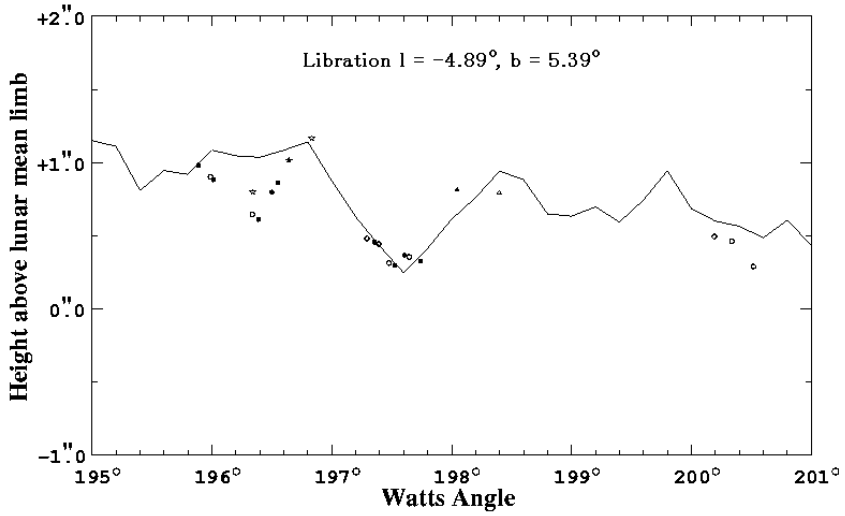
Occultation Newsletter

Volume 11, Number 4 October 2004 $5.00 North Am./$6.25 Other

Graze of Antares on 2005 Mar 3



Filled symbols are from disappearances and open symbols from reappearances. Circles are from the 2005 Mar 3 graze of Antares observed by Roc V. Fleishman, Hal Povenmire, and Kerry Coughlin in Baja California, Mexico. Triangles are from the same graze but from the fainter component of Antares observed by Kerry Coughlin with less reliability. The stars between 196 and 197 degrees of W.A. are from the Antares graze on 2005 Feb 4 by Eberhard Bredner in Monzelfeld, Germany (libration: l = −5.60°, b = +5.36°). The solid line is from Watts' charts. The observations clearly show that there is a deep valley at about 196.4° of W.A. which was not shown in Watts' charts.

Reduction Profile of the Graze of Antares 3 March 2005

In this Issue

ON THE COVER:

Reduction Profile of the Graze of Antares, 3 March 2005 courtesy of Dr. Mitsuru Soma

Publication Date for this issue: July 2005

Please note: The date shown on the cover is for subscription purposes only and does not reflect the actual publication date.

The next issue, Volume 12, Number 1 will be published in July.

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Secretary & Treasurer
5403 Bluebird Trail
Stillwater, OK 74074 USA
Email: **business@occultations.org**

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John A. Graves, Editor for *Occultation Newsletter,*
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Nashville, TN 37218-3133 USA
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Dr. Mitsuru Sôma
V.P. for Grazing Occultation Services
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Petrin 205
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Occultation Newsletter subscriptions (1 year = 4 issues) are US$20.00 per year for USA, Canada, and Mexico; and US$25.00 per year for all others. Single issues, including back issues, are 1/4 of the subscription price.

Memberships include the *Occultation Newsletter* and annual predictions and supplements. Memberships are US$30.00 per year for USA, Canada, and Mexico; and US$35.00 per year for all others. Observers from Europe and the British Isles should join the European Service (IOTA/ES). See the inside back cover for more information.

IOTA Publications

Although the following are included in membership, nonmembers will be charged for:

Local Circumstances for Appulses of Solar System Objects with Stars predictions US$1.00
Graze Limit and Profile predictions US$1.50 per graze.
Papers explaining the use of the above predictions US$2.50
IOTA Observer's Manual US$5.00

Asteroidal Occultation Supplements will be available for US$2.50 from the following regional coordinators:
South America--Orlando A. Naranjo; Universidad de los Andes; Dept. de Fisica; Mérida, Venezuela
Europe--Roland Boninsegna; Rue de Mariembourg, 33; B-6381 DOURBES; Belgium or IOTA/ES (see inside back cover)
Southern Africa--Brain Fraser - fraserb@intekom.co.za
Australia and New Zealand--Graham Blow; P.O. Box 2241; Wellington, New Zealand
Japan--Toshiro Hirose; 1-13 Shimomaruko 1-chome; Ota-ku, Tokyo 146, Japan
All other areas-Jan Manek; (see address at left)

ON Publication Information

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Invitation to ESOP XXIV 2005

ESOP XXIV 2005

European Symposium on Occultation Projects Helsinki, Finland, August 26 – 31, 2005

The boards of IOTA/ES and Ursa Astronomical Association invite all members and friends to participate in the European Symposium on Occultation Projects to be held in Helsinki in Finland in the end of August 2005. The symposium will be located near the center of Helsinki in the House of Sciences.

You can get more information about symposium via internet at:

http://www.ursa.fi/esop2005

You may also make contact via email to:

esop2005@ursa.fi

Program Details

Welcome Evening
Friday, August 26, 2005 at 6 p.m. - 9.30 p.m.

The Welcome Registration and Reception on Friday evening will take place in House of Sciences at Kirkkokatu 6 (5th floor), Helsinki (about 400 meters east from the Cathedral of Helsinki. Here you will get your conference folder. Have some typical Finnish sandwiches and refreshments.

Scientific Program

The symposium is open to all scientific contributions in the field of eclipses, occultations, instrumentation, organization of events, etc. Based on abstracts sent in, the scientific committee will decide about the presentation on the conference.

Saturday and Sunday, August 27 – 28, 2005 The symposium will take place in the House of Sciences at Kirkkokatu 6 (5th floor), Helsinki.

Social Program

Conference Lunches
The Conference Lunches take place on Saturday and Sunday in the restaurant Science Cafe in the 1st floor. Cost of lunches and coffee breaks are included in the conference fee.

Conference location

House of Sciences, Kirkkokatu 6 (5th floor), Helsinki

Conference fee

The conference fee is 60 EUR for all persons attending the symposium. The registration fee includes:

- Admission to all lectures on Saturday and Sunday
- Welcome reception on Friday evening
- Refreshments and coffee breaks during the symposium
- Lunches on Saturday and Sunday
- Abstract booklet
- Symposium information folder

The Extended Program

There are three excursions to astronomically interesting places on Monday, August 29 – Wednesday, August 21, 2005.

The places of excursions are the Metsahovi Observatories of the Finnish Geodetic Institution and the Technical University of Helsinki, the Tuorla Observatory of Turku University, the new countryside Observatory of Ursa Astronomical Association and the Science Center Heureka in Vantaa.

Deadlines

Registration for symposium: July 15th
Registration for social program: July 15th
Abstracts: August 1st
Abstracts for posters: August 1st ■

The March 3, 2005 Grazing Occultation of Antares Over Baja, California, Mexico

Hal Povenmire

The most favorable grazing occultation in 2005 on the North American Continent occurred on the morning of March 3, 2005. The red supergiant (M1.5 Iab-Ib) star Antares (21 α Sco; HR 6134) is one of only four first-magnitude stars that can be occulted by the Moon. Antares is a long-period variable that varies from 0.88*V* to about 1.8*V* (*V* denotes the Johnson visual magnitude). It has a blue companion of spectral type B2.5 V and visual magnitude 5.5. The primary has a measured angular diameter of 0.042 seconds of arc, one the largest known. The graze path ran at a steep angle from the northwest to the southeast over the Pacific Ocean and contacted land over the southern part of the Baja California peninsula. The path crossed near La Paz, but was in the Sea of Cortez at this location. The most favorable area to intercept the graze path was east of Ciudad Constitución.

The moon was in the waning phase and about 53% sunlit. The graze occurred 19 degrees on the dark southern limb at an altitude of 28 degrees. At the time of occultation the skies were mostly clear with a heavy dew. There were coyotes howling in the nearby brush.

The graze location was deep in the desert about 3 hours drive north of La Paz. The four stations were comprised of Hal Povenmire, my wife, Katie Povenmire, from Indian Harbour Beach, Florida, and Kerry Coughlin and Roc V. Fleishman from the La Paz area. The last two observers were somewhat inexperienced, but very capable advanced amateur astronomers who used video equipment to record the graze. Approximately 18 timings were made of the primary and some others of the secondary. Some interesting fades of the secondary were recorded on video. The tape is being digitized to help give a precise reduction. While not likely, the possibility of the secondary star being a binary star cannot be ruled out. We found out after the event that we were the only observers of this spectacular grazing occultation.

The reduced timings have been reported to IOTA and The International Lunar Occultation Center in Tokyo.

Hal Povenmire
Canaveral Area Graze Observers
215 Osage Drive
Indian Harbour Beach, FL 32937

Please note that Bob Sandy's Pictorial Reduction of the Antares Graze can be found on page 8 of this issue. ■

Satellites of Asteroids?

Arthur Lucas

Most of you have now seen that relatively rare event, an occultation of a star by an asteroid. We are told to watch both before and after an expected occultation for the detection of an even more rare event, a possible satellite of the asteroid. Pretty hard to believe that this is not what country folk call a "snipe hunt". The story goes that asteroids and their possible satellites are produced by some kind of grinding, breaking, collisional event and that small families might exist much as does the solar system. After some deliberation I decided to review the possibility and probability of finding one.

I started with a review of the large volumes, Asteroids, Asteroids II, and Asteroids III. In these volumes one sees the growth of the idea that asteroids might have satellites until, finally, in Asteroids III Merline[1], et al. summarize the evidence for existence of several dozen satellites. The evidence arrives from several sources, some more certain than others. Certainly there are several. Are there many? How large are they? How far out might they be from the parent body?

To begin to answer this I reverted to my personal experience in the laboratory. I've broken a lot of things. Some of them intentional. We have a lot of experience in growing clear, hard crystals and, subsequently, breaking them into fine powders of measured size. In these commercial efforts we always wish we could make powders of the large objects which have only a single particle size. It never works that way. With small variations it always seems that the breaking spectrum during grinding or ball milling is invariant with size. That is to say, the mass per unit diameter is almost the same independently of diameter. The sketch in Figure 1 describes this further. The mass between 9 and 10 microns is the same as the mass between 99 and 100 microns. This is my starting point.

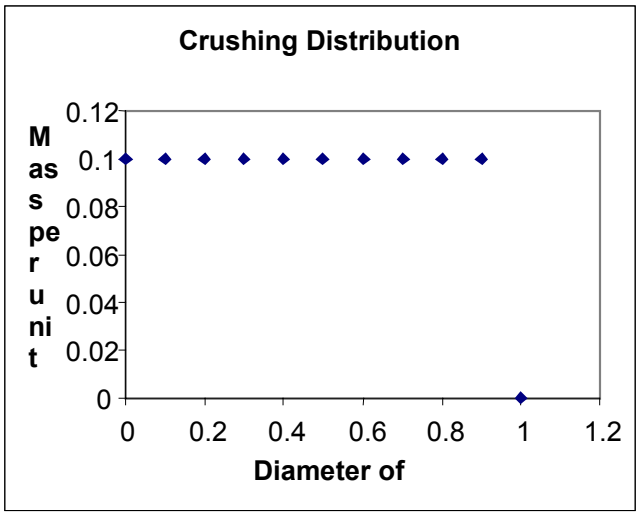


Figure 1. Sketch of the postulated distribution of particles per unit diameter which would be produced by collisional shattering.

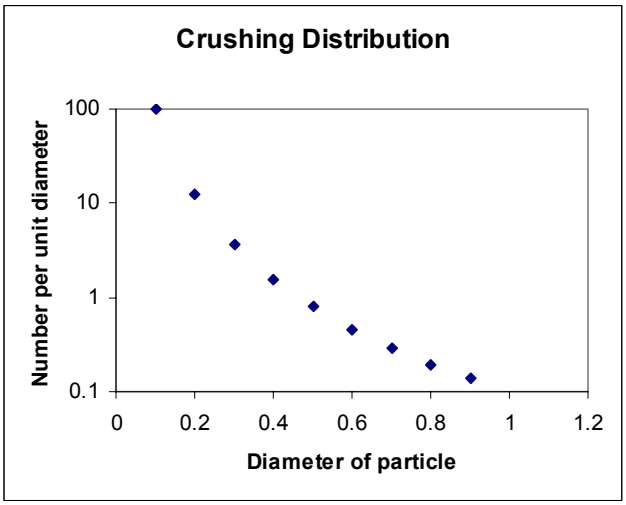


Figure 2. Sketch of the estimated number of satellites of asteroids as a function of the diameter of that satellite.

At this point I state my first satellite postulate.

Postulate 1. The total mass of small satellites is expected to be about the same as the total mass of large satellites.

Accepting this starting point ask now, how many particles are in the bin between 9 and 10 microns compared to the number of particles in the bin 99 to 100 microns. Since the particles are 1/10 the diameter then each particle has 1/1000 the mass. Since the mass in the bin of small particles is equal to the mass in the bin of large particles then the number of smaller particles is 1000 times the number of large particles. So now we construct the graph of the number of particles in a size bin. It is the inverse cubic shown in Figure 2.

So we now come to the second postulate of this reasoning process.

Postulate 2. The number of small satellites is expected to be very much greater than the number of large satellites

.

Now we ask where they are. Are they in close? Are they far out? How many are close? How many are far out? As the recoiling of collision products is a random process, I see no reason that smaller products should be closer or farther from the collision center. In like reasoning I see no reason that larger products should be closer or farther from the collision center. Now, certainly, those that go into a low orbit have a high probability of being captured so we do not expect many that are very close. Further, some are so far out and traveling so fast that they may escape the gravity of the central mass.

Does this mean that we have the same probability of finding a satellite at large distance as at small distance from the central mass. No, if as I reason above, the satellites are distributed evenly in radius from the central mass, the number density is inversely proportional to the distance from the center. This follows from the fact that the circumference of any chosen annulus in space is proportional to the radius from the center. Some validation of this reasoning process is to be found in the graph of Figure 3.

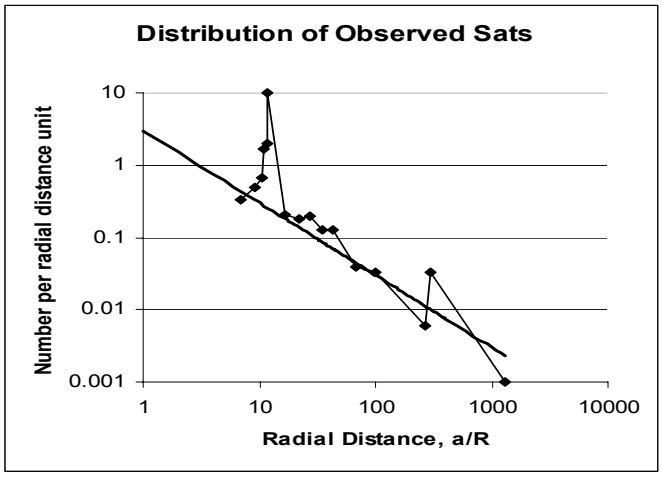


Figure 3. Summary data of Merline, et al. plotted with the 1/radius line predicted from the reasoning process presented here.

Here we take the list of satellites published in Asteroids III by Merline, et al.. We find the number of discoveries per unit radius from the central asteroid and plot that quantity as a function of the listed radius. On top of that data we plot the inverse radius line discussed above. Reasonable agreement is found in this comparison giving some credence to the qualitative conclusions of this discussion. Note, however, that some discoveries are reported far from the central asteroid. Data are shown at 1000 times the radius of the central asteroid. Suppose the radius of the central asteroid to be 10 km. The graph would predict some probability of detection of a satellite at 10,000 km from the center. So we state the third postulate.

Postulate 3. There is a reasonable probability of detecting satellites of asteroids at distances up to several thousand kilometers from the asteroid.

How do we deal, however, with the small probability at large distances? The answer to this lies in looking at our detection methodologies. Most observations are visual. Even when we record with tape we normally review the tape visually detecting occultations of the order of one second or more. The answer to enhancing this detectability lies in the graph of Figure 4.

The data of Figure 4 show the PC-23 data recorded by Bob Sandy[2] in observation of the Lysistrata occultation of 2003. Analysis showed, first, a 0.2 second occultation indicative of a near grazing observation. The occultation was hesitantly offered by the observer as a "blink".

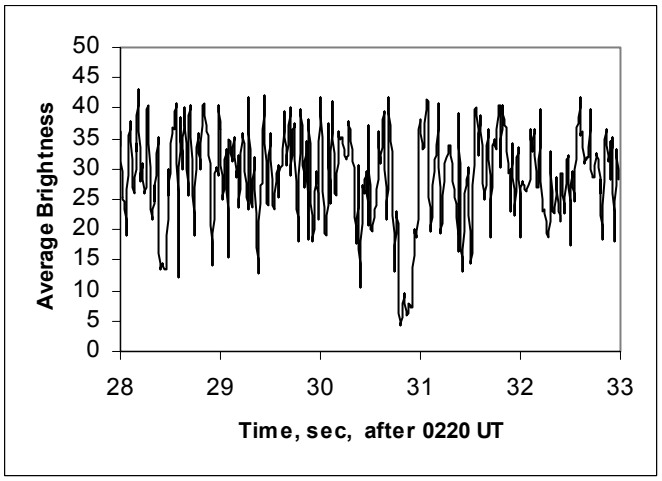


Figure 4. Average star brightness derived by field by field analysis of a video record of the Lysistrata occultation. Note the main, grazing, occultation at 30.8 seconds consistent with a central observation by Robinson nearby. Note also a possible satellite observation at 28.4 seconds. Note further that the statistical probability of this kind of outage is low in these 300 fields.

Field by field analysis produced a clear occultation trace shown in Figure 4 at about 30.8 seconds. Additionally, there is a several field darkening at 28.4 seconds, 2.4 seconds earlier. Recent statistical discussions by Roger Venable[3] a/pplied to this short outage declares this, also, to be a real occultation. Is this a satellite of Lysistrata? Perhaps so.

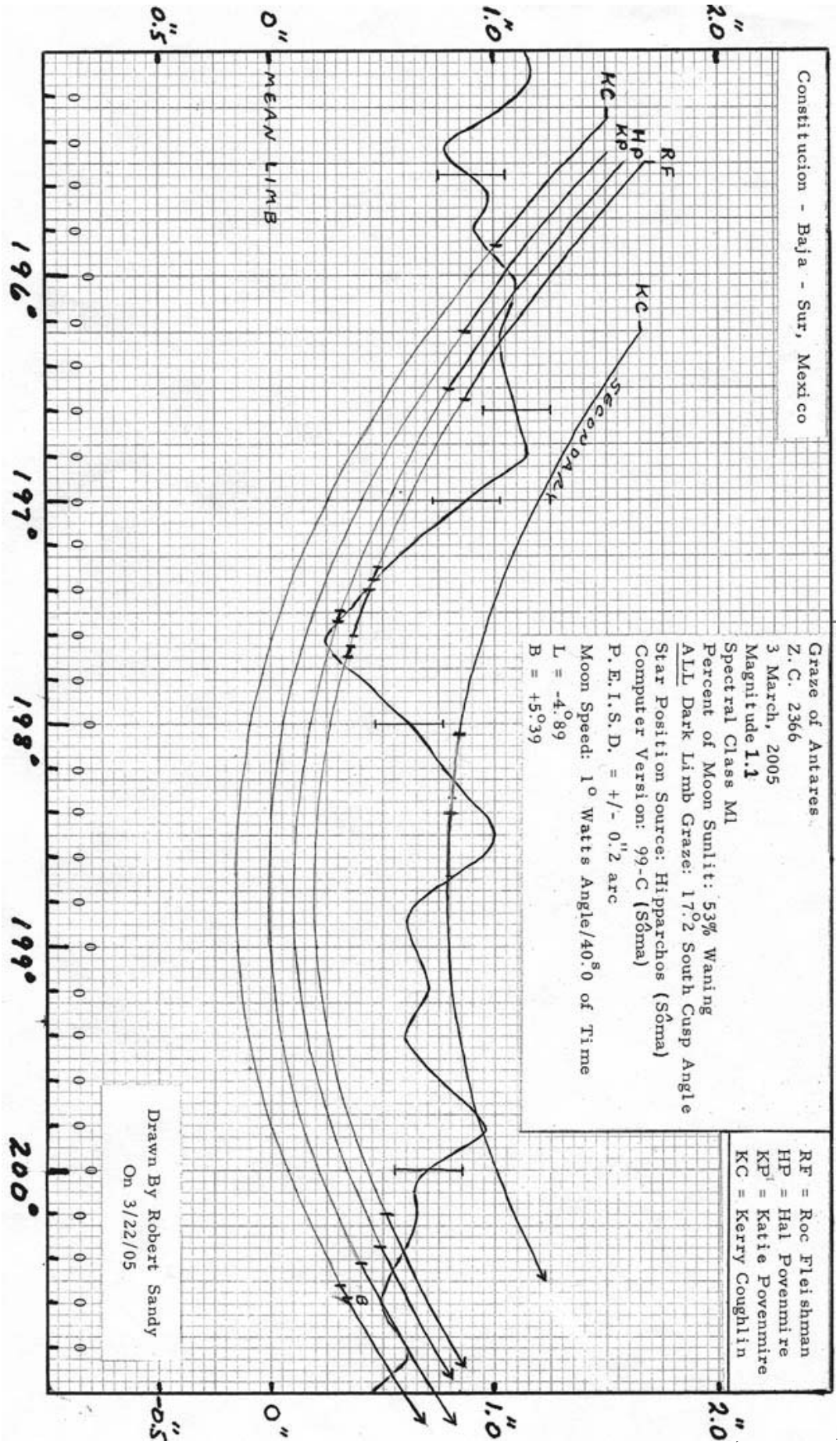
The reasoning process above leads to a final postulate.

Postulate 4. Extending the detectable occultation time downward by a factor of 10 will increase the number of detected events by a factor of 100.

The technical approach to doing this must lie in automatic, computer assisted, field by field review of tape records. While each of us has done a certain amount of field by field review using computers, the process is not, so far as I know, fully automated in such a way that even a few, well equipped observers could employ it. Should such equipment and software become readily available the number of detected occultations by satellites of asteroids could be increased by something like a factor of 10 to 100.

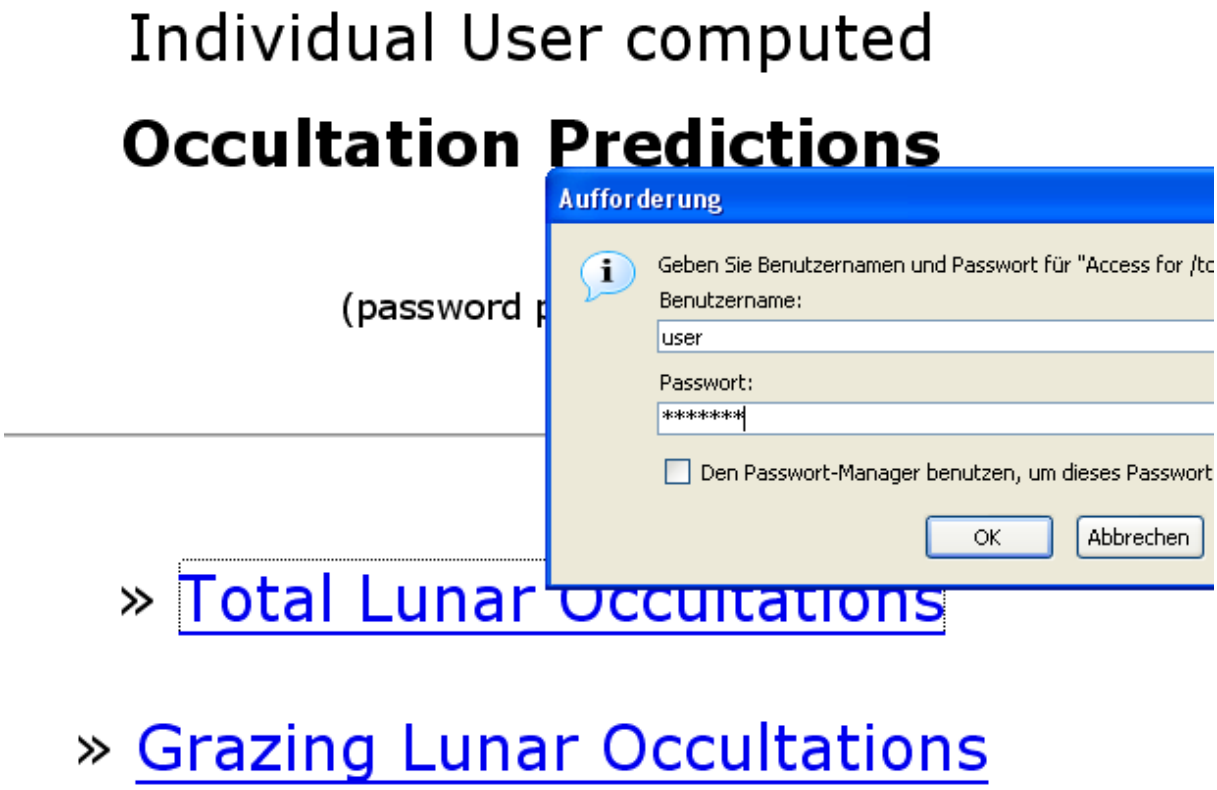
References.

1. Merline, W. J., et al., Asteroids III, p 289 ff., 2002
2. Sandy, Robert, Occultation Newsletter, Vol. 11, No. 2
3. Venable, Roger, Occultation Newsletter, Vol. 11, No. 2 ■


Constitucion - Baja - Sur, Mexico
Graze of Antares
Z. C. 2366
3 March, 2005
Magnitude 1.1
Spectral Class M1
Percent of Moon Sunlit: 53% Waning
ALL Dark Limb Graze: 17.°2 South Cusp Angle
Star Position Source: Hipparchos (Sôma)
Computer Version: 99-C (Sôma)
P.E.I.S.D. = +/- 0."2 arc
Moon Speed: 1° Watts Angle/40.s0 of Time
L = -4.°89
B = +5.°39
RF = Roc Fleishman
HP = Hal Povenmire
KP = Katie Povenmire
KC = Kerry Coughlin
Drawn By Robert Sandy
On 3/22/05
MEAN LIMB
2.0"
1.0"
0"
0.5"
196°
197°
198°
199°
200°
RF
HP
KP
KC
KC
SECONDARY

New IOTA/ES Service
Hans – J. Bode

A new service had been installed by IOTA/ES. Started by May 1st 2005 every member (Details: see below) can download his own individual computed data for grazing and total occultations by the moon from the occultation website www.occultations.info.



After having selected Total Lunar Occultations you have to type in the user-name and the actual password (During the test-phase these keys are "user" and "stellar", for every IOTA/ES-member should test if his data are OK.). Press OK and the following message might appear:

Instead of the 8 question marks you have to type either the first 7 characters of your name, of your observatory name, of the name of the town you are living or the station-number (e.g. SX181 or SX18 (that is SX180 – SX189)). The 8th character (if your name contains only 5 characters it will be the 6th) must be a "T" (in case of grazing occultations it must be a "G").

Within a few moments you will receive your total occultation data for the specified coordinates you once sent us. In case of grazing occultations just act the same way.

If you select planetary occultations the following message might be seen:

wrong or missing filename, must be:
http://occultations.info/planet/????????.zip

For planetary occultations the name of the file is ME2005PL (Europe) or MA2005PL (Africa) that you have to type instead of the 8 question marks, where 2005 is the year that has been used for the calculation of the events.

After you have chosen the Occultation Newsletter the following message will be seen:

wrong or missing filename, must be:
http://occultations.info/ON/????????.zip

Again you have to replace the 8 question marks with characters like this "ON_v_n", where "v" is the volume-number and "n" is the number of the ON within the volume. So the July 2004 edition can be downloaded with its file-name "ON_11_3.zip".

Members who are still interested to receive their data / ON on floppy-disk or paper should send us an e-mail to service@occultations.info.

How to become a member of IOTA/ES?

Just send an e-mail including your address coordinates and travel-radii to service@occultations.info and, after having paid your yearly membership-fee of € 20, your data will be transferred to this web-site. ■

AN OCCULTATIONAL HAZARD---or Tinkle, Tinkle, Little Star.
Bob Sandy

As many readers know, the canine family usually does a #1 "job" on either a tree trunk, bush, or fire hydrant, but a slightly different object was used by a dog residing at a farmhouse near Mound City, Missouri. I had placed ASKC member Richard Landingham in front of a farmhouse to observe a grazing occultation of a star by the Moon in September, 1989. Upon arriving at his site, Richard was greeted by a barking dog. Barking is, of course, a minor disturbance during the period that the Moon is grazing a star, but after the graze was over, and Richard started to pack up his gear, he noticed a lot of moisture inside his eyepiece box that had been left open!! ■

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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President	David Dunham, Dunham@erols.com
Executive Vice-President	Paul Maley , pdmaley@yahoo.com
Executive Secretary	Richard Nugent, RNugent@wt.net
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Editor for *Occultation Newsletter*	John A Graves, editor@occultations.org
IOTA/ES President	Hans-Joachim Bode, president@IOTA-ES.de
IOTA/ES Secretary	Eberhard H.R. Bredner, secretary@IOTA-ES.de
IOTA/ES Treasurer	Brigitte Thome, treasurer@IOTA-ES.de
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IOTA/ES Public Relations	Eberheard Riedel, E_Riedel@msn.com

IOTA European Section (IOTA·ES)

Observers from Europe and the British Isles should join IOTA/ES, sending a Eurocheck for EURO 25,00 (bank-transfer-costs included) to the account IOTA/ES; Bartold-Knaust-Strasse 8; D-30459 Hannover, Germany; Postgiro Hannover 555 829-303; bank code number (Bankleitzahl) 250 100 30. Sending EURO 20 EU-members must use the IBAN- and BIC-code as additional bank-address (IBAN: DE97 2501 0030 0555 8293 03, BIC: PBNKDEFF). German members should give IOTA/ES an "authorization for collection" or "Einzugs-Ermaechtigung" to their bank account. Please contact the Secretary for a blank form. Full membership in IOTA/ES includes one supplement for European observers (total and grazing occultations) and minor planet occultation data, including last-minute predictions; when available. The addresses for IOTA/ES are:

Eberhard H. R. Bredner
IOTA/ES Secretary
Ginsterweg 14
D-59229 Ahlen 4 (Dolberg)
Germany

Phone: 49-2388-3658 (in Germany 0-2388-3658)

Hans-Joachim Bode
IOTA/ES President
Bartold-Knaust-Str. 8
D-30459 Hannover 91
Germany

Phone: 49-511-424696 (in Germany 0-511-424696)
Fax: 49-511-233112 (in Germany 0-511-233112)

IOTA on the World Wide Web

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

IOTA Member Site
http://www.occultations.org

This site contains information about the organization known as IOTA and provides information about joining IOTA and IOTA/ES, topics related to the *Occultation Newsletter*, and information about the membership--including the membership directory.

IOTA Lunar Occultations, Eclipses, and Asteroidal and Planetary Occultations Site
http://www.lunar-occultations.com

This site contains information on lunar occultations, eclipses, and asteroidal and planetary occultations and the latest information on upcoming events. It also includes information explaining what occultations are and how to report them.