm

David Dunham, Paul Maley, Scotty Degenhardt and Brad Timerson, IOTA

Journal for Occultation Astronomy

# ALFRED C. WEBBER 1907-2012

**By Richard Nugent**

Alfred C. Webber, 104, of Chadds Ford, Pennsylvania passed away in his home on August 8, 2012. Born in Lisbon Falls, Maine on October 10, 1907.

Al graduated from Lisbon Falls High School, Bates College (B.S. 1928) and Boston University (M.S. 1940). He started his career as an educator, teaching science in high schools in Franklin and Brookline, Massachusetts. In 1942 he joined the DuPont Company Plastic Department Research Laboratory in Arlington, New Jersey, where he set up the company first Physical Measurements Laboratory. When that Department was moved to the Experimental Station in Wilmington, Delaware, Al followed. He developed standardized test methods for comparison of products in research and development throughout the company.


Al was president of the American Society of Testing and Materials in 1962 and was the plastics chairman of the International Standards Organization. He became a Fellow of the Optical Society of America, was awarded the International Award by the Society of Plastics Engineers, and the ASTM Award of Merit. He retired from DuPont in 1972.

He was very active in the community establishing Cub Packs and Scout Troops, working on Chadds Ford May Fairs and reunions. He served on the Unionville-Chadds Ford School Board, was active with the Chadds Ford Historical Society, and was Judge of Elections in Birmingham Township. He became a Director Emeritus of the Kennett Symphony Orchestra of Chester County.

Al received the Messier Certificate from the Astronomical League on January 29, 1990 for observing at least 70 of the Messier objects. He was 82 at the time. At the Delaware Astronomical Society, Al gave numerous presentations on binocular observing, the Halley's comet return in 1986 and occultations.

Chadds Ford psychologist Kayta Gajdos also knew Webber. "He was a Renaissance man. He could literally show a woman the moon. That is, in his backyard with an amazing telescope. When not being an astronomer he was a gemologist or an organist or a photographer. His hobbies of stamp collecting, gardening, astronomy, photography and lapidary filled his retirement years. Most of all, he enjoyed sharing his knowledge and love of these things.

He was a Life Member of the Delaware Astronomical Society where he received the Luther J. Porter Educator Award, a Fellow of Mount Cuba Astronomical Observatory, a Life Member of The Tuscarora Lapidary Society, and an Honorary Member of the Delaware Photographic Society. He was a Brother of the Granite-Corinthian Lodge No. 34, serving as a Mason for 81 years.

He proudly returned at age 100 to his 80th Anniversary at Bates College, leading the parade with the banner of the Class of 1928, and presented the Bates Mineralogy Department with a gift of his collection of 2600 micromount minerals.

At the 2006 IOTA meeting at Mt. Cuba Observatory, Greenville, Delaware, David Dunham was discussing the solar radius research effort and mentioned the January 24, 1925 solar eclipse over the northeast USA. Al, who at 99 drove himself to the meeting, was sitting up front and waived his hand and said, "I saw that eclipse". Dunham's eyes opened up wide and he said, "You did?" Al said he photographed that total solar eclipse in New York with a 5 x 7 camera. He was 18 at the time.

At age 94, Al made a grazing occultation observation of ZC 306, m = +6.8 on February 28, 2001 from the Mt. Cuba Observatory. This observation likely holds the record for a grazing occultation observation made by the oldest person.

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# 15th Conference of the VdS-Minor-Planet-group 2th+3rd June 2012 in Berlin

Martina Haupt, Sven Andersson

The 15th conference of the VdS*-minor planet group took place on June 2nd and 3rd at the Archenhold observatory in Berlin. Even though the meeting was held in German it has many attendants from Austria, Switzerland, and the Netherlands.

Asteroids are the main topic of the conference. On Saturday there was a huge variety of reports covering the full spectrum of minor planet observation and research. In the beginning Gerhard Lehmann, the leader of the VdS-minor planet group, spoke about the development of the group. 'Lust and frustration' concerning the naming of minor planets was the topic of Markus Griesser. Newly discovered asteroids usually receive the name of the person that reported its finding for the first time. Sometimes this rule is neglected resulting in confusion and anger.

In his talk "Is (44) Nysa really double" Harrie Rutten reported about the evidence of companions of asteroids being observed during their occultations of stars. A highlight of the day was a lecture by Prof. Dr. Dieter B. Hermann titled "Archenhold Observatory and Zeiss Planetarium – How they became what they are", informing about the history of both institutions from their founding until today

Two local professional astronomers underlined the scientific ambition of the conference. Dr. Gerhard Hahn of DLR (German Aeronautic and Space Agency) spoke about "Space Missions to Minor Planets" and Dr. Rainer Arlt of the AIP (Leibniz Astronomical Institute) in Potsdam, Germany, reported about "Minor Planets inducing Meteor swarms".

Detlef Koschny from the Netherlands who could not reach Berlin as planned contributed remotely via the internet speaking about the NEO datacenter of ESA (European Space Agency) thus adding to the report of Dr. Gerhard Hahn. Bernhard Haeusler reported about his own observations of NEOs and Gerhard Dangl about stellar occultations by minor planets. Some successes and difficulties concerning observations of TNOs were discussed by IOTA/ES-president Hans-Joachim Bode. The evening dinner of that day in a nearby restaurant was filled with interesting chats.

Sunday morning began with a presentation about TOTAS by André Knoefel. Following this Mike Kretlow reported about the generation of synthetic light curves from models of asteroids. After that two private observatories were presented.

Finally José De Queiroz invited for the next conference of the minor planet group in Falera, Switzerland. This will be the first time the meeting will be held outside of Germany.

*VdS: "Vereinigung der Sternfreunde" Germany's biggest star gazer group with more than 4000 members

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# The occultation of the sun by planet Venus

Susanne M Hoffmann

This year we redid the historical determination of the astronomical unit. We used the methods of Joseph Delisle and Edmond Halley and additionally developed a simplified method by comparing photographies, which was not possible in the 18th century, because this was before the invention of photography. We provide our data in the internet for educational use and re-doing observations and calculations for didactical purpose.

## Expeditions

In 1760 the french astronomer Joseph Delisle announced a big international project: In memoriam to his friend Sir Edmond Halley he suggested to observe the transit of venus in front of the sun from many different places on earth.

Halley had suggested to determin the solar parallax by measuring the different pathes of the planet on the solar disk. Therefore, he suggested to compare observations from the northern hemisphere with those from the southern. That is why, Delisle's first calls for observations concerned astronomers who were willing to make big expedtions to far points all in unknown or bad explored terretories of the earth.

In the mean time, Delisle realized, that the risk for the observation to fail is quite big because it will be necessary, that the weather on transit day is good for six or seven hours. The whole measurement will fail if one of the observers misses one of the contact times due to personal reasons or even clouds. That is why, Delisle developed another evaluation method, with which it will be possible to get a value for the distance to the sun by comparing only the times of one contact observed from different places on earth.

In 1761 there had been some expeditions from french and english astronomers to observe the transit of venus and measure the contact times. Surprisingly, it was not possible to determin those times as exact as Halley expected. The reason were observational phenomena, Halley did not knew like the black drop effect or the phenomenon of a light bow around venus at the solar rim. That is why, astronomers had been disappointed concerning the results, although they had been very good and inproved the understanding of the distances in the solar system. In 1769 even more astronomers traveled around the world trying to get some results for contact times.

There methods must have been as simple as possible, because they had to travel long ways and their voyages often had been very difficult. From the observers group around James Cook we know, that they used only one clock. An assistent had the task to announce the seconds loudly and all three observers at the telescopes noted their own seen time of the contacts.

## Our Expeditions

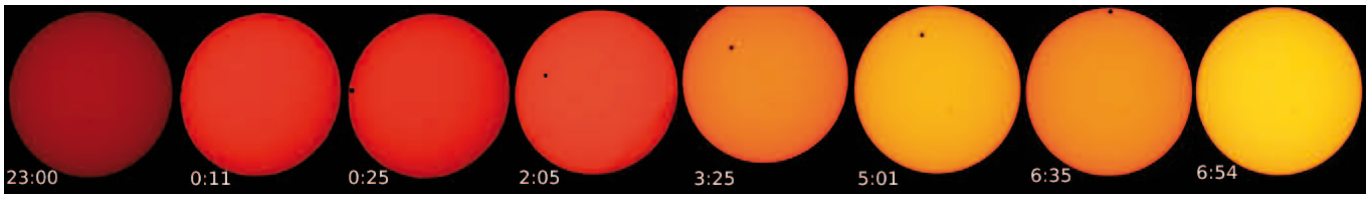
The same we did in Krasnoyarsk in Siberia:

On a big roof of the "House of Pupils" we mounted our six telescopes we brought with us. Four we had brought from Germany and two we had bought, because on the day before the transit it was still not clear, if our suit case with the telescopes will arrive in time.

Another expedition of us was in Tromsø, Norway. For central Europe the transit began short after midnight. In the northern area of Norway our pupils had the chance to observe the midnight sun. They made photos with a telementor telescope, while we in Krasnoyarsk used a Borg refractor for the photos and several russian telescopes to observe by eyes.

Some pupils also tried to determin the times by watching with eclipse glasses, but of course without any magnification the sun is too small. They where not able to take valuable data.

| | Tromsö Norway | Krasnojarsk Russia | Berlin Germany |
|---|---|---|---|
| 1st contact | 00:04:58 | Cloudy | Sun below horizon |
| 2nd contact | 00:22:18 | 06:25:30 | Sun below horizon |
| 3rd contact | 06:35:58 | 12:34:10 | 06:37:22 |
| 4th contact | 06:53:19 | 12:51:31 | cloudy |






## Evaluation

In September many of the German youngsters came together again to evaluate the observations. While in the 1820s the German astronomer Franz Encke needed two years for the evaluation of the data of only one transit, we used an online calculator based on the methods of Halley and Delisle.

The pupils learned to distinguish between those two concepts and then had the task to compare the data of our two data.

Additionally, we did not use only the complicated historical methods, but also a modernized didactically simplified method to evaluate our data. With the simplified method we got 12 % deviation from the modern value of the astronomical unit. The historical methods yield 152.4 million km  7.1 % - which is only 5 % away from the modern value. Encke in 1835 got 154 million km – so, we succeeded quite good with our experiment to re-do the historical determination of the distance to the sun.

## Final Remarks

As far as I can say this, I think, that it was a great project! We had an amazing time in Norway and in Russia and the evaluation was successful. With our primitive methods we got values for the astronomical unit which have only 5 % deviation from the modern value for the distance of the sun.

Since for us living beings it won't probably be possible to observe another transit of venus, our Krasnoyarsk group took video observations. We put those sequences in the internet and now, everybody has the chance to use it to re-do  our observation, determin the times of contacts in Krasnoyarsk on his own and re-calculate the astronomical unit.

So, we are glad to provide this didactical concept and e-learning entity. Please feel free to visit www.exopla.net and have fun!

*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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**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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