Journal for Occultation Astronomy

2017–01

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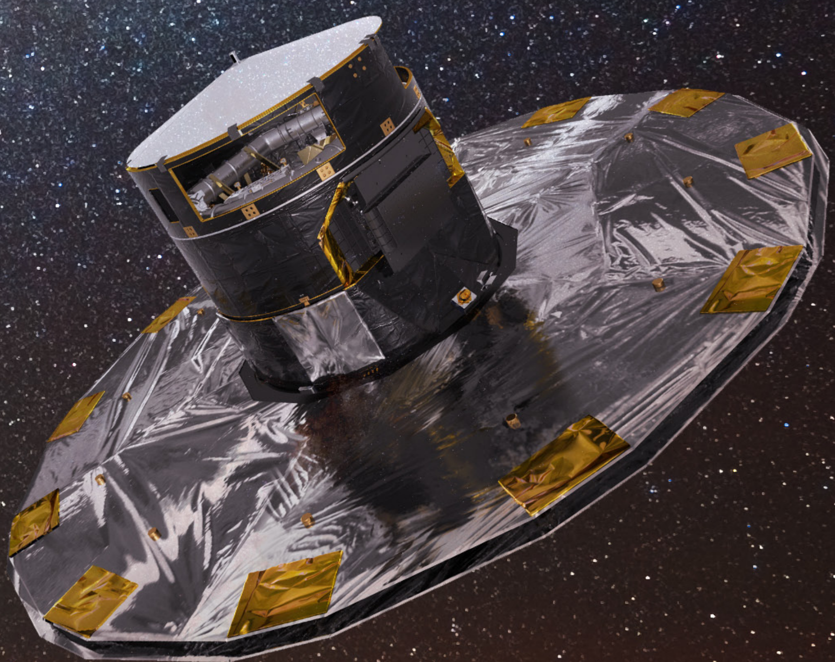

An artist's impression of the Gaia spacecraft, with the Milky Way in the background.
Credit: ESA/ATG medialab; background image: ESO/S. Brunier

Dear reader,

astronomy is one of the oldest scientific human beings were engaged in. In these old times men and woman were looking at the night sky, undisturbed by nothing more than perhaps a fire place. Seeing the beauty and miracles of the stars and their movements. And they started to describe and explain, what they saw. It was at the beginning more religion than science, and it was used to control and dominate their clans.

Today, everybody can take part in this science, but we have to be careful, it can and will be used to control people. Not so much in astronomy, but in other subjects.

In scientific work we observe facts, we try to grab a little of reality, we generate models, how nature can be described. We should not be megalomaniac towards explaining all of nature at the first moment. Looking at the beauty of the universe, we still feel very suppliant and also happy, that we are able to get a glimpse of its nature.

Science is not about accumulation of data and putting them in the closet. We have to work with our data, publish them and the most important to discuss it with others everywhere. We have put a lot of work in the past to gain data, making predictions, building sophisticated instruments and setting up communications about it. But now is the time to do more in terms of interpreting, what we see, draw conclusions and contribute to improve the knowledge about the universe. The real work will start right now, not stop with incremental science just gathering occultations by occultations and lightcurves by lightcurves. Many of us do this work not for money, this makes us very independent. And we should not forget... we do this because we want to fun!

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In this issue:

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Occultation of UCAC3 113-399867 by Chariklo, August 8th 2016

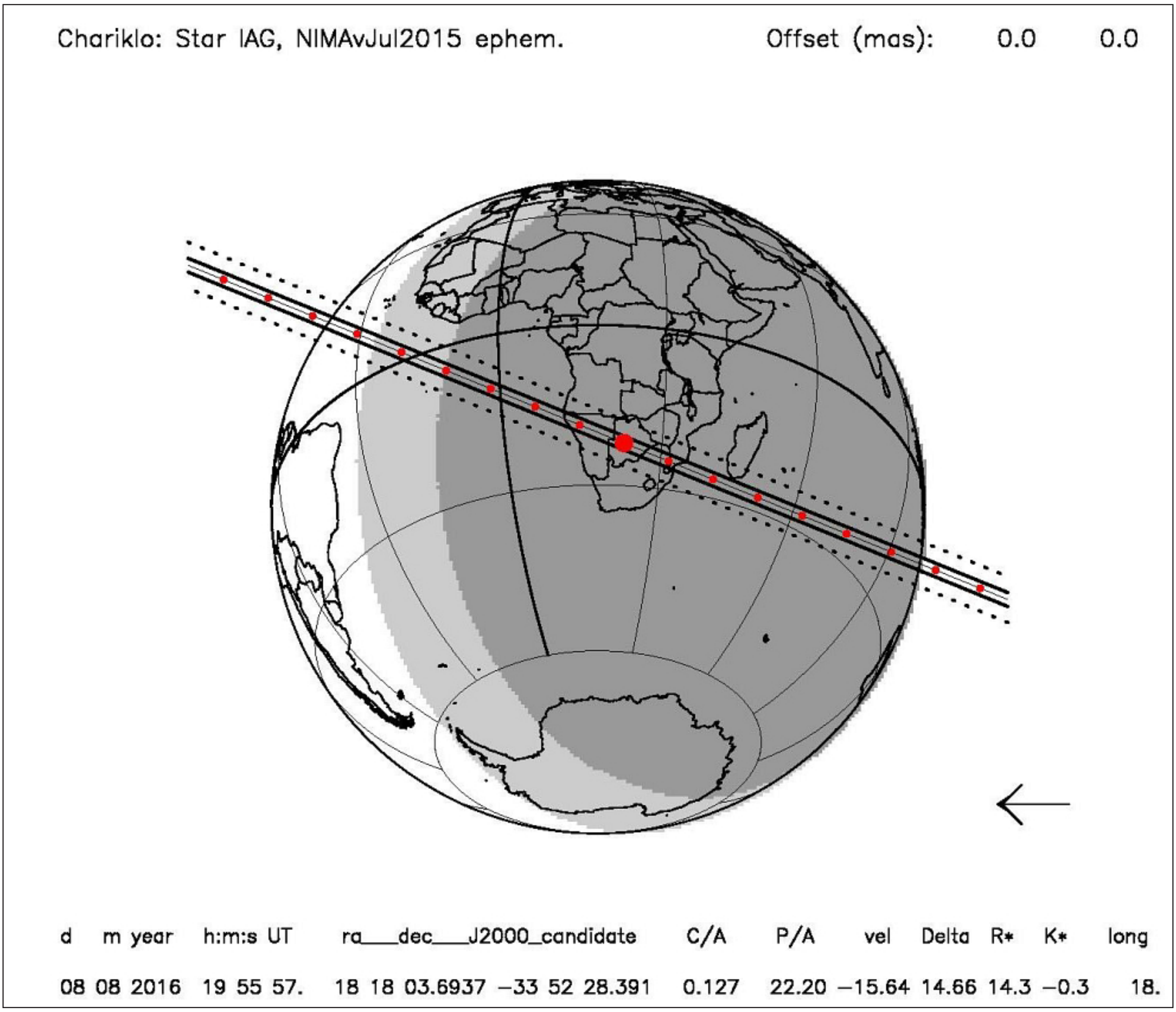
Preliminary Results

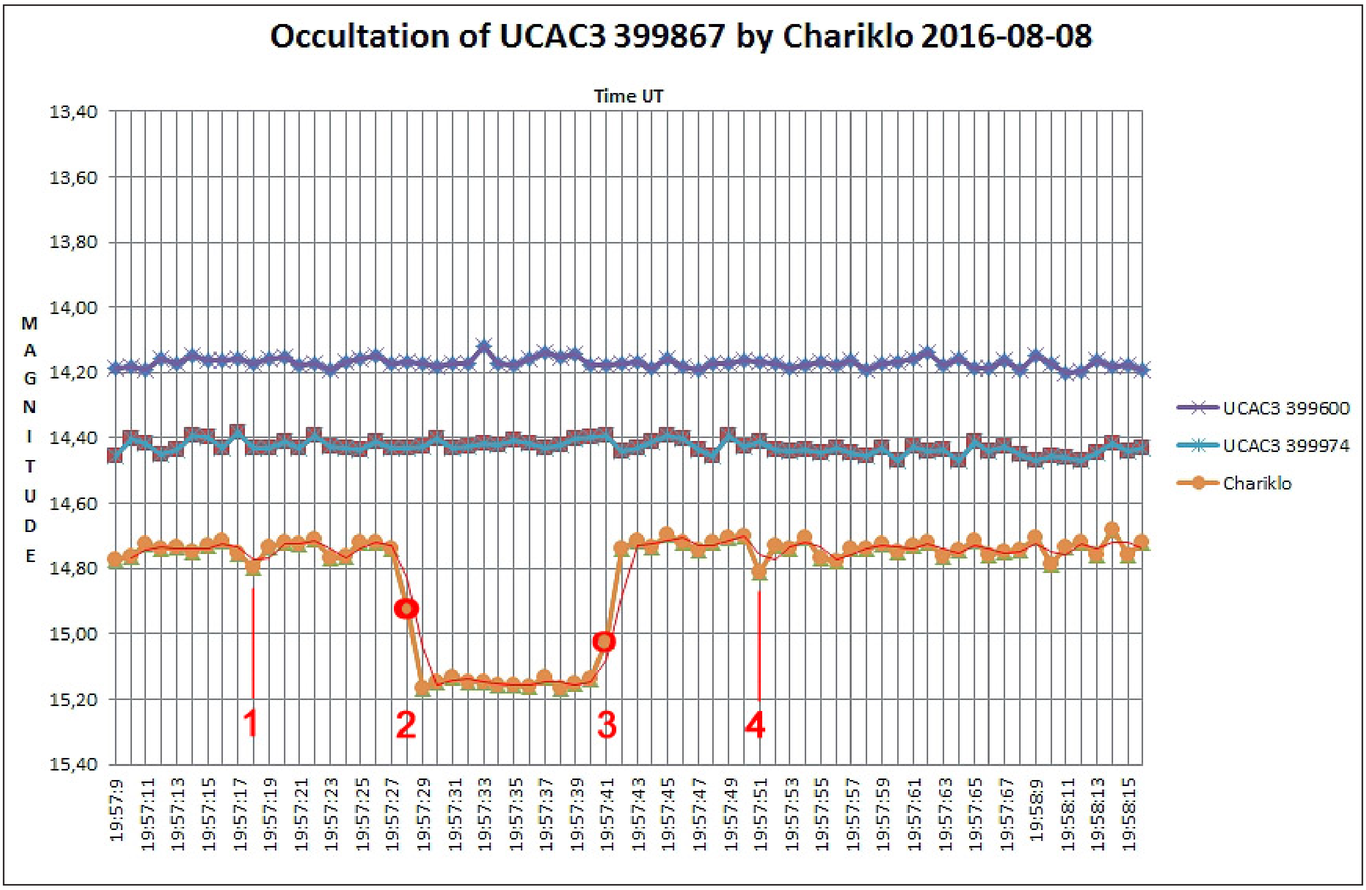
Hans-Joachim Bode · IOTA/ES

The rings of Chariklo were discovered in 2013. Thereafter different attempts were made in 2014, 2015 and 2016 in southern Africa to find out more details about its structure and composition. Duffard et. al. /1/ could explain temporal variations of water ice signatures in the spectroscopic data by the ring system. They showed that in contrast to the particles in the rings, which contain about 20% water ice on their surface, the surface of Chariklo is nearly ice free.

Fortunately there are 2 more predicted possible Chariklo occultations that will take place in southern Africa, which can be used to derive more physical data of this object.

It would be good if several teams at different stations would monitor these events on April 9 at 2h26 UT and June 22 at 8h19 UT. GAIA-Data had been used to compute these predictions, with an accuracy being much better now.





Ring passage at 19:57:18 & 19:57:51 (mid-occultation: 19:57:34.5), marked with red arrows (1, 4).
Main body from 19:57:27 to 19:57:42 (mid-occultation: 19:57:34.5)
Modified Disappearance (2) ~ 19:57:27.5, Reappearance (3) ~ 19:57:41.3

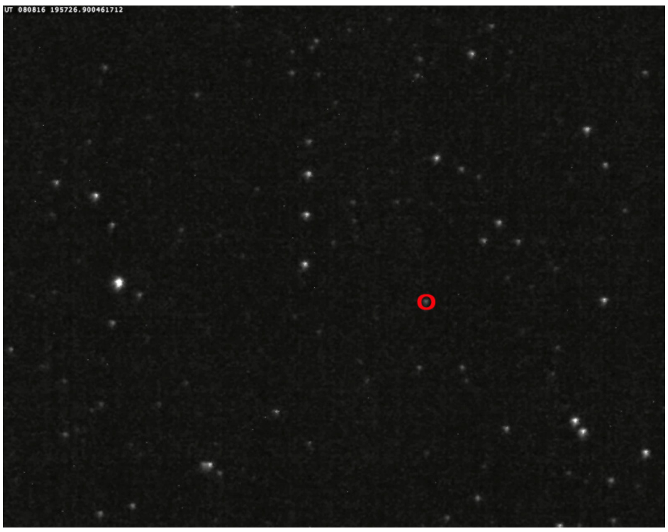
© Diane Berard, Observatoire de Paris

Although positive recordings of the past were taken into account to the 2015-preditions and several stations were positioned around the centreline on August 4, 2015 no occultation could be registered. The reason is still uncertain – maybe the "occulted" star was a close double.

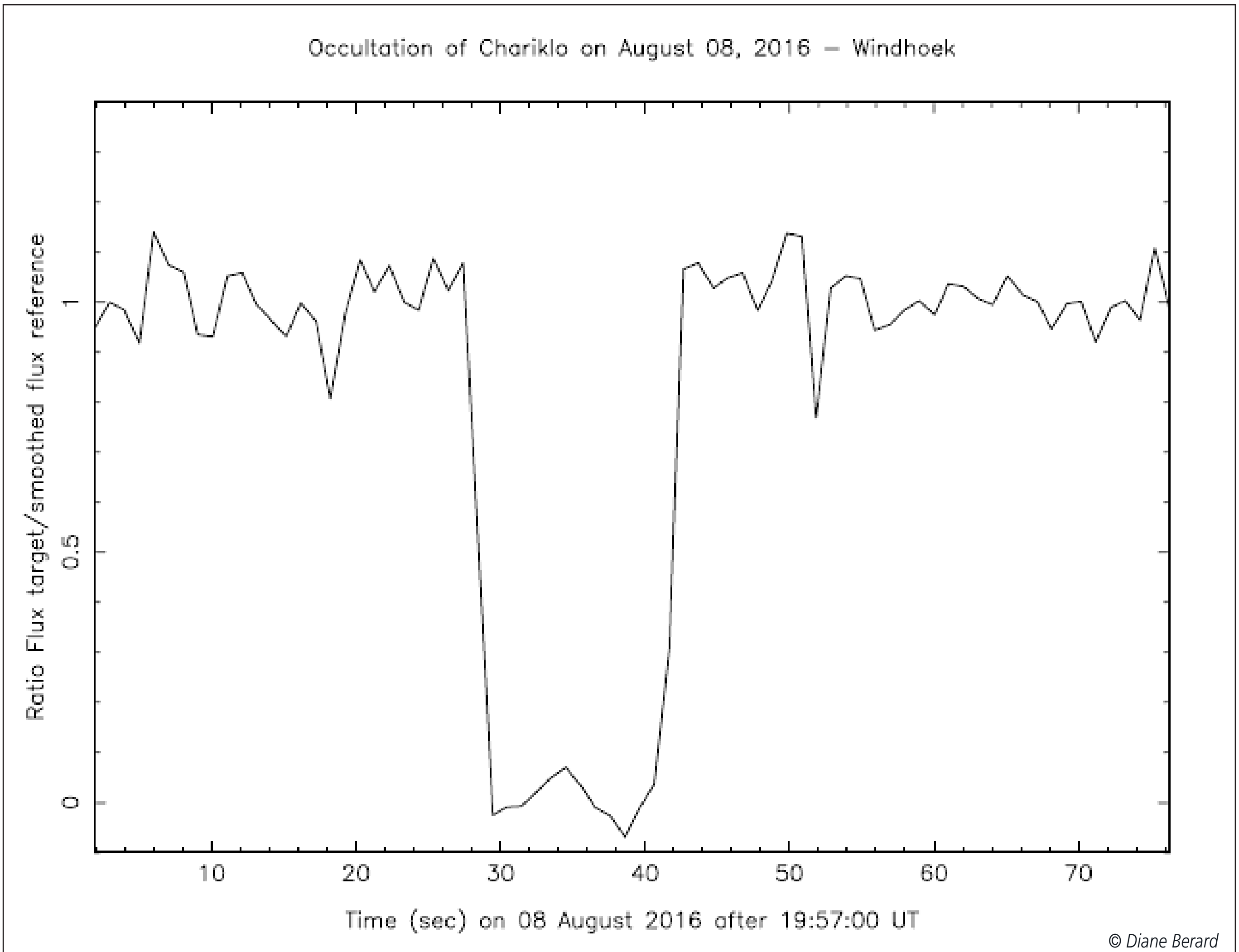
In 2016 the situation was different concerning the observer-scan. Only one observatory was able to monitor that event on the 8th of August in 2016: the C14 of Sonja Itting-Enke , near Windhoek at coordinates latitude S 22° 41.9150' and longitude E 017° 06.5400' at an altitude of 1.945 m. The C14 was equipped with a focal reducer, to bring the focal ratio down to 1:7. The telescope was equipped with an ASI 120MM camera from ZW-Optical with a CMOS chip. The limiting magnitude was 17m3 with an exposure time of 1 second. No filter was used.

It was a pity that no more observatories were able to record this positive occultation – so no more additional chords can be included…

You can see the 2 ring-passages and the dis- and reappearance of the occulted main body on the light curve. Have a close look at the immersion (19:57:10) and emersion (19:57:33) the star's light changed during the exposure-time of 1 second (figure-mark 2 & 3).



*1) Astronomy & Astrophysics manuscript no. chariklo08, July 25, 2014:
Photometric and spectroscopic evidence for a dense ring system around Centaur Chariklo



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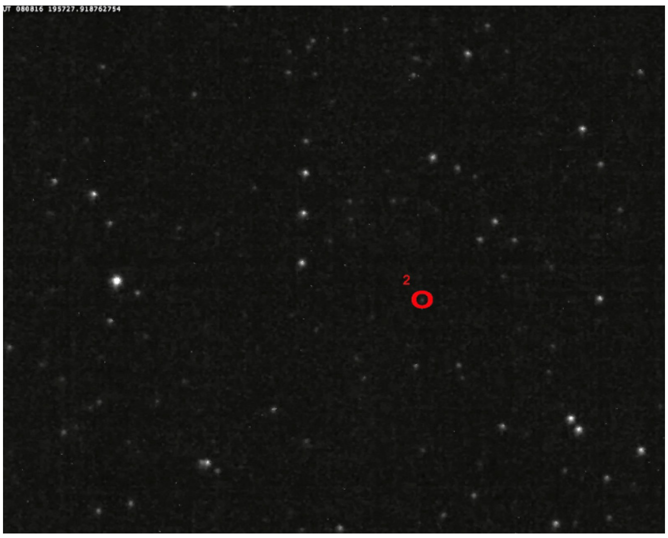
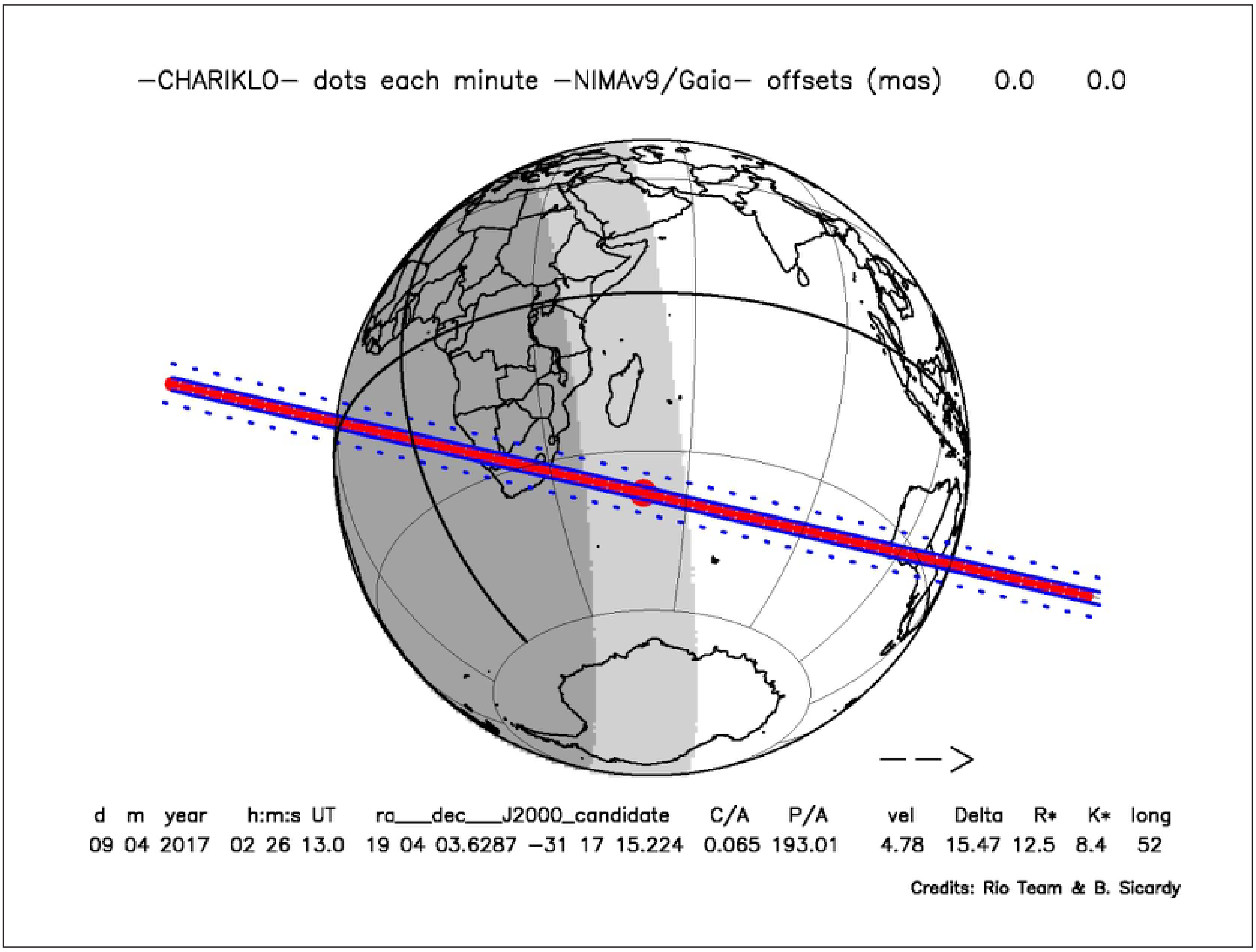
*/1/ Photometric and spectroscopic evidence for a dense ring system around Centaur Chariklo.
R. Duffard, N. Pinilla-Alonso , J.L. Ortiz , A. Alvarez-Candal , B. Sicardy , P. Santos-Sanz , N. Morales, C. Colazo , E. Fernández-Valenzuela ,
and F. Braga-Ribas. A&A 568, A79 (2014)*

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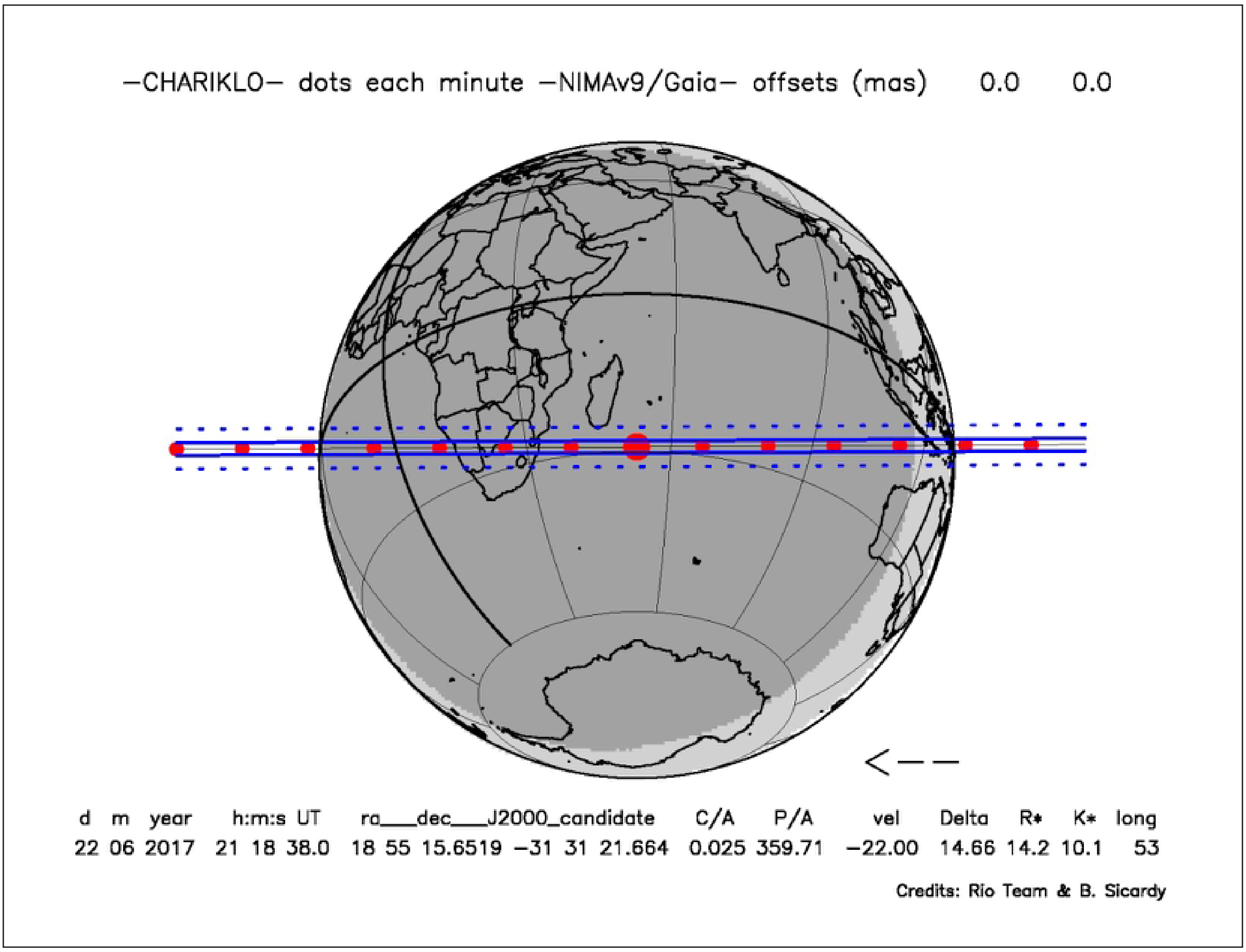
Credits: Rio Team & B. Sicardy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Credits: Rio Team & B. Sicardy

Beyond Jupiter

The world of distant minor planets

Since the degradation of Pluto in 2006 by the IAU, the planet Neptune marks the end of the zone of planets. Beyond Neptune, the world of icy large and small bodies, with and without an atmosphere (called Trans Neptunian Objects or TNOs) starts. This zone between Jupiter and Neptune is also host to mysterious objects, namely the Centaurs and the Neptune Trojans. All of these groups are summarized as "distant minor planets". Occultation observers investigate these members of our solar system, without ever using a spacecraft. The sheer number of these minor planets is huge. As of December 2016, the Minor Planet Center listed 689 Centaurs and 1789 TNOs.

In the coming years, JOA wants to portray a member of this world in every issue; needless to say not all of them will get an article here (KG).

In this issue:

(10199) Chariklo

Mike Kretlow
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DISCOVERY:

Chariklo was discovered on February 15, 1997 by James V. Scotti within the Spacewatch Project at Kitt Peak Observatory. Later it was found on precovery images back to 1988. Chariklo is named after the nymph Chariclo, the wife of Chiron and the daughter of Apollo. The object belongs to the so-called Centaurs and with a mean diameter of about 250 km it is currently the largest known member of this population.

Centaurs are (by definition of the Minor Planet Center, MPC) objects with a perihelion distance beyond the orbit of Jupiter ($q > 5.2$ AU) and a semi-major axis less than that of Neptune ($a < 30.1$ AU)[1]. More than 390 Centaurs are in the JPL's small-body database, while the MPC lists Centaurs and Scattered-Disk objects together, with currently 690 objects. The origin of the Centaurs remained mysterious for a long time but meanwhile we believe, that these objects come from the Kuiper belt, a reservoir of cometary nuclei beyond the orbits of Neptune and Pluto. Having been perturbed inward by Neptune or Uranus (or both), they currently are on dynamically unstable orbits. That means that a Centaur will either be

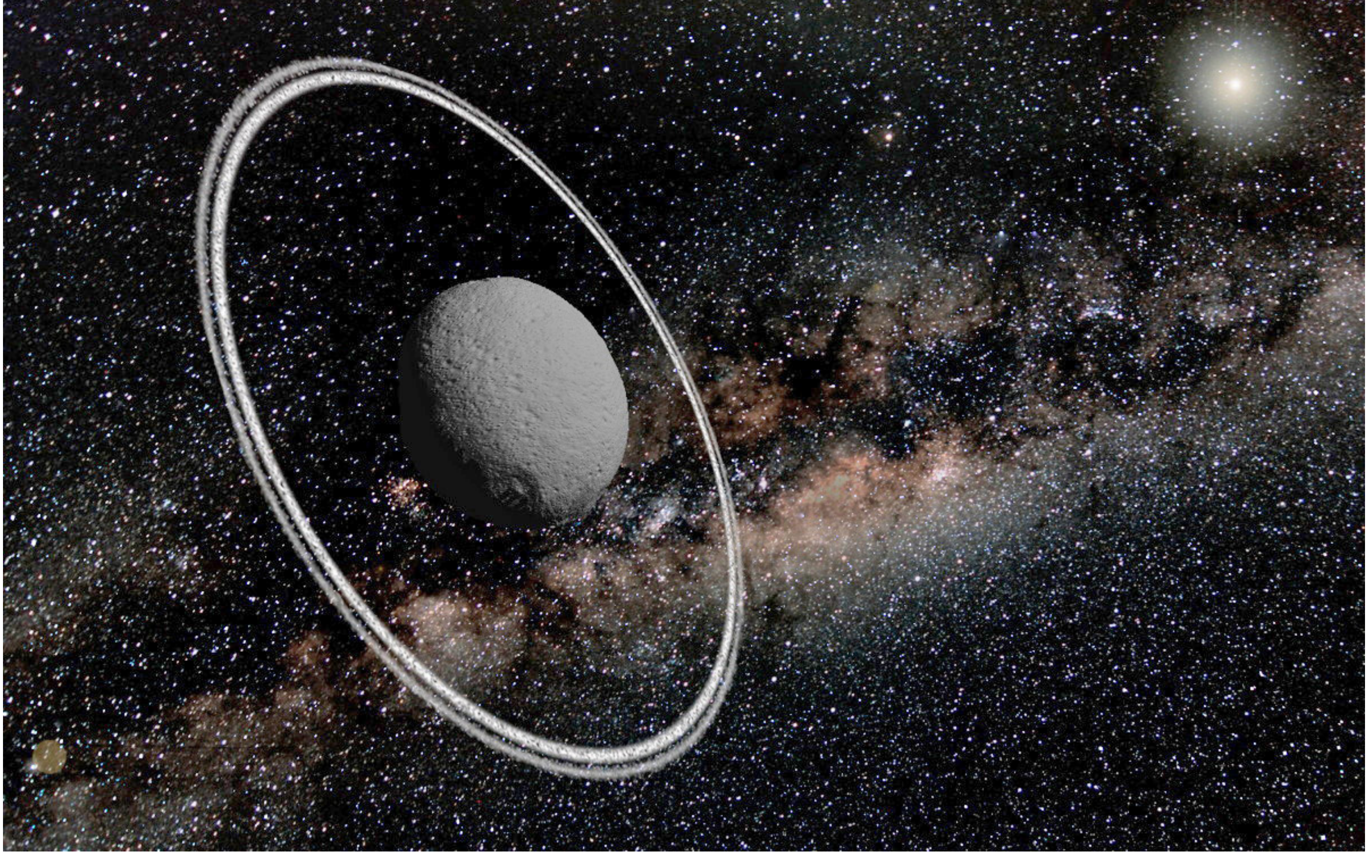


Figure 1: Artist's impression of the rings surrounding the Centaur Chariklo. Credit: Lucie Maquet.

ejected from the Solar System, will impact on a planet or the Sun, or will become a short-period comet due to the gravitational influence of the giant planets. This implies that the population of Centaurs is being continually replenished from the Kuiper belt.
Chariklo is not only the largest Centaur known to date but also the first asteroid-like sized object to have rings.

Orbital and physical parameters

Chariklo is orbiting the Sun in an eccentric ($e = 0.172$) and inclined ($i = 23.4°$) orbit with a perihelion distance of about 13 AU. The last perihelion was in January 2004, the next one will be in the year 2066. Fornasier et al. [1] found a sideral rotation period of 7.004 ± 0.0036 h and a geometric albedo of the system of only 0.042, which is comparable to the albedo of fresh asphalt. The SMASS spectral type is given as D.

Discovery of the rings

Chariklo's ring system was discovered during the occultation of UCAC4 248-108672 on June 3, 2013, which was observed from various sites in South America ([3] and Fig. 2). This was the first successful occultation by Chariklo ever observed. Two narrow secondary events before and after the main event were detected (Fig. 3) and the best (though surprising) explanation for this detection is the presence of two rings: an inner, denser ring (2013C1R) at about 390 km distance from Chariklo's center and a more tenuous ring (2013C2R), 15 km outside the inner ring. They are separated by a gap of about 9 km. Further occultations observed on April 29, 2014 and August 08, 2016 ([2]) confirmed the rings around Chariklo. The ring system can explain the dimming of Chariklo's system (i.e. variation of the absolute magnitude H by about 0.8 mag) between 1997 and 2008, and also the gradual disappearance of ice and other absorption features in its spectrum over the same period [3, 4]. Before the discovery of the ring system during that occultation, this brightness variation was attributed to (unexplained) cometary activities and / or spin-axis orientation effects. The origin of the rings is unknown, but they are likely to be remnants of a debris disk. This disk could have been formed by any kind of impact or collision scenario on Chariklo or between pre-existing moons. Another possible source could be released material from the surface due to cometary activity or rotational disruption. Collisions between ring particles would cause the ring to widen substantially, and the Poynting-Robertson drag would cause the ring particles to fall onto the central body within a few million years, requiring either an active source of ring particles or dynamical confinement by small (kilometer-sized) embedded or shepherd moons yet to be discovered.

1 The JPL has a similar, though slightly different definition and there are further definitions, for example respecting their transitional orbit state between TNOs and (short-period) comets.

Observing circumstances and occultation predictions

Chariklo is currently on the southern sky (declination $\delta \approx -31°$) and moving with less than 1 arc minute per day towards the north. The apparent magnitude stays around $V \approx 18.5$-19.5 in the upcoming years. The next opposition will be in July, 2017.

Additional occultation observations could be very helpful to improve the ring orbital elements and / or to derive Chariklo's shape and orientation (wrt the rings). The knowledge of the shape has impact on the understanding of the dynamics of the rings. As long as the shape cannot be derived by other means (for example by lightcurve inversion), the occultation technique will be most promising.

Using a special ephemeris [5] provided by Josselin Desmars (IMCCE, Paris) a search for star occultations has been done for this year. The star catalog HSOY [6] (a catalog based on PPMXL and Gaia DR1) was used, limited to brighter than 15 Gmag stars. Essentially three events can be considered for this year. Two favorable occultations in April and June will be observable from Southern Africa (Fig. 4 and 5). The third event, in November, will be observable from Australia, but the circumstances are not so favorable, because of the fainter star, the lower altitude and possible twilight interference (Fig. 6).

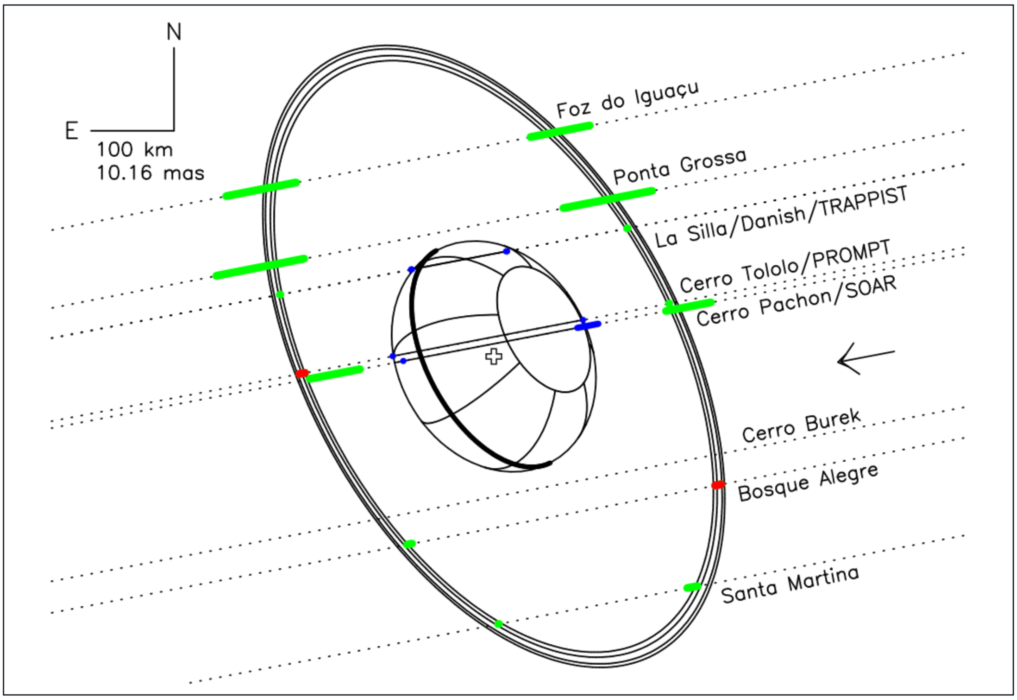


Figure 2: Trajectories of the star relative to Chariklo in the plane of the sky, as observed from eight sites located in Argentina, Brazil and Chile. After [3] Braga-Ribas et al. (2014).

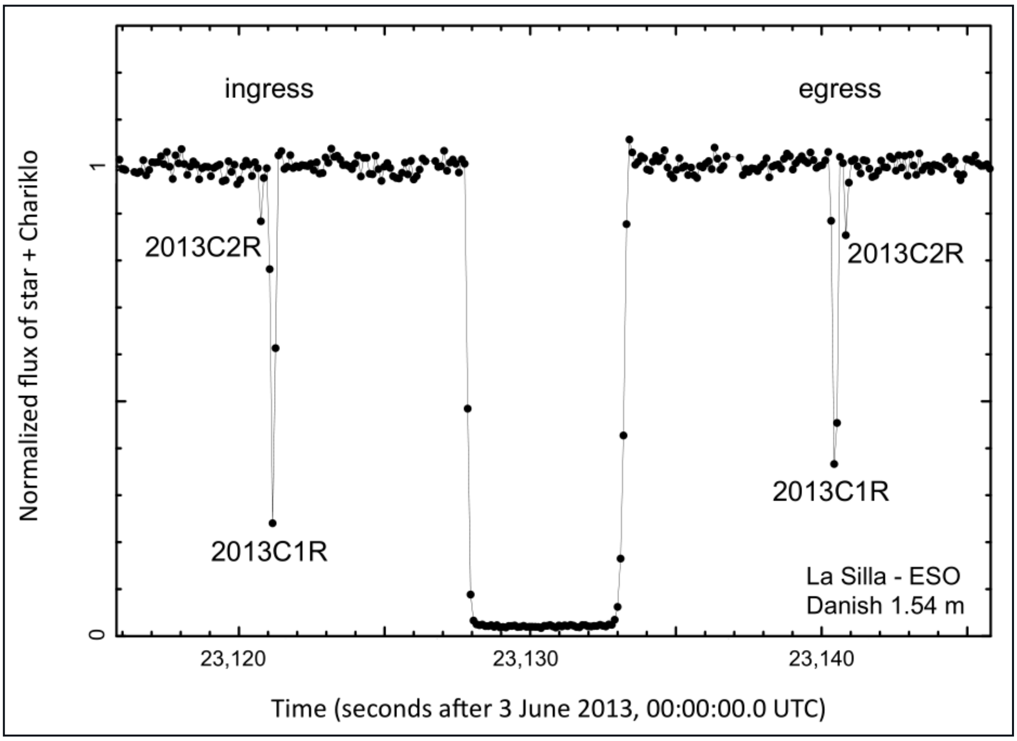


Figure 3: Lightcurve of the occultation by the Chariklo system, taken with the Danish 1.54 m telescope (La Silla) at a data rate of almost 10 Hz. After [3] Braga-Ribas et al. (2014).

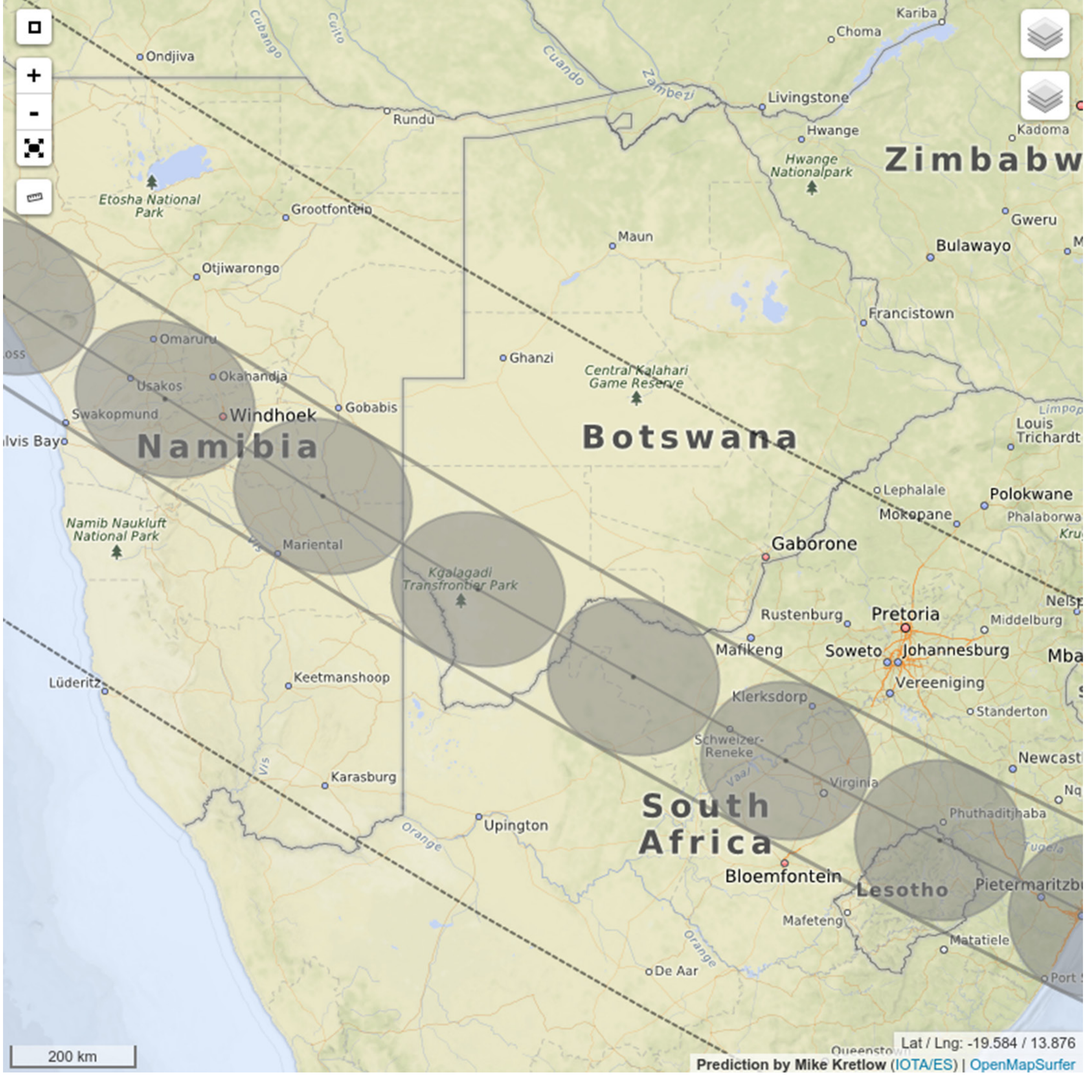


Figure 4: Occultation of 14.0 Gmag star G1SRC 6757456455517129344 (position and proper motion from HSOY catalog) by (10199) Chariklo on 2017-04-09 at t_0 = 02:25.6 UT. The 1-sigma prediction uncertainty is marked by the dashed line. Prediction by the author using the NIMAv10 ephemeris kindly provided by J. Desmars (IMCCE, Paris).

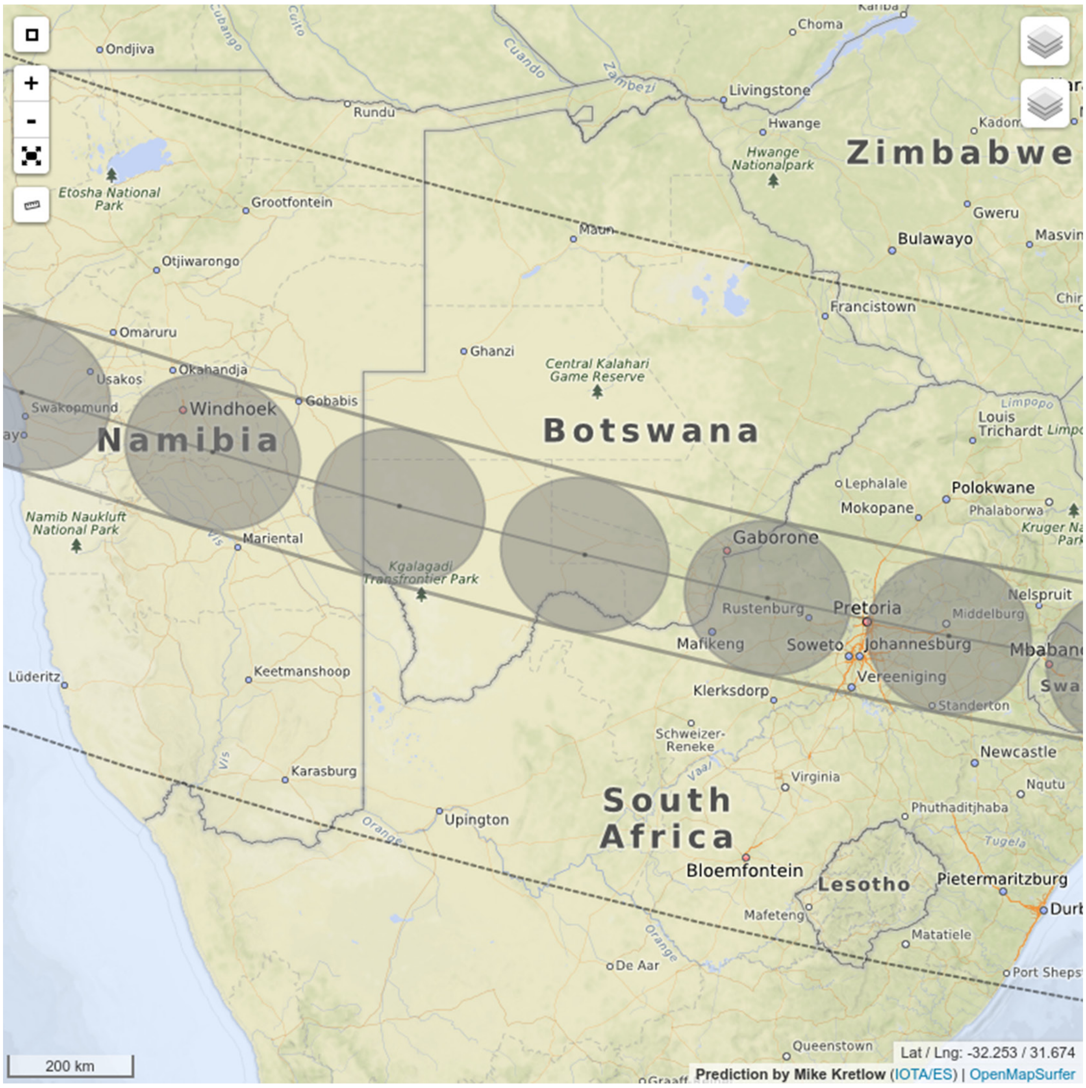


Figure 5: Occultation of 14.1 Gmag star G1SRC 6760223754481862656 (position and proper motion from HSOY catalog) by (10199) Chariklo on 2017-06-22 at t_0 = 21:18.5 UT. The 1-sigma prediction uncertainty is marked by the dashed line. Prediction by the author using the NIMAv10 ephemeris kindly provided by J. Desmars (IMCCE, Paris).

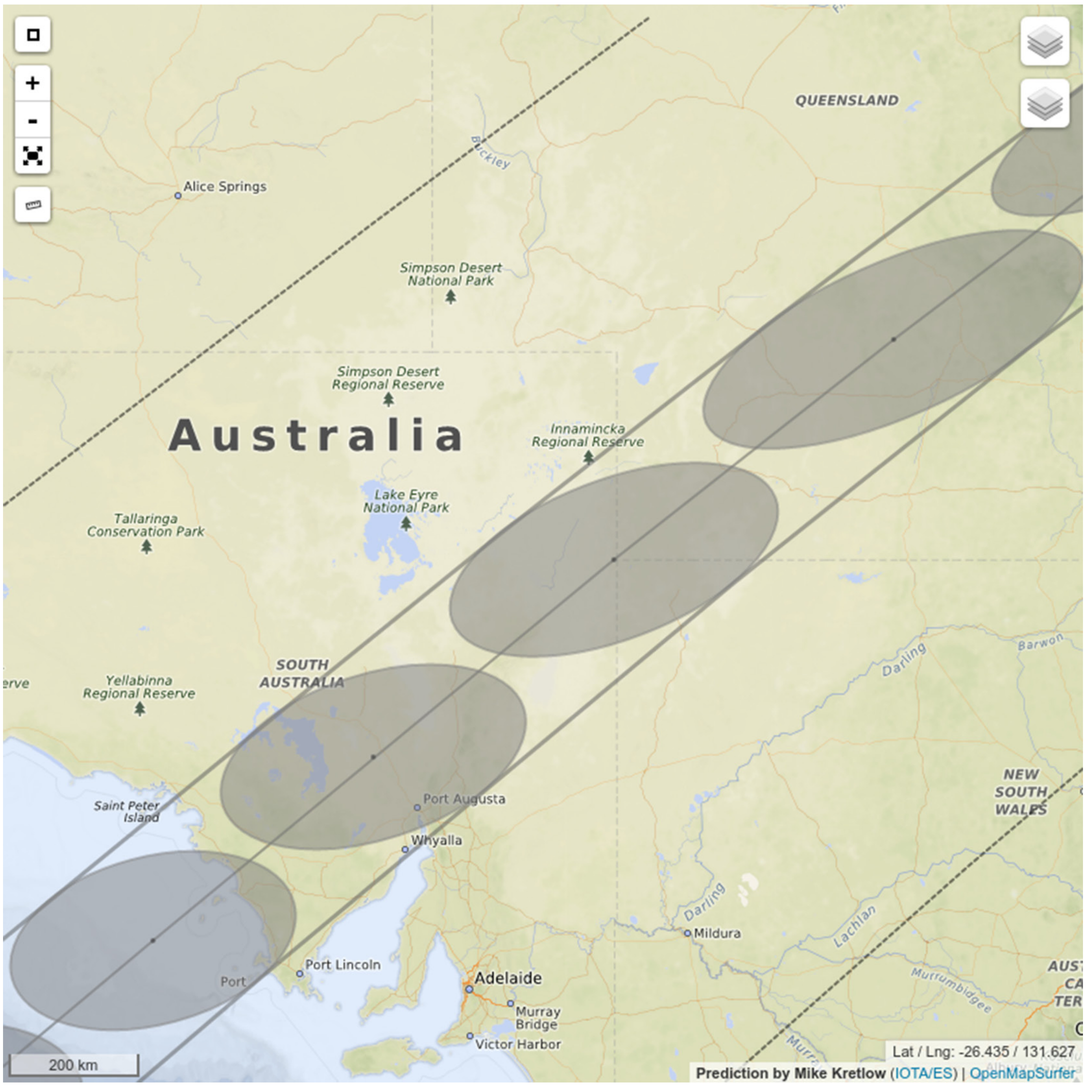


Figure 6: Occultation of 14.9 Gmag star G1SRC 6761362745448535552 (position and proper motion from HSOY catalog) by (10199) Chariklo on 2017-11-19 at t_0 = 10:23.6 UT. The 1-sigma prediction uncertainty is marked by the dashed line. Prediction by the author using the NIMAv10 ephemeris kindly provided by J. Desmars (IMCCE, Paris).

References

[1] Fornasier, S., et al. 2014. The Centaur 10199 Chariklo: investigation into rotational period, absolute magnitude, and cometary activity. Astron. Astrophys. 568, L 11, 5 pp.

[2] Bode, H.-J. 2017. Occultation of UCAC3 113-399867 by Chariklo. Journal for Occultation Astronomy, No. 1, January-March (this issue).

[3] Braga-Ribas, F., et al. 2014. A ring system detected around Centaur (10199) Chariklo. Nature 508, 72-75. arXiv: 1409.7259.

[4] Ortiz, J.L. et al. 2015. Possible ring material around centaur (2060) Chiron. arXiv:1501.05911v1.

[5] Desmars, J., et al. 2015. Orbit determination of trans-Neptunian objects and Centaurs for the prediction of stellar occultations. Astron. Astrophys. 584, id. A96, 11pp.

[6] Altmann, M., et al. 2017. Hot Stuff for One Year (HSOY) - A 580 million star proper motion catalogue derived from Gaia DR1 and PPMXL. arXiv:1701.02629v1.

Further reading

Burns, J. A. 2014. Ring in the new... Journal for Occultation Astronomy, No. 2, April-June, 21- 23.

Sicardy, B., et al. 2016. Rings beyond the giant planets. arXiv: 1612.03321v1.
To be published in: M. Tiscareno and C. Murray (Eds.). Planetary Ring Systems. Cambridge University Press.

Grazing Occultations of Stars by the Moon in 2017

Eberhard Riedel · IOTA/ES

2017 — Grazing Occultations Europe 2017 - <=6.0 mag. — GRAZPREP 4.04, IOTA/ES

No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	LONG LAT	STAR NAME	MAG1	MAG2
1	**Mar 15**	ZC 1941	139390	4.7	94 -	S	2 20.8	-19 50	74 I2 Vir		
2	**Mar 19**	ZC 2399	160046	4.9	64 -	S	0 53.1	-9 38	24 (Sco)/Oph		
3	**Mar 30**	ZC 444	93232	5.9	9+	S	19 3.9	0 66			
4	**Mar 31**	ZC 608	93775 $	6.0	19+	N	22 39.1	-19 65	179 B. Tau	6.1	8.8
5	**Apr 01**	ZC 741	94227 V	5.5	27+	N	18 21.2	9 63	318 B. Tau	6.5	6.5
6	**Apr 03**	ZC 1072	96407 X	6.0	50+	S	20 34.6	9 68	110 B. NP Gem	7.0	7.0
7	**Apr 04**	ZC 1207	97472 X	5.6	62+	N	20 11.5	-19 53	3 Cnc	6.0	7.6
8	**Apr 19**	ZC 2902	163060 V	5.9	52 -	S	3 40.6	-19 48	57 Sgr	6.8	6.8
9	**Apr 28**	ZC 671	93957 V	3.4	7+	S	15 38.8	28 51	78 theta2 Tau	4.0	5.0
10	**Apr 28**	ZC 669	93955 V	3.8	7+	S	15 42.5	26 45	77 theta1 Tau	4.0	7.8
11	**Apr 28**	ZC 692	94027 A	0.9	7+	N	18 10.7	-19 68	87 alpha Tau (Aldebaran)	1.1	11.3
12	**Apr 28**	ZC 699	94043	5.8	7+	S	19 18.9	12 61	89 Tau		
13	**Apr 29**	ZC 836	94649	5.7	14+	N	17 2.9	28 37	120 Tau		
14	**Apr 29**	ZC 878	94858 K	5.5	16+	S	21 55.2	1 68	130 Tau	5.6	9.0
15	**May 01**	ZC 1158	97120 K	5.0	35+	S	18 14.2	11 41	74 m Gem	6.0	6.0
16	**May 04**	ZC 1439	98755	5.7	59+	S	1 29.7	-19 45	18 Leo		
17	**May 04**	ZC 1531	99136 Y	6.0	68+	N	19 4.7	6 49	45 CX Leo	6.7	6.7
18	**May 04**	ZC 1547	118355 M	3.8	68+	N	21 49.1	-19 51	47 rho Leo	4.6	4.6
19	**May 17**	ZC 2981	163592 M	5.1	68 -	S	3 26.7	-19 56	10 pi Cap	5.2	8.5
20	**Jun 03**	ZC 1825	138933	5.9	73+	N	20 52.7	17 62			
21	**Jun 04**	ZC 1941	139390	4.7	81+	S	22 45.5	12 50	74 I2 Vir		
22	**Jun 08**	ZC 2291	159625 V	5.5	98+	S	2 47.8	-19 41	49 Lib	6.3	6.3
23	**Jun 10**	ZC 2666	186794 M	4.9	98 -	S	23 44.2	-12 61	21 Sgr	5.0	7.5
24	**Jun 19**	ZC 170	109715	6.0	33 -	N	0 10.0	22 55	33 Cet		
25	**Jun 21**	ZC 462	93320 K	6.0	12 -	N	4 0.8	-18 49		6.7	6.7
26	**Jun 22**	ZC 608	93775 $	6.0	6 -	N	2 52.9	7 50	179 B. Tau	6.1	8.8
27	**Jun 22**	ZC 692	94027 A	0.9	4 -	N	15 24.7	5 68	87 alpha Tau (Aldebaran)	1.1	11.3
28	**Jun 26**	ZC 1337	98250	5.7	10+	N	19 53.2	-2 41	63 omicron2 Cnc		
29	**Jul 18**	ZC 405	110723 V	4.3	35 -	N	0 46.8	1 32	87 mu Cet	4.5	8.5
30	**Jul 20**	ZC 704	94054	4.7	15 -	S	0 12.7	24 50	92 sigma2 Tau		
31	**Jul 25**			0.2	6+	S	7 41.0	-7 49	Mercury		
32	**Jul 25**	ZC 1487	98967 A	1.4	6+	N	9 6.6	-19 36	32 alpha Leo (Regulus)		
33	**Jul 26**	ZC 1644	118804	4.0	14+	N	20 12.1	-19 42	77 sigma Leo (Shang Ts.)		
34	**Jul 27**	ZC 1749	119245	6.0	22+	N	19 18.4	1 40	10 Vir		
35	**Aug 05**	ZC 2734	187324	5.2	93+	S	1 20.4	-19 35	29 Sgr		
36	**Aug 14**	ZC 491	93416	6.0	49 -	N	23 52.6	-4 40	8 B. Tau		
37	**Aug 15**	ZC 635	93868 K	3.6	38 -	N	23 23.0	7 45	54 gamma Tau (Hyadum I)	4.7	4.7
38	**Aug 15**	ZC 640	93876	5.3	38 -	S	23 32.7	7 48	58 V696 Tau	5.3	5.3
39	**Aug 16**	ZC 661	93932 V	4.5	37 -	S	1 30.2	-11 27	71 V777 Tau	4.8	6.8
40	**Aug 16**	ZC 671	93957 V	3.4	37 -	S	2 38.1	3 27	78 theta2 Tau	4.0	5.0
41	**Aug 16**	ZC 667	93950 V	5.0	37 -	N	2 43.8	-8 27	75 Tau	5.4	7.9

The following maps and tables show a selection of this year's grazing occultations of the brightest stars by the moon. For the European overview the limiting magnitude is 6.0, whereas for the different countries the limit is 7.0 mag. Some unfavorable events were omitted due to low altitude or bright lunar limb conditions.

Five more grazes of Aldebaran are on the list, but none on the dark limb at night. Two of them are daytime events and three occur on the bright lunar limb with the sun below the horizon. During the last two nighttime events (Nov. 6 and Dec. 31) the moon causes problems being close to full whereas the best bright limb observation may be possible on the morning of April 28 in southern Finland at an only 7% sunlit lunar limb right after sunset. The observation of the daytime grazes of Aldebaran needs telescopes of probably 10 inches aperture upwards and very good atmospheric conditions.

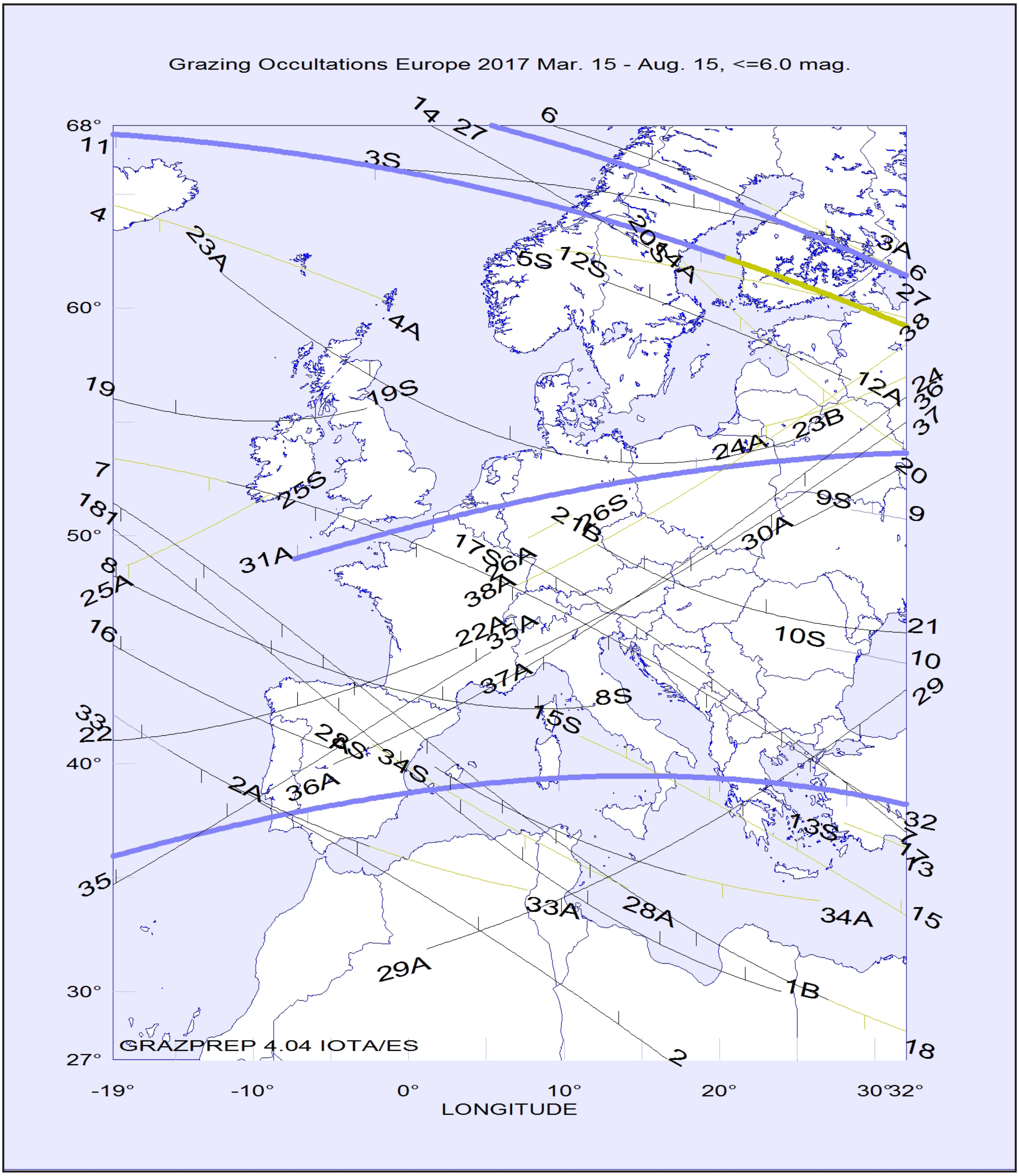
Fortunately Regulus makes up for Aldebaran: at least on Sept. 18 there will be a brilliant nighttime northern limb graze far from any sunlit features being visible in Sicily, Greece and Turkey. Studying this event in detail shows that multiple events are possible when choosing an offset to the south by 3 or 4 kilometers.

All tables and pictures of this article were created with the author's GRAZPREP-software. 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) including prediction files that are needed additionally for different regions of the world. 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 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 depending on 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 and observing locations 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. Furthermore a report form is provided to enable sending and collecting observation data in a fixed format, thus supporting the reduction and scientific evaluation of observed contacts.

42	**Aug 16**	ZC 677	93975 X	4.8	37 -	N	4 3.5	-19	51	264 B. Tau	5.6	5.6
43	**Aug 16**	ZC 692	94027 A	0.9	36 -	N	6 49.6	-19	55	87 alpha Tau (Aldebaran)	1.1	11.3
44	**Aug 17**	ZC 806	94526 C	5.0	27 -	S	1 26.5	-10	49	111 Tau	5.1	8.9
45	**Aug 17**	ZC 836	94649	5.7	25 -	N	5 2.6	-19	32	120 Tau		
46	**Aug 29**	ZC 2399	160046	4.9	54+	N	18 58.5	-1	52	24 (Sco)/Oph		
47	**Sep 10**	ZC 462	93320 K	6.0	74 -	N	23 24.7	-19	36		6.7	6.7
48	**Sep 11**	ZC 608	93775 $	6.0	63 -	N	23 42.4	-19	41	179 B. Tau	6.1	8.8
49	**Sep 12**	ZC 635	93868 K	3.6	62 -	S	5 31.3	-19	35	54 gamma Tau (Hyadum I)	4.7	4.7
50	**Sep 12**	ZC 669	93955 V	3.8	61 -	S	10 39.7	-19	41	77 theta1 Tau	4.0	7.8
51	**Sep 12**	ZC 741	94227 V	5.5	54 -	N	20 26.3	30	52	318 B. Tau	6.5	6.5
52	**Sep 14**	ZC 947	95432 A	5.2	39 -	N	3 21.8	-19	36	71 Ori	5.2	11.2
53	**Sep 16**	ZC 1236	97645 Z	5.1	19 -	N	2 27.6	-8	40	16 zeta Cnc (Tegmine)	5.6	6.0
54	**Sep 17**	ZC 1375	98456	5.4	10 -	N	4 46.9	-19	49	82 pi Cnc		
55	**Sep 18**	ZC 1487	98967 A	1.4	5 -	N	3 26.3	7	36	32 alpha Leo (Regulus)		
56	**Sep 29**	ZC 2886	162964	4.9	66+	S	18 54.1	-16	40	56 f Sgr		
57	**Sep 29**	ZC 2902	163060 V	5.9	66+	N	23 8.7	-19	44	57 Sgr	6.8	6.8
58	**Oct 07**	ZC 405	110723 V	4.3	94 -	N	19 22.6	0	40	87 mu Cet	4.5	8.5
59	**Oct 14**	ZC 1337	98250	5.7	31 -	S	3 36.6	18	44	63 omicron2 Cnc		
60	**Oct 14**	ZC 1336	98247	5.2	31 -	S	3 43.0	12	63	62 omicron1 Cnc		
61	**Oct 15**	ZC 1466	98876 V	5.3	21 -	N	5 57.4	-19	62	27 nu Leo	6.0	6.0
62	**Oct 22**	ZC 2291	159625 V	5.5	8+	S	15 59.6	20	35	49 Lib	6.3	6.3
63	**Nov 03**	ZC 249	110065	4.5	98+	N	4 4.8	-19	44	106 nu Psc		
64	**Nov 06**	ZC 692	94027 A	0.9	95 -	S	2 29.4	-19	45	87 alpha Tau (Aldebaran)	1.1	11.3
65	**Nov 13**	ZC 1644	118804	4.0	26 -	S	1 24.0	4	51	77 sigma Leo (Shang Ts.)		
66	**Nov 21**	ZC 2639	186544 A	6.0	9+	N	15 51.5	12	42	16 Sgr	6.0	13.0
67	**Nov 25**	ZC 3181	164612 V	6.0	41+	N	20 20.3	-19	63	45 Cap	6.7	6.7
68	**Nov 25**	ZC 3177	164600 K	5.9	41+	N	20 48.8	1	32	44 Cap	6.8	6.8
69	**Nov 27**	ZC 3421	146612	4.9	61+	N	16 57.7	3	27	92 chi Aqr	4.9	5.1
70	**Nov 30**	ZC 170	109715	6.0	81+	N	0 27.8	-18	51	33 Cet		
71	**Dec 01**	ZC 405	110723 V	4.3	95+	N	15 53.8	9	40	87 mu Cet	4.5	8.5
72	**Dec 04**	ZC 913	95166 L	5.1	97 -	N	21 1.8	-8	27	64 Ori	6.3	6.3
73	**Dec 07**	ZC 1259	97781	5.9	83 -	N	2 25.4	-19	28	20 d1 Cnc		
74	**Dec 07**	ZC 1375	98456	5.4	74 -	S	23 51.9	30	62	82 pi Cnc		
75	**Dec 08**	ZC 1487	98967 A	1.4	64 -	S	21 37.3	12	42	32 alpha Leo (Regulus)		
76	**Dec 10**	ZC 1644	118804	4.0	50 -	S	8 31.9	-19	57	77 sigma Leo (Shang Ts.)		
77	**Dec 11**	ZC 1733	119156	5.4	41 -	N	1 7.3	-4	40	7 b Vir		
78	**Dec 20**	ZC 2886	162964	4.9	5+	N	17 56.3	-18	38	56 f Sgr		
79	**Dec 21**	ZC 2994	163626 A	5.9	9+	N	14 27.9	26	50	12 omicron Cap	6.1	6.6
80	**Dec 28**	ZC 364	110543	4.3	75+	S	18 58.6	-16	27	73 xi2 Cet		
81	**Dec 31**	ZC 692	94027 A	0.9	93+	S	1 19.3	-19	47	87 alpha Tau (Aldebaran)	1.1	11.3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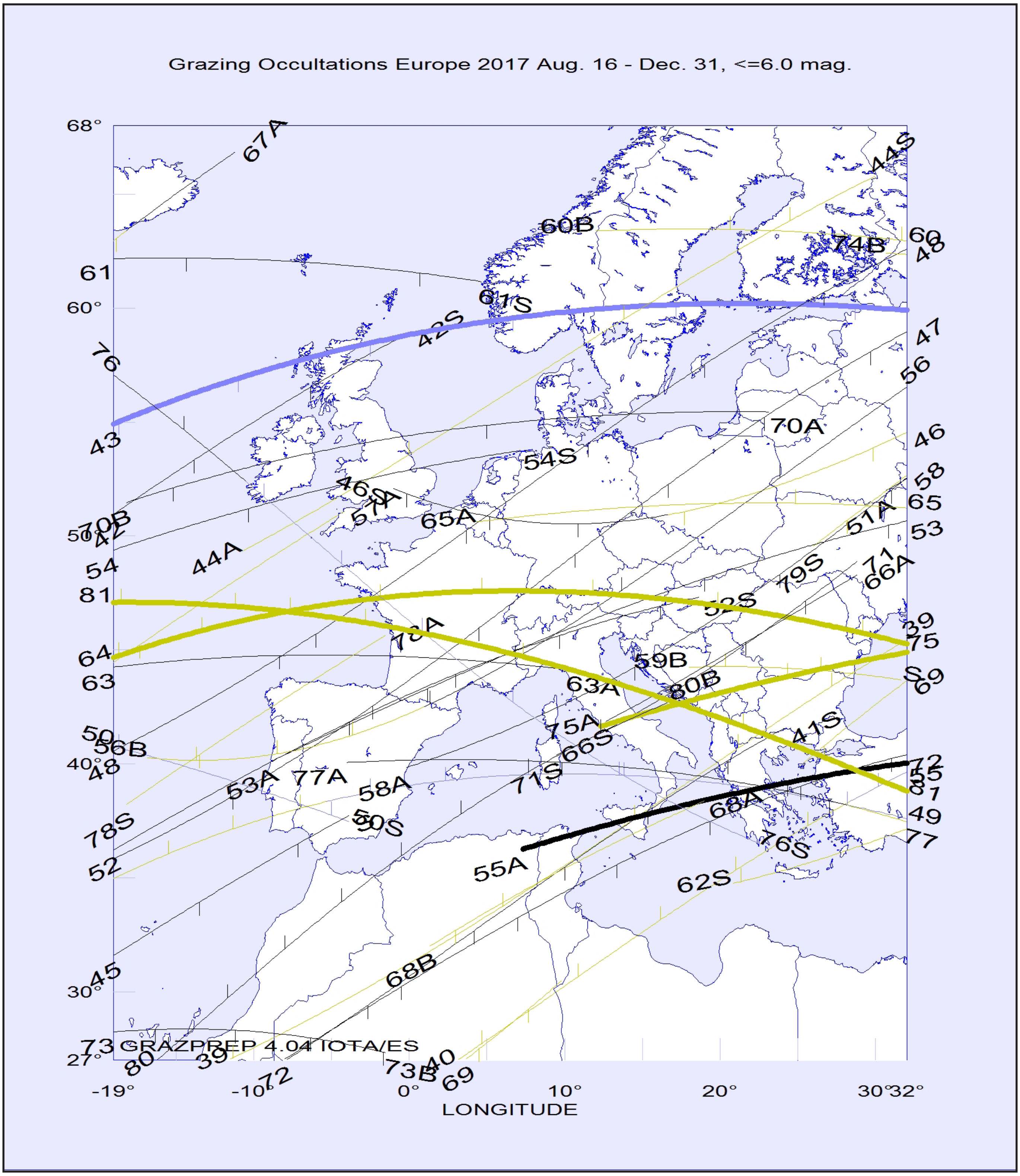
Grazing Occultations Europe 2017 Aug. 16 - Dec. 31, <=6.0 mag.
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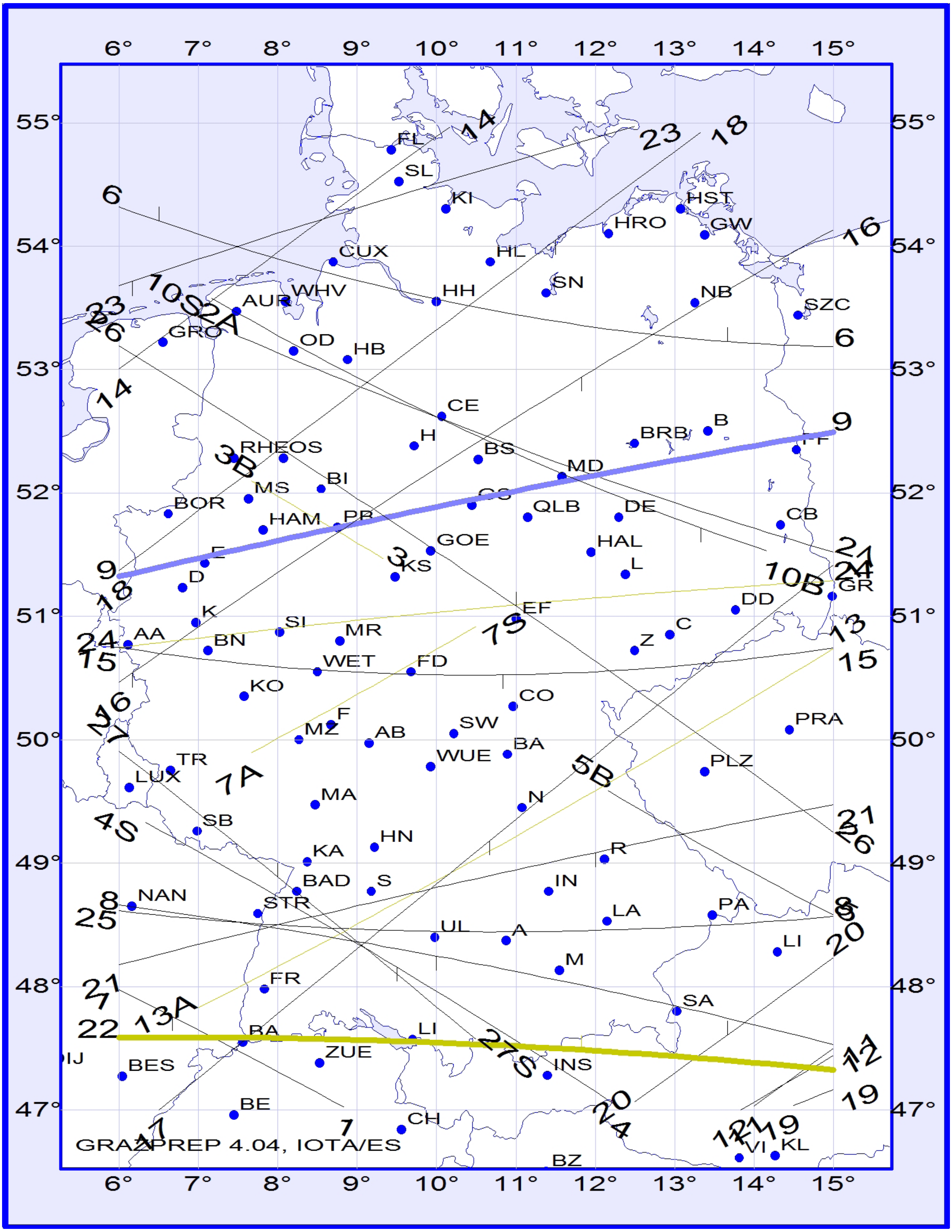
Germany

2017 — **Grazing Occultations Germany 2017, <= 7.0 mag.** — GRAZPREP 4.04, IOTA/ES

No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	CUSP-A T	STAR NAME	MAG1	MAG2
1	**Apr 04**	ZC 1207	97472 X	5.6	62+	N	20 49.1	2.5 D A	3 Cnc	6.0	7.6
2	**Apr 20**	ZC 3022	163798	7.0	42 -	S	2 45.6	7.1 D C			
3	**May 03**	ZC 1413	98652	6.8	57+	S	19 24.3	1.3 B C	35 B. Leo		
4	**May 04**	ZC 1531	99136 Y	6.0	68+	N	19 4.7	1.7 D B	45 CX Leo	6.7	6.7
5	**Jun 04**	ZC 1941	139390	4.7	81+	S	22 45.5	2.0 D A	74 l2 Vir		
6	**Jun 10**	ZC 2666	186794 M	4.9	98 -	S	23 59.5	15.4 D A	21 Sgr	5.0	7.5
7	**Jun 22**	ZC 608	93775 $	6.0	6 -	N	2 52.9	7.3 B C	179 B. Tau	6.1	8.8
8	**Jul 02**	ZC 2020	139732 K	6.5	68+	S	22 52.7	2.8 D C	94 Vir	7.4	7.4
9	**Jul 25**			0.2	6+	S	7 44.0	9.9 D A	Mercury		
10	**Jul 29**	ZC 1976	139548	7.0	42+	N	19 50.8	1.0 D C	186 G. Vir		
11	**Aug 15**	ZC 491	93416	6.0	49 -	N	0 5.2	5.0 D A	8 B. Tau		
12	**Aug 15**	ZC 635	93868 K	3.6	38 -	N	23 24.6	3.8 D A	54 gamma Tau (Hyadum I)	4.7	4.7
13	**Aug 15**	ZC 640	93876	5.3	38 -	S	23 32.7	3.1 B C	58 V696 Tau	5.3	5.3
14	**Aug 16**	ZC 659	93925 O	6.6	37 -	N	2 2.5	5.1 D A	70 Tau	7.0	7.3
15	**Aug 29**	ZC 2399	160046	4.9	54+	N	19 11.8	2.1 D A	24 (Sco)/Oph		
16	**Sep 10**	X 3132	110464	6.8	83 -	N	1 50.6	10.4 D B			
17	**Sep 10**	ZC 462	93320 K	6.0	74 -	N	23 53.2	9.4 D A		6.7	6.7
18	**Sep 12**	ZC 608	93775 $	6.0	63 -	N	0 2.9	8.2 D A	179 B. Tau	6.1	8.8
19	**Sep 16**	ZC 1236	97645 Z	5.1	19 -	N	2 36.9	7.6 D A	16 zeta Cnc (Tegmine)	5.6	6.0
20	**Sep 29**	ZC 2886	162964	4.9	66+	S	19 48.7	1.7 D A	56 f Sgr		
21	**Oct 15**	ZC 1449	98809	6.5	22 -	N	2 17.7	8.3 D A	23 Leo		
22	**Nov 06**	ZC 692	94027 A	0.9	95 -	S	3 12.0	12.3 B A	87 alpha Tau (Aldebaran)	1.1	11.3
23	**Nov 09**	ZC 1151	97087	6.8	69 -	N	0 10.0	9.7 D B			
24	**Nov 13**	ZC 1644	118804	4.0	26 -	S	1 24.2	7.2 B C	77 sigma Leo (Shang Ts.)		
25	**Dec 08**	ZC 1385	98517	6.6	73 -	N	2 4.8	3.4 D B	227 B. Cnc		
26	**Dec 08**	ZC 1396	98574	6.8	73 -	S	5 41.5	0.6 T B			
27	**Dec 09**	ZC 1522	99098	6.8	62 -	S	6 36.1	2.4 D B			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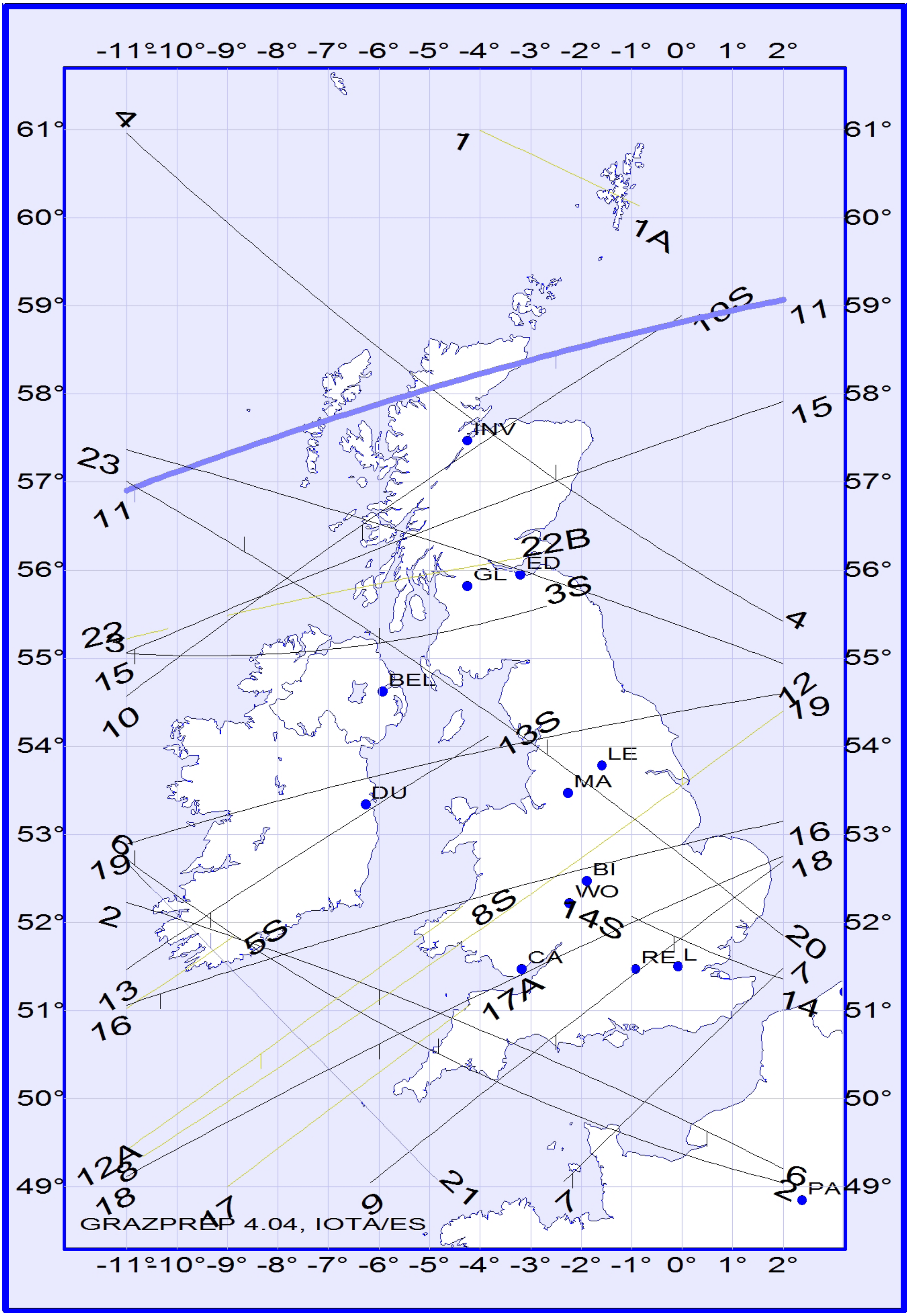
GRAZPREP 4.04, IOTA/ES

Great Britain

2017			Grazing Occultations Great Britain 2017, <= 7.0 mag.								GRAZPREP 4.04, IOTA/ES
No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	CUSP-A T	STAR NAME	MAG1	MAG2
1	**Mar 31**	ZC 608	93775 $	6.0	19+	N	22 42.8	1.3 B C	179 B. Tau	6.1	8.8
2	**Apr 04**	ZC 1207	97472 X	5.6	62+	N	20 22.7	0.1 T A	3 Cnc	6.0	7.6
3	**May 17**	ZC 2981	163592 M	5.1	68 -	S	3 34.1	5.3 D A	10 pi Cap	5.2	8.5
4	**Jun 10**	ZC 2666	186794 M	4.9	98 -	S	23 44.5	16.9 D C	21 Sgr	5.0	7.5
5	**Jun 21**	ZC 462	93320 K	6.0	12 -	N	4 3.8	4.2 B C		6.7	6.7
6	**Jul 02**	ZC 2020	139732 K	6.5	68+	S	22 30.1	0.1 T B	94 Vir	7.4	7.4
7	**Jul 13**	ZC 3310	165147 V	6.4	86 -	N	3 30.2	3.8 D B	58 B. Aqr	7.2	7.2
8	**Jul 21**	ZC 886	94920 X	6.8	7 -	N	4 8.9	1.1 B C		7.7	7.7
9	**Aug 16**	ZC 672	93961 O	6.7	37 -	N	3 25.2	6.0 D A		7.0	7.7
10	**Aug 16**	ZC 677	93975 X	4.8	37 -	N	4 14.0	5.2 D A	264 B. Tau	5.6	5.6
11	**Aug 16**	ZC 692	94027 A	0.9	36 -	N	7 0.1	3.6 D A	87 alpha Tau (Aldebaran)	1.1	11.3
12	**Aug 17**	ZC 806	94526 C	5.0	27 -	S	1 26.5	3.5 B C	111 Tau	5.1	8.9
13	**Aug 17**	ZC 829	94617	6.8	26 -	N	4 38.2	5.3 D A			
14	**Aug 29**	ZC 2399	160046	4.9	54+	N	18 58.5	3.5 D B	24 (Sco)/Oph		
15	**Sep 17**	ZC 1371	98427 O	6.5	10 -	N	3 40.7	7.4 D A	81 Cnc	7.2	7.2
16	**Sep 17**	ZC 1375	98456	5.4	10 -	N	4 49.7	7.2 D A	82 pi Cnc		
17	**Sep 29**	ZC 2902	163060 V	5.9	66+	N	23 14.8	2.9 B C	57 Sgr	6.8	6.8
18	**Nov 08**	ZC 1151	97087	6.8	69 -	N	23 56.6	11.0 D B			
19	**Nov 30**	ZC 170	109715	6.0	81+	N	0 32.8	3.0 D A	33 Cet		
20	**Dec 09**	ZC 1522	99098	6.8	62 -	S	6 6.7	0.5 T B			
21	**Dec 10**	ZC 1644	118804	4.0	50 -	S	8 46.7	2.2 D A	77 sigma Leo (Shang Ts.)		
22	**Dec 26**	ZC 106	128974	6.6	55+	S	23 12.4	0.6 B C	123 B. Cet		
23	**Dec 30**	ZC 526	93532	6.7	86+	N	3 15.9	8.0 D C			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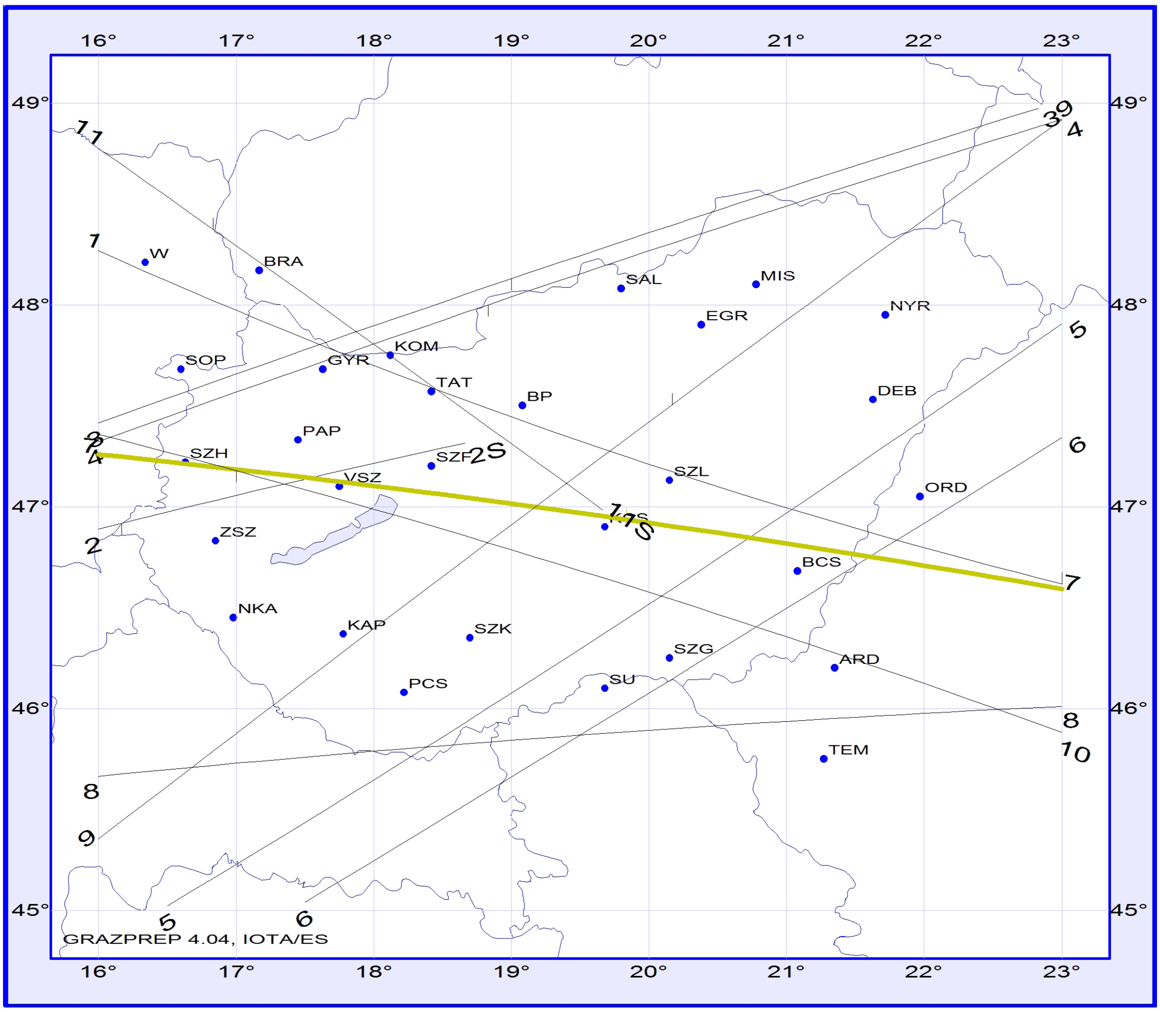
GRAZPREP 4.04, IOTA/ES

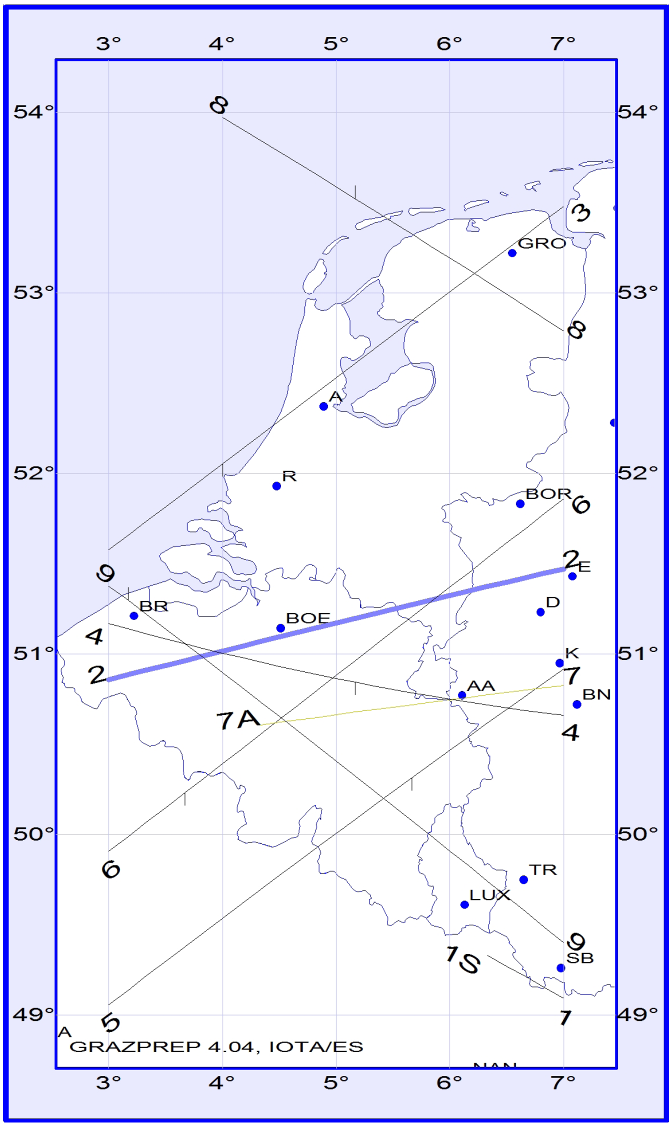
Hungary

2017	Grazing Occultations Hungary 2017, <= 7.0 mag.										GRAZPREP 4.04, IOTA/ES
No.	**M D**	**USNO**	**SAOPPM D**	**MAG**	**%SNL**	**L.**	**W.UT**	**CUSP-A T**	**STAR NAME**	**MAG1**	**MAG2**
1	**Jun 04**	ZC 1941	139390	4.7	81+	S	22 51.5	2.6 D A	74 I2 Vir		
2	**Sep 14**	ZC 947	95432 A	5.2	39 -	N	4 9.9	6.0 D A	71 Ori	5.2	11.2
3	**Sep 16**	ZC 1236	97645 Z	5.1	19 -	N	2 38.0	7.5 D A	16 zeta Cnc (Tegmine)	5.6	6.0
4	**Sep 16**	X 12393	97646 X	6.2	19 -	N	2 38.0	7.5 D A	16 zeta2 Cnc (Companion)	6.2	9.0
5	**Oct 07**	ZC 405	110723 V	4.3	94 -	N	19 31.9	14.6 D A	87 mu Cet	4.5	8.5
6	**Oct 10**	ZC 871	94830	6.7	67 -	N	21 4.2	10.2 D C			
7	**Nov 06**	ZC 692	94027 A	0.9	95 -	S	3 25.5	10.6 B A	87 alpha Tau (Aldebaran)	1.1	11.3
8	**Nov 13**	ZC 1645	118806	6.7	26 -	N	1 8.4	7.0 D B			
9	**Nov 24**	ZC 3041	163910	6.2	31+	S	17 35.9	3.3 D A	81 B. Cap		
10	**Dec 08**	ZC 1385	98517	6.6	73 -	N	2 18.6	1.5 D B	227 B. Cnc		
11	**Dec 08**	ZC 1396	98574	6.8	73 -	S	5 58.8	1.4 D B			



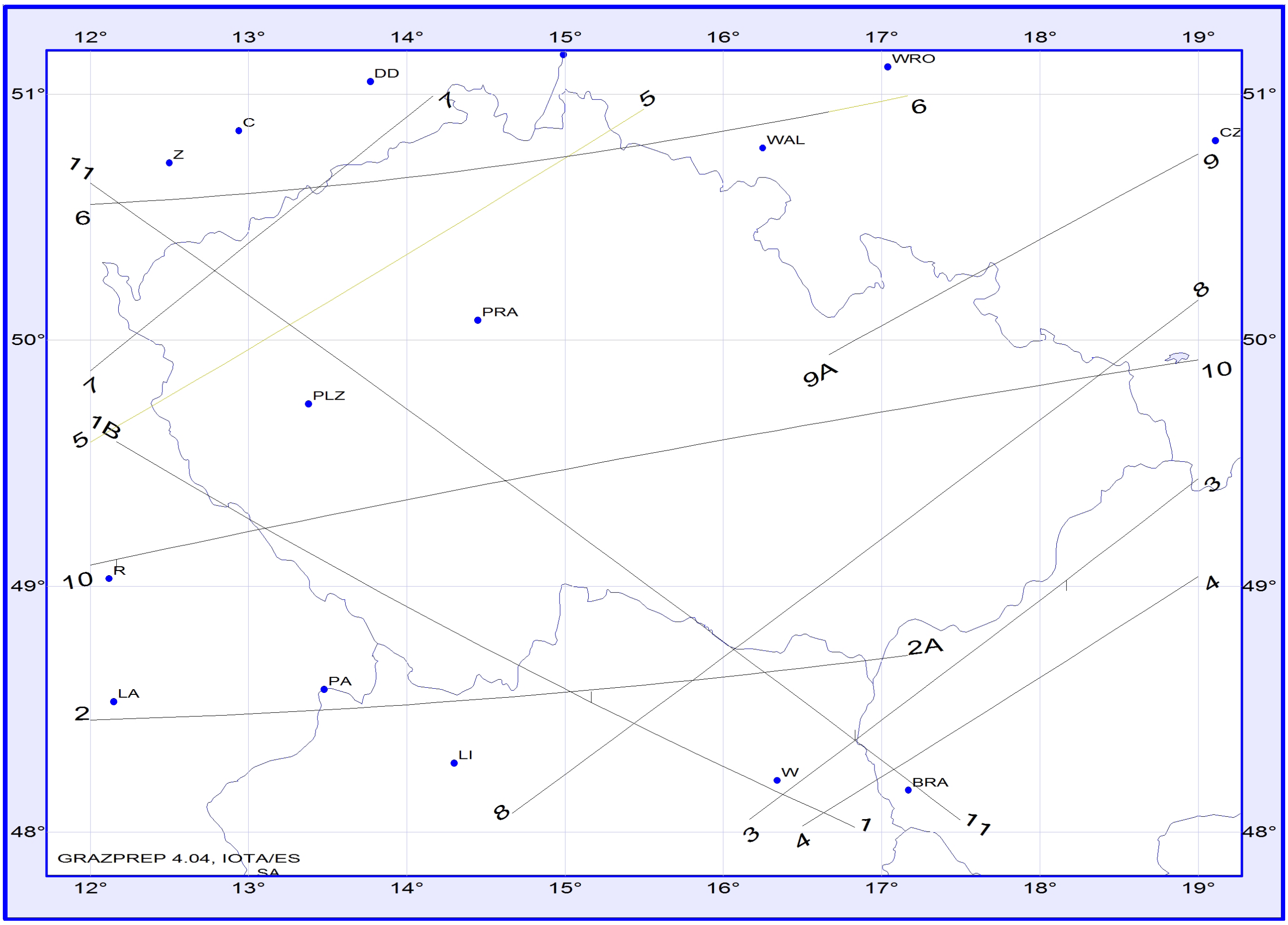
BeNeLux

2017			Grazing Occultations BeNeLux 2017, <= 7.0 mag.								GRAZPREP 4.04, IOTA/ES
No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	CUSP-A T	STAR NAME	MAG1	MAG2
1	**May 04**	ZC 1531	99136 Y	6.0	68+	N	19 4.7	1.7 D B	45 CX Leo	6.7	6.7
2	**Jul 25**			0.2	6+	S	7 43.0	10.1 D C	Mercury		
3	**Aug 16**	ZC 659	93925 O	6.6	37 -	N	1 59.0	5.1 D A	70 Tau	7.0	7.3
4	**Aug 29**	ZC 2399	160046	4.9	54+	N	19 6.1	2.7 D A	24 (Sco)/Oph		
5	**Sep 10**	X 3132	110464	6.8	83 -	N	1 45.3	10.7 D B			
6	**Sep 11**	ZC 608	93775 $	6.0	63 -	N	23 59.3	8.2 D A	179 B. Tau	6.1	8.8
7	**Nov 13**	ZC 1644	118804	4.0	26 -	S	1 24.0	7.4 B C	77 sigma Leo (Shang Ts.)		
8	**Dec 08**	ZC 1396	98574	6.8	73 -	S	5 38.2	0.4 T B			
9	**Dec 09**	ZC 1522	99098	6.8	62 -	S	6 30.3	2.1 D B			



Czech Republic

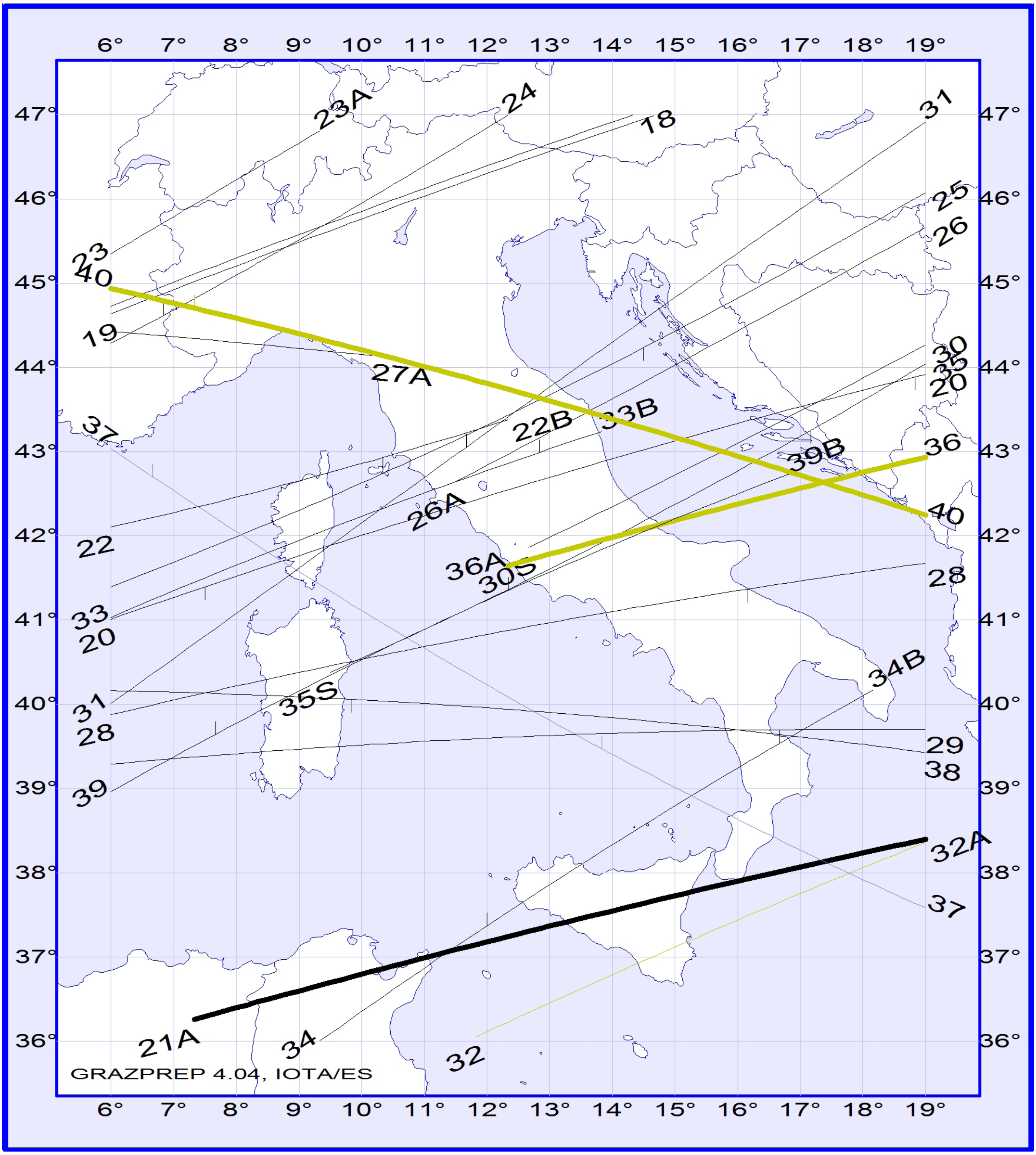
2017	Grazing Occultations Czech Republic 2017, <= 7.0 mag.									GRAZPREP 4.04, IOTA/ES
No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	CUSP-A T	STAR NAME	MAG1	MAG2
1	Jun 04	ZC 1941	139390	4.7	81+	S	22 45.5	2.0 D A	74 l2 Vir		
2	Jul 02	ZC 2020	139732 K	6.5	68+	S	22 56.8	3.7 D C	94 Vir	7.4	7.4
3	Aug 15	ZC 491	93416	6.0	49 -	N	0 7.7	5.1 D A	8 B. Tau		
4	Aug 15	ZC 635	93868 K	3.6	38 -	N	23 25.8	3.9 D A	54 gamma Tau (Hyadum I)	4.7	4.7
5	Aug 15	ZC 640	93876	5.3	38 -	S	23 34.0	3.4 B C	58 V696 Tau	5.3	5.3
6	Aug 29	ZC 2399	160046	4.9	54+	N	19 22.1	0.9 T A	24 (Sco)/Oph		
7	Sep 11	ZC 462	93320 K	6.0	74 -	N	0 2.3	9.4 D A		6.7	6.7
8	Sep 29	ZC 2886	162964	4.9	66+	S	19 51.4	1.8 D A	56 f Sgr		
9	Oct 12	X 11708	97260 A	7.0	44 -	N	22 24.2	9.3 D C		7.9	9.6
10	Oct 15	ZC 1449	98809	6.5	22 -	N	2 20.0	7.8 D A	23 Leo		
11	Dec 08	ZC 1396	98574	6.8	73 -	S	5 51.8	1.2 D B			



Italy

2017 — Grazing Occultations Italy 2017, <= 7.0 mag. — GRAZPREP 4.04, IOTA/ES

No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	CUSP-A T	STAR NAME	MAG1	MAG2
1	**Apr 04**	ZC 1207	97472 X	5.6	62+	N	20 53.9	2.9 D A	3 Cnc	6.0	7.6
2	**Apr 19**	ZC 2902	163060 V	5.9	52 -	S	4 6.1	5.0 D A	57 Sgr	6.8	6.8
3	**Apr 22**	ZC 3295	165079	7.0	23 -	S	3 22.0	7.5 D C	54 Aqr		
4	**Apr 30**	ZC 1040	96111 O	6.4	25+	S	21 54.9	0.4 T A	74 B. Gem	6.8	7.0
5	**May 01**	ZC 1158	97120 K	5.0	35+	S	18 14.2	1.0 B B	74 m Gem	6.0	6.0
6	**May 04**	ZC 1531	99136 Y	6.0	68+	N	19 15.8	2.7 D A	45 CX Leo	6.7	6.7
7	**May 20**	ZC 3375	146438	6.8	38 -	S	3 38.5	2.7 D A	260 B. Aqr		
8	**Jun 02**	ZC 1732	119150	6.8	64+	S	23 32.2	1.9 D C			
9	**Jul 25**	ZC 1487	98967 A	1.4	6+	N	9 17.2	6.2 B A	32 alpha Leo (Regulus)		
10	**Aug 02**	ZC 2448	160231 K	6.3	79+	S	21 53.4	2.5 D B	29 Oph	7.2	7.2
11	**Aug 14**	ZC 491	93416	6.0	49 -	N	23 57.9	4.4 D A	8 B. Tau		
12	**Aug 15**	ZC 635	93868 K	3.6	38 -	N	23 23.0	3.4 D A	54 gamma Tau (Hyadum I)	4.7	4.7
13	**Aug 16**	ZC 661	93932 V	4.5	37 -	S	1 45.8	7.1 B B	71 V777 Tau	4.8	6.8
14	**Aug 16**	ZC 667	93950 V	5.0	37 -	N	3 12.4	8.3 D A	75 Tau	5.4	7.9
15	**Aug 17**	ZC 823	94586 T	6.7	26 -	N	3 29.5	7.3 D A		6.8	7.5
16	**Sep 12**	ZC 635	93868 K	3.6	62 -	S	6 27.2	3.3 B B	54 gamma Tau (Hyadum I)	4.7	4.7
17	**Sep 14**	ZC 947	95432 A	5.2	39 -	N	3 54.6	7.6 D A	71 Ori	5.2	11.2
18	**Sep 16**	ZC 1236	97645 Z	5.1	19 -	N	2 32.1	8.1 D A	16 zeta Cnc (Tegmine)	5.6	6.0
19	**Sep 16**	X 12393	97646 X	6.2	19 -	N	2 32.2	8.2 D A	16 zeta2 Cnc (Companion)	6.2	9.0
20	**Sep 16**	ZC 1241	97669 A	6.5	18 -	N	3 18.9	8.2 D A		6.4	12.3
21	**Sep 18**	ZC 1487	98967 A	1.4	5 -	N	3 26.3	10.1 D A	32 alpha Leo (Regulus)		
22	**Sep 25**	ZC 2352	159888 M	7.0	28+	N	18 45.4	1.0 D B	107 B. Sco	7.6	7.8
23	**Sep 28**	ZC 2760	187514 A	6.9	57+	S	21 35.0	3.5 D C		6.7	12.0
24	**Sep 29**	ZC 2886	162964	4.9	66+	S	19 38.7	0.9 T A	56 f Sgr		
25	**Oct 07**	ZC 405	110723 V	4.3	94 -	N	19 24.6	13.5 D A	87 mu Cet	4.5	8.5
26	**Oct 10**	ZC 871	94830	6.7	67 -	N	21 2.2	10.0 D C			
27	**Nov 03**	ZC 249	110065	4.5	98+	N	4 13.5	21.2 D B	106 nu Psc		
28	**Nov 11**	ZC 1415	98662 Y	6.3	47 -	N	0 43.7	8.9 D A	7 Leo	7.0	7.0
29	**Nov 13**	ZC 1648	118823	6.9	26 -	N	1 52.4	7.1 D B	358 B. Leo		
30	**Nov 21**	ZC 2639	186544 A	6.0	9+	N	15 51.5	2.3 D C	16 Sgr	6.0	13.0
31	**Nov 24**	ZC 3041	163910	6.2	31+	S	17 20.8	3.4 D A	81 B. Cap		
32	**Nov 25**	ZC 3177	164600 K	5.9	41+	N	20 54.3	3.3 B C	44 Cap	6.8	6.8
33	**Nov 28**	X 246	128661	6.6	71+	S	22 13.0	1.5 D B			
34	**Nov 29**	ZC 150	109643 A	6.1	81+	S	20 24.1	3.8 D A	26 Cet	6.2	8.6
35	**Dec 01**	ZC 405	110723 V	4.3	95+	N	15 53.8	7.6 D C	87 mu Cet	4.5	8.5
36	**Dec 08**	ZC 1487	98967 A	1.4	64 -	S	21 37.3	9.1 B B	32 alpha Leo (Regulus)		
37	**Dec 10**	ZC 1644	118804	4.0	50 -	S	9 19.1	1.7 D C	77 sigma Leo (Shang Ts.)		
38	**Dec 11**	ZC 1733	119156	5.4	41 -	N	1 8.8	3.9 D A	7 b Vir		
39	**Dec 28**	ZC 364	110543	4.3	75+	S	19 56.3	4.4 D A	73 xi2 Cet		
40	**Dec 31**	ZC 692	94027 A	0.9	93+	S	1 48.9	10.5 B A	87 alpha Tau (Aldebaran)	1.1	11.3



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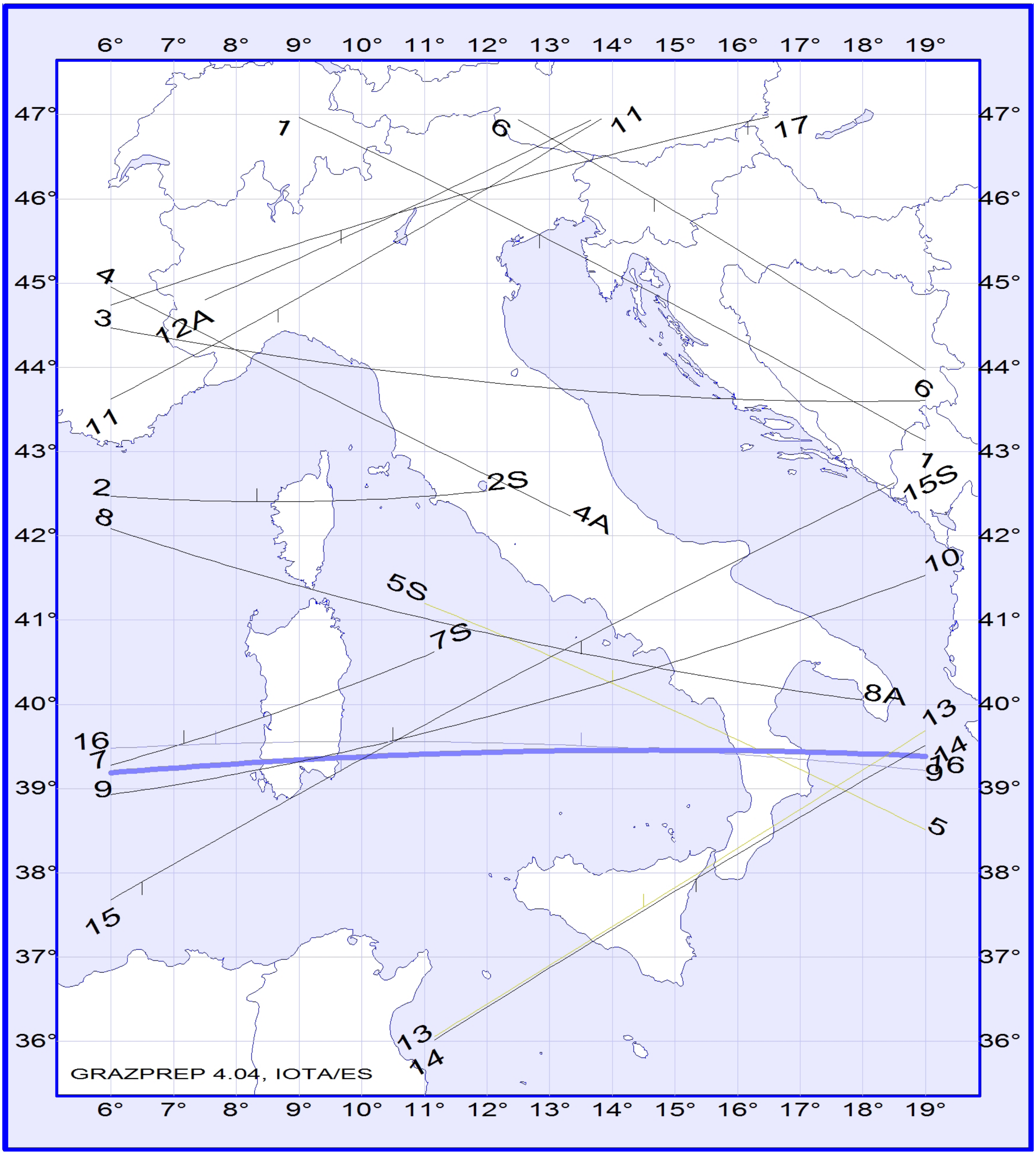
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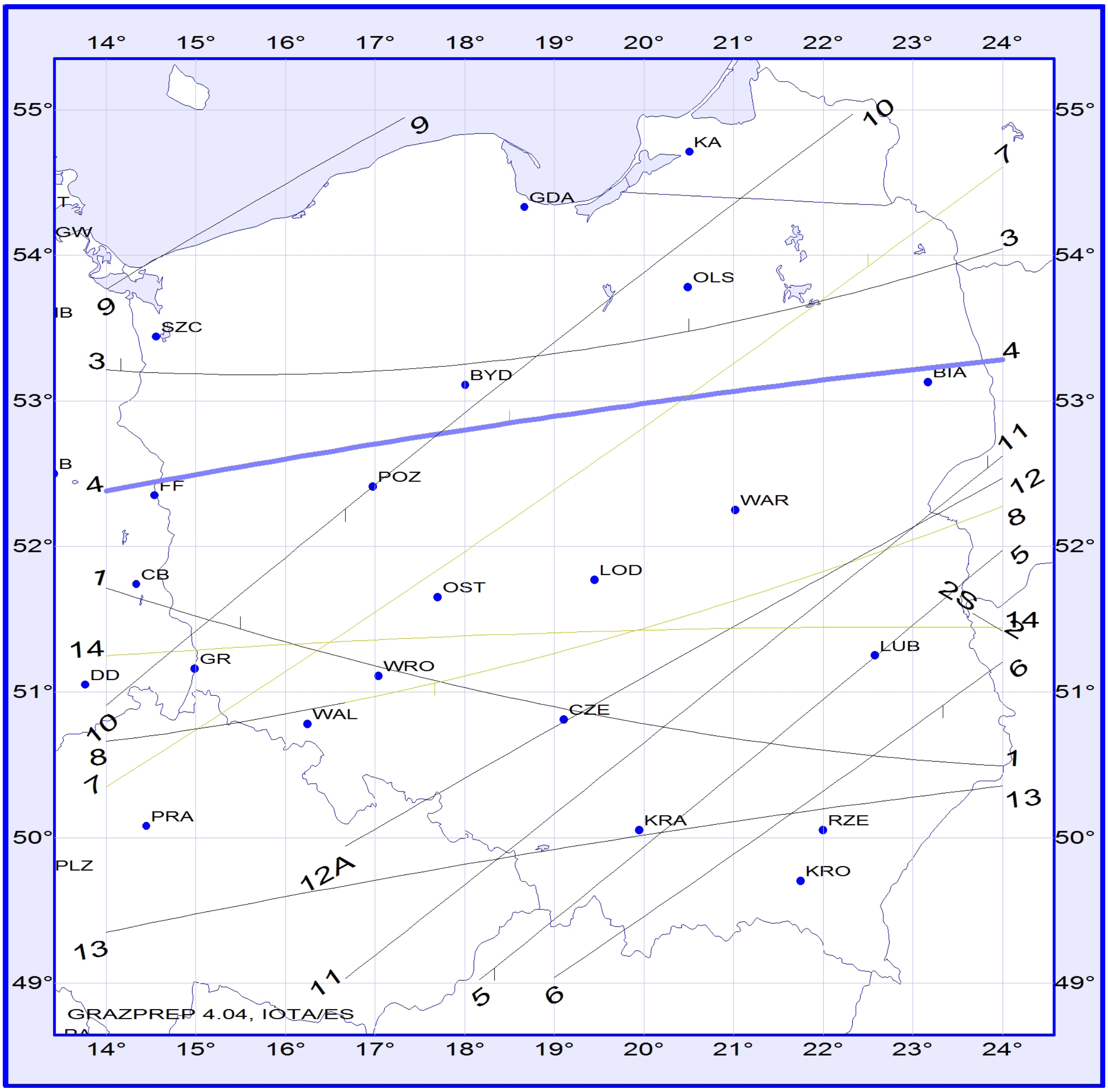
Poland

2017	Grazing Occultations Poland 2017, <= 7.0 mag.									GRAZPREP 4.04, IOTA/ES	
No.	M D	USNO	SAOPPM D	MAG	%SNL	L.	W.UT	CUSP-A T	STAR NAME	MAG1	MAG2
1	Apr 20	ZC 3022	163798	7.0	42 -	S	2 49.0	6.4 D C			
2	May 27	ZC 951	95456 V	6.6	5+	S	18 43.0	7.5 D C		7.1	8.4
3	Jun 11	ZC 2666	186794 M	4.9	98 -	S	0 10.7	14.0 D A	21 Sgr	5.0	7.5
4	Jul 25			0.2	6+	S	7 47.5	9.2 D A	Mercury		
5	Aug 15	ZC 491	93416	6.0	49 -	N	0 10.1	5.2 D A	8 B. Tau		
6	Aug 15	ZC 635	93868 K	3.6	38 -	N	23 27.1	4.1 D A	54 gamma Tau (Hyadum I)	4.7	4.7
7	Aug 15	ZC 640	93876	5.3	38 -	S	23 34.8	3.5 B C	58 V696 Tau	5.3	5.3
8	Aug 29	ZC 2399	160046	4.9	54+	N	19 25.1	0.5 T A	24 (Sco)/Oph		
9	Sep 10	X 3132	110464	6.8	83 -	N	2 3.3	9.4 D B			
10	Sep 11	ZC 462	93320 K	6.0	74 -	N	0 5.7	9.3 D A		6.7	6.7
11	Sep 29	ZC 2886	162964	4.9	66+	S	19 53.8	1.9 D A	56 f Sgr		
12	Oct 12	X 11708	97260 A	7.0	44 -	N	22 24.2	9.3 D C		7.9	9.6
13	Oct 15	ZC 1449	98809	6.5	22 -	N	2 21.0	7.6 D A	23 Leo		
14	Nov 13	ZC 1644	118804	4.0	26 -	S	1 25.9	6.4 B B	77 sigma Leo (Shang Ts.)		



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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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