

Occultation Newsletter

Volume III, Number 7

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FROM THE PUBLISHER

For subscription purposes, this is the first issue of 1984.

When renewing, please give your name and address exactly as it appears on your mailing label, so that we can locate your file; if the label should be revised, tell us how it should be changed.

O.N.'s price is \$1.40/issue, or \$5.50/year (4 issues) including first class surface mailing. Back issues through vol.2, No. 13 still are priced at only \$1.00/issue; later issues @\$1.40. Please see the masthead for the ordering address. Air mail shipment of *O.N.* back issues and subscriptions, if desired, is 45¢/issue (\$1.80/year) extra, outside the U.S.A., Canada, and Mexico.

IOTA membership, subscription included, is \$11.00/year for residents of North America (including Mexico) and \$16.00/year for others, to cover costs of overseas air mail. European and U. K. observers should join IOTA/ES, sending DM 20.-- to Hans-J. Bode, Bartold-Knaust Str. 8, 3000 Hannover 91, German Federal Republic.

IOTA NEWS

David W. Dunham

When the new IOTA officers were elected according to our bylaws at the annual meeting last November, new procedures had to be established for handling prediction requests and processing new memberships and *O.N.* subscriptions. Unfortunately, there were some misunderstandings about exactly who should be doing particular tasks, resulting in processing delays for many who sent requests early this year. We apologize for these delays, and believe that the misunderstandings causing the delays have been resolved, so that our service should improve in the future.

The second IOTA annual meeting probably will be held in the Houston, TX, area in late October, early November, or early December; it will need to be scheduled so that it does not conflict with the total solar eclipse expedition to Papua New Guinea organized by Paul Maley (see p. 150). It would be tempting to hold the meeting near the very favorable grazing occultation of 5.0-mag. 60 Sagittarii on the dark side of a 19% sunlit moon near Ft. Worth, TX, early Monday evening, November 26th, but that likely would be too close to the solar eclipse trip.

However, there will be some meetings during the next few months which may be of interest. On Saturday, June 16th, there will be a regional meeting of occultation observers in Hannover, German Federal Republic; Hans Bode, address above, phone 0511-424696, can provide details. Main topics will be asteroidal occultations, solar eclipses, and the International Halley Watch (I.H.W.). I will attend the meeting, which should help with overall coordination between IOTA/ES and the main IOTA. On June 14-15, I will be in Rome, Italy, for the end of an I.A.U. colloquium on comets, and on June 18-19, Bode and I will attend an I.H.W. astrometry meeting near Munich. I will give a presentation about the astrometric needs for the ICE (ISEE-3) mission to Comet Giacobini-Zinner (see p. 117 of the last issue), but also hope to round up more international support for astrometric improvement of asteroidal occultation predictions.

Mark Allman plans to attend the Astronomical League meeting in Milwaukee, WI, on August 1-4, and will lead an IOTA workshop or session. If you are interested in participating, contact him at the IOTA address (Columbus) given in the masthead, telephone 614,863-2422.

The 3rd European Symposium on Occultation Projects (ESOP-3) will be held in Czechoslovakia in September. Bohumil Maleček is the local organizer. More information will be announced in a future issue, or can be obtained from Malaček or Bode.

The solar eclipse trip in November organized by Paul Maley has been billed as "IOTA Tax Deductible Expedition #1." This is probably true for major expeditions organized through a travel agency. But at least one IOTA member already has claimed a deduction on his 1983 income tax return for his travel expenses to attempt to observe last September's occultation of 14 Piscium by (51) Nemausa, which occurred after IOTA's incorporation; see p. 146 of the last issue. The deductible mileage rate for use of a personal automobile is less (9 cents per mile for 1983 taxes) for service donated to a non-profit scientific organization such as IOTA than for business expenses. Since the Internal Revenue Service will monitor our tax-exempt status, we need to be careful that it is not abused by individuals, or the status could be revoked. Tentatively, we plan to distribute a simple expense form which members or other observers need to complete for each IOTA trip they claim. The form will be submitted to the IOTA Treasurer at the (St. Charles) address given in the masthead, who will verify that the listed expenses are a service donated to IOTA (with stamp and ini-

tials), and return the form to the individual. Forms for several trips, perhaps all during a given year, could be sent at one time to save postage. More information will appear in a future issue. It may be a few months before the forms are prepared, since the next U.S. federal income tax deadline is almost a year away. In the meantime, keep careful records of the expenses which you plan to deduct.

The new book, *Solar System Photometry Handbook*, edited by Russ Genet, features a schematic of a grazing occultation on the cover. The book has forewords by Douglas Hall and me. There are ten chapters, including "Photometry of Asteroids" by Rick Binzel; "Photometry of Comets" by Michael A'Hearn; "Occultations by Planets and Satellites" by Robert Millis; "Asteroid Occultations" by Alan Harris; "Lunar Occultations" by Graham Blow; and "Portable High Speed Photometer Project" by Peter Chen. The 224-page book can be obtained for \$17.95 (plus \$1.00 postage and handling for North Americans, \$2.00 for those overseas, plus \$3.25 if registration is desired) from Willman-Bell, Inc.; P.O. Box 3125; Richmond, VA 23235; U.S.A.; telephone 804,320-7016.

Vol. 4, No. 13 (January-March, 1984) of *Universo*, the official publication of the Liga Ibero-Americana de Astronomia, is a "numero especial dedicado a ocultaciones." It includes a seven-page article by Jorge Polman, director of the Occultation Section of LIADA, entitled "As Ocultações de Estrelas pela Lua e por Planetoides," and a nine-page account of last May's Pallas occultation by Paul Maley, "Midiendo la Forma de un Asteroide."

Unfortunately, time again does not permit publishing an article and summary about observed grazing occultations. I am more determined than ever to prepare one for the next issue. Robert Sandy has kept busy preparing reduction profiles of several of the better-observed grazes, some of which will be published in the next issue. Station data were sent to the graze computers in late April, so they could begin calculating the predictions for the last half of 1984. The graze data tape for 1985 is being prepared at U.S.N.O., so that copies might be distributed to the computers much earlier than in previous years. The grazing occultation manual mentioned on p. 116 of the last issue got sidetracked; the effort that would have been devoted to it went into the paper about observing the May 30th eclipse (see page 149). I hope that the preliminary version will be ready in a few months.

Work on the annular solar eclipse has kept me busier than expected, delaying this issue and other projects, especially the preparation of the first draft of the paper on last May's Pallas occultation for the *Astronomical Journal*. I expect to work on the Pallas paper in June, and hope to complete it early in July. After that, I will work on a comprehensive paper including all visual observations of last September's Nemausa occultation, but I also will need to begin calculations for 1985 occultations for my annual *Sky and Telescope* articles (their deadlines are now much earlier than in the past). Also I have been asked to organize my occultation double star data better. However, the other projects mentioned above are more important, so I doubt that I will be able to do anything with the occultation double star data during the next several months. I hope to mention some important double star developments in the

next issue. We plan to hold this issue to 10 pages, and publish another issue (number 8) probably early in June, to try to get caught up with our publication schedule. That issue will include mainly a grazing occultation article, summary, and more of Bob Sandy's plots, as well as charts and maps of planetary occultations for the following few months. I hope that issue number 9, targeted for August or September, will be a more "normal" issue.

OCCULTATION OF VENUS BY THE SUN

Mitsuru Sôma

Venus will pass behind the sun on June 15-16. First contact will be on June 15th at 5^h 35^m U.T. in position angle 311°0 and 3rd contact will take place on June 16th at 10^h 00^m in p.a. 28°6. Second and 4th contacts will be 23 minutes after these respective events, the amount of time for the edge of the sun to pass over Venus' 9'6-diameter disk. I estimate that the uncertainty of the predicted times is ± 10 minutes. Professor Hiei and I plan to observe this phenomenon with the coronagraph at the Norikura station of the Tokyo Astronomical Observatory in order to investigate the relativistic light deflection due to solar gravity. We encourage workers in other countries also to attempt observation of this difficult event. The Eastern Hemisphere is favored.

(CORRECTION)³

The note "Correction Corrected" (see *O.N.* 3 (6) 146) needs further correction. The page number of the incorrect correction is 114, and the article is not "Planetary Occultations During 1984," but instead is "IOTA NEWS."

THE ASTEROID RESEARCH PROJECT

Jim Stamm

The A.R.P. was organized for the purpose of confirming asteroid duplicity, by having as many observers as possible monitor asteroid appulses as well as occultations. We continually are seeking additional observers to become ARP participants.

For each event that is visible from anywhere in the contiguous 48 states, we prepare an observation form. It lists the general conditions of the event and includes finder and eyepiece fields. Local circumstances are provided by Joseph Carroll, and can be added to the form. These forms, as well as report forms, news items, and tips on observing, timing, etc., can be had for a self-addressed stamped (37¢ for initial requests) envelope. Send requests to me at Rt 13 Box 109; London, KY 40741; U.S.A.

If members of IOTA in other countries wish to organize similar projects, I would be most happy to supply forms and information on doing so.

OBSERVATIONS OF ASTEROIDAL APPULSES AND OCCULTATIONS

David W. Dunham

Henceforth, observations of asteroidal appulses should be sent to Jim Stamm (address above), telephone 606,864-7763. As a cooperative effort involving his Asteroid Research Project and IOTA, Jim will prepare future summary articles, similar to this

one, for *O.N.* This should give me some time to work on other tasks while documenting observers' efforts to watch for asteroidal occultations more thoroughly than I have been able to do. I will provide Stamm with information about astrometric updates to include with his articles. Reports sent to Stamm should identify the appulse (date, asteroid, and star), your geographical position, the time you started and ended observation, telescope aperture, other pertinent information about the observation (such as visibility of the asteroid and approximate limiting magnitude), and preferably the predicted U.T. and distance of closest approach at your location.

If you are reasonably sure that one or more occultations of the star occurred at your location, you should use the lunar occultation report forms of the International Lunar Occultation Centre, or the equivalent IOTA graze report forms, marking the name of the asteroid at the top of the front side of the form. Do not send the report to ILOC, but rather send copies to me at P.O. Box 7488, Silver Spring, MD 20907, U.S.A.; to Gordon Taylor, H.M. Nautical Almanac Office, Royal Greenwich Observatory, Herstmonceux Castle, Hailsham, Sussex BN27 1RP, England; to Jim Stamm; and to any other professional astronomer (such as Bob Millis at Lowell Observatory, Flagstaff, AZ, or Leif Kristensen at Aarhus University, Denmark) in your region who plans to analyze the observations for a publication. Indicate on the report to whom copies have been sent.

Most of the asteroid occultation activity during early 1984 has shifted to Europe, as the photoelectric transit telescope at Bordeaux, France, has proven to give astrometric updates as accurate as large-scale last-minute photographic observations using secondary reference star positions measured from large-field Lick Observatory plates. Since the Bordeaux telescope is limited to the meridian, both the star and asteroid must cross the meridian in a dark sky (i.e., not too far from opposition) and both must be brighter than 13th magnitude. Unfortunately, personal problems and the demands of other competing projects limited the ability of Lick Observatory to update asteroidal occultations early this year. Arnold Klemola's essentially unique astrometric abilities at Lick have become too well known, so that nearly everyone needing the best astrometric accuracy is turning to him.

Accounts of individual events are given below. [Ed: Most of the accounts will be in the next *O.N.* issue]

(56) *Melete* and SAO 139812, 1982 July 7: Gregory Lyzenga, LaVerne, Calif., saw no occultation between 7h 20m and 7h 50m U.T.; the star appeared "rock steady" in his 20-cm telescope throughout the period. This casts some doubt on the long occultation reported by Gregg noted in *O.N.* 3 (1), 5, since his location at Escondido was about a third of the predicted diameter from the LaVerne path. But *Melete* could have been very elongated in its direction of motion.

PLANS FOR MAY 30TH, AND OTHER ECLIPSE NEWS

David W. Dunham and Joan Bixby Dunham

An article about the partial eclipse of the sun visible from most of North America and Europe will be

published in the May issue of *Sky and Telescope*, which will be received by most readers before this issue of *O.N.* A section of that article entitled "Eclipse Event Timings Sought" gives some observing tips for recording the annular phase of the eclipse and notes IOTA's plans for coordinating observations, including telephone message centers and the addresses and telephone numbers of regional coordinators in Mexico and each state crossed by the narrow path. There are also good articles about the eclipse by Fred Espenak and Allen Seltzer in the May issue of *Astronomy* magazine, including a wealth of information on observing and photographing the eclipse which nicely supplement other papers about the eclipse by us and by Alan Fiala. You should use published photographic exposure tables with caution. At a recent local meeting about the eclipse, IOTA member Bob Bolster showed several slides of the sun taken with different exposure speeds through a stopped-down telescope with neutral density filter. Sunspot details showed well in some of his pictures, but if he had used the tables in *Astronomy* magazine, the pictures would have been underexposed. Be sure to set up and test your equipment at least a couple of weeks beforehand, taking a variety of exposures (if you are planning photography), so that you can see what will work best with your particular arrangement.

Early in April, we distributed the first IOTA coordinator's notice package about the eclipse. This included detailed computer predictions of the limits of broken and partial annularity, taking into account the lunar profile; a description of the predictions and how they were computed; positioning strategy for the eclipse in Mexico, the Azores, and Morocco (true annularity region), from Louisiana to Alabama (limiting region of true annularity), and from Georgia to Maryland (broken annularity); timing methods; information on photographing or videotaping the eclipse either directly or by projection; visual observing methods; local arrangements known at the time; figures illustrating the different types of annularity, a radial diagram in ten-degree sectors for helping visual observers using projection, and sequences illustrating the eclipse as seen from the annularity limits and central line; a copy of the notice which we had prepared for last year's total solar eclipse; and, in some cases, copies of 1:250,000-scale maps showing the broken and partial annularity zone from Greensboro, NC, to Assateague Island, MD.

The regional coordinators are contacting local coordinators in their regions. The local coordinators are scouting out specific sites and are to report planned meeting times and places to the regional coordinators and to us. In a future notice, we plan to include as many of the local coordinators as possible, with meeting times and places, so that anyone can be redirected to someone who has detailed local information, in case weather forces many to travel to regions they had not originally planned for observation. The local coordinators have been asked to locate many extra observing sites for possible use by others coming from outside their areas.

If you are planning to observe the eclipse, please contact the coordinator for the region in which you plan to observe, so that you can obtain accurate local information. This also will help local coordinators in knowing how many observers to expect in

their areas. You should send the coordinator a long, self-addressed stamped envelope. For 20¢ postage, the coordinator can send one page of local information and the text part of the 1st coordinator's notice. For 37¢, more local information (perhaps some maps) and/or the 1983 eclipse notice can be enclosed. The figures can be included also with 54¢, and the computer predictions for a total postage of 71¢ (a very fat envelope).

The observations of the total solar eclipse in Java last June apparently indicated a north shift of about a kilometer. Since the moon and the earth were in approximately the same part of their orbits then as they will be on May 30th, a similar shift probably will occur this year. Early in May, we will analyze the 1983 data to determine the shift that occurred then, and pass this result on to the regional coordinators. The narrowness of the path of annularity makes precise positioning more important for this eclipse than for most others.

Most IOTA members in North America probably have received a mailing from Hanssen International, Inc., giving information about the IOTA/Johnson Space Center Astronomical Society expedition organized by Paul Maley to observe the total solar eclipse in Papua New Guinea on November 22nd, with visits to New Zealand and Australia. This is not the only IOTA expedition for the November eclipse; Hans Bode also has organized an expedition for European observers to travel to Indonesia and observe the eclipse from West Irian. The plan is for Bode's group, and perhaps another expedition from Australia, to try to cover the southern limit while Maley's group observes near the northern limit. Some tentative plans had been made earlier to observe the eclipse near the southern limit on Sandy Island, shown as a large sand bar on many maps. These plans were abandoned when checking Landsat imagery and recent nautical records showed that the island no longer exists, and is under water.

The revised solar radius results published on p. 119 of the last issue need some revision, or at least explanation. The corrections listed used all observations, central as well as polar (those made near the eclipse limits). The results for 1925 were dominated by central timings, while the others mainly resulted from observations near the edges of the eclipse paths. If only polar data were used, the results for 1925 and 1979 would be $+0''.51 \pm 0''.08$ and $-0''.10 \pm 0''.07$, respectively. For reasons which have been explained in other articles, we feel that the edge observations give the most accurate result. Hence, the solar radius appears to have been significantly larger in 1925 than in 1979, not the relatively insignificant difference which one might infer from the numbers published last time.

Since this issue of *O.N.* probably will be distributed before the 2nd eclipse coordinators' notice, we will correct some of the information given in the 1st notice about local arrangements. Michael Watson's organizational efforts are for the Royal Astronomical Society of Canada. They will have at least one full bus with at least 47 observers. The Petersburg National Military Park, which they plan to use, is well located astride the path of broken annularity and is probably the best site in the Petersburg area. The statement in the 1st coordinators' notice about it being south of the broken an-

nularity zone is wrong; that was caused by our misinterpretation of the park's location on the 1:250,000-scale map of the area. Also, the R.A.S.C.'s alternate site is not near Greenville, NC; specifically, it is at the Guilford Ch. National Military Park, also within the zone of broken annularity, in the northern suburbs of Greensboro. The A.A.V.S.O. has changed its meeting to the Petersburg Holiday Inn - north, which is within the broken annularity zone near the junction of I-85 and I-95 not far from the R.A.S.C.'s site. We plan to observe with the National Capital Astronomers, tentatively planning to stay Tuesday night at the Econolodge in South Hill, VA, about 45 miles southwest of Petersburg. We plan to observe from open rural country around Bishops Corner, 10 miles to the north, from some of the same sites where we observed a spectacular graze of 115 Tauri on 1979 April 30.

UPCOMING ASTEROIDAL OCCULTATIONS

David W. Dunham

The next North American events for which "last-minute" astrometric updates are planned are the occultations by (21) Lutetia on May 16 (the moon will be 98% sunlit waning and 30° away at the time; astrometry will be difficult, since two days before, the 99% sunlit waxing moon will pass $1''.5$ away); (704) Interamnia on June 18 (new event, see below); perhaps (145) Adeona on June 24; and (209) Dido on June 30. North American astrometry will be impossible for the occultation by (326) Tamara on June 4; nevertheless, observers with a good southern horizon, especially in the southwestern U.S.A., are encouraged to try to follow the star for a possible occultation. In addition to the telephone numbers given on p. 131 of the last issue, last-minute prediction updates can now also be obtained from the answering machine at the Astronomical Society of Harrisburg's observatory at Lewisberry, PA, phone 717,938-6041; and from a machine which we recently put on our home phone line in Silver Spring, MD, at 301,585-0989. We plan to get a separate number, which will be used primarily for the answering machine, but until we get it and can announce it in *O.N.*, the above number will be used. Messages up to 30 minutes long also can be left! Incoming messages can be retrieved, and the outgoing message updated, from any remote telephone, which would have been very convenient for last year's Pallas and Nemausa events!

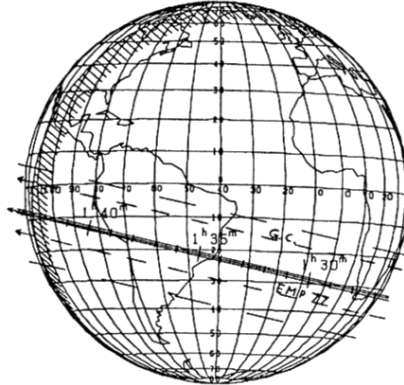
J. Lecacheux at Paris Observatory, Meudon, France, says that the Bordeaux photoelectric transit telescope will be used, when weather and astronomical circumstances permit, to update predictions for asteroidal occultations which might occur in western Europe. See the article on observations starting on p. 148 for accounts of recent successes with this instrument. Gordon Taylor in England, Joe Churms in South Africa, and perhaps others will attempt last-minute astrometry for other events.

Bob Millis, Otto Franz, Larry Wasserman, and Ted Bowell have found several asteroidal occultations of uncatalogued stars by the larger asteroids during 1984, similar to the ones they found for 1983 described in *O.N.* 3 (2), 25. A list of these will be published in the next issue, after they have appeared in an article by the Lowell astronomers in the May issue of the *Astronomical Journal*. Some occultations of Astrographic Catalog stars by (51) Ne-

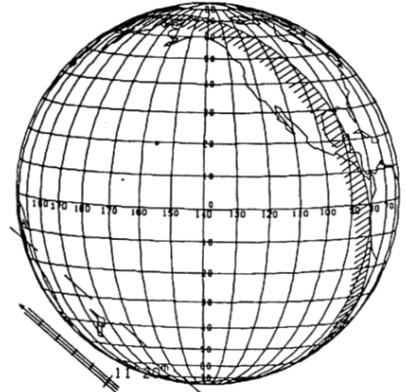
mausa which I have found occurring during the last months of the year also will be included in the next issue. But in order to give observers some time to plan observations, information about two events in June are given here. On June 10, from U.T. 12^h 2^m to 8^m, (704) Interamnia (diameter 339 km, mag. 10.8, distance 2.09 A.U.) will occult 10.9-mag. L944915 at 1950 R.A. 19^h 1^m 8, Dec. -24° 41', Δm=0.7, central duration 30 seconds. The nominal path crosses New Zealand and Queensland. An 88% sunlit moon will be 65° away. On June 18, Interamnia will occult 12.2-mag. L944503 at 1950 R.A. 18^h 55^m 4, Dec. -24° 14', Δm=0.2, central duration 27 seconds. My nominal path just barely misses the earth's surface, but a reasonable south shift would put the path across the U.S.A. A 78% sunlit waning moon will be 41° away. The 97% sunlit waning moon will pass only 2° away on June 15, complicating the last-minute astrometry planned for this event.

Bob Millis recently checked the Astrographic Catalog star predicted to be occulted by (9) Metis on May 18th, and discovered that it was in both the AGK3 and SAO catalogs. The SAO gives its spectral type as K0 and mag. 9.2, much brighter than the blue-sensitive A.C. magnitude. That's the good news; the bad news is that the position is much different, so that the occultation path will miss the earth's surface. That's why it wasn't found in earlier catalog searches at Lowell and Royal Greenwich observatories. The star, SAO 118990 = B.D. +9° 2533, has a proper motion of almost 12"/century in R.A. At the A.C. epoch of 1905, the SAO and A.C. R.A.'s differ by only 1".2, but now the difference is about 6". The proper motion in Dec. is very small and all declinations agree within about 1". Klemola did not realize this a few weeks ago, when he obtained three Lick Observatory exposures on March 29th including both the star and Metis. The Metis ephemeris was only about 1" off and his position of the star is about 1".6 from the SAO position and 7" from the A.C. position. The Lick data confirm that the path will miss the earth's surface by 3" to the north, so we will not publish a finder chart, or regional or world maps for this event; even the possible satellite would miss by at least 2".

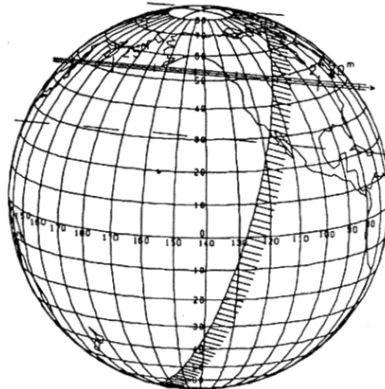
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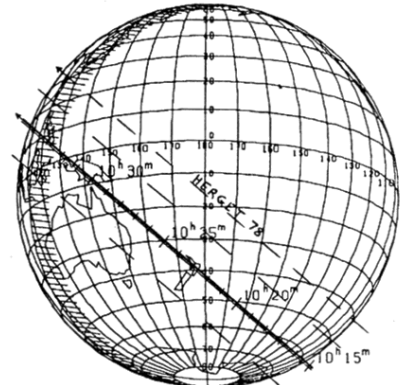
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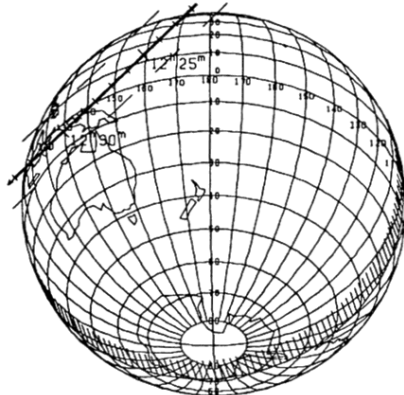
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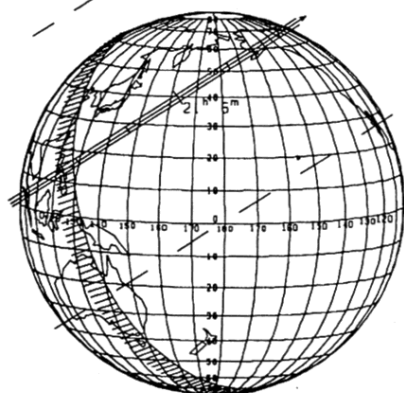
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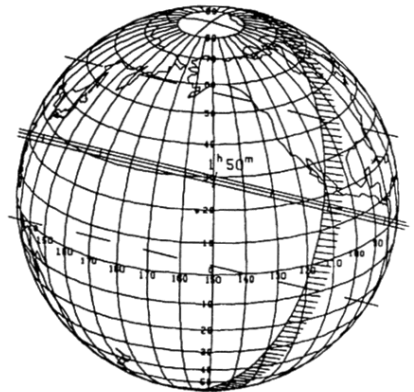
SAO 226309 by Tamara 1984 May 11



SAO 159094 by Mars 1984 May 12

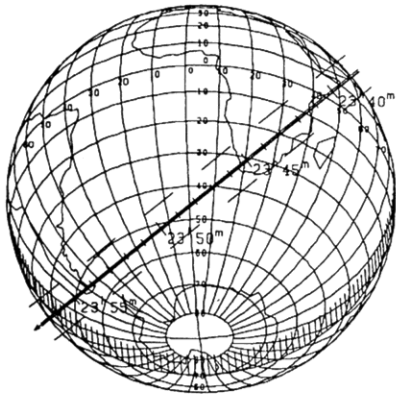
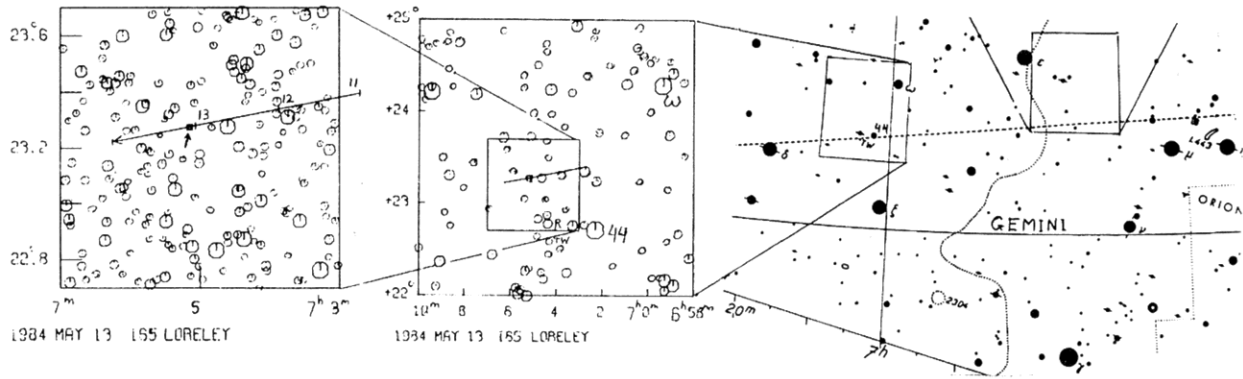


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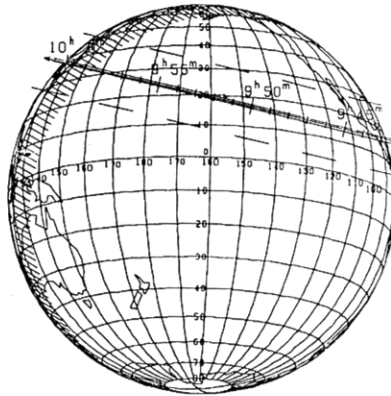


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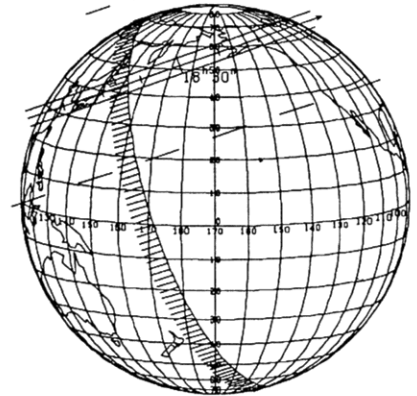
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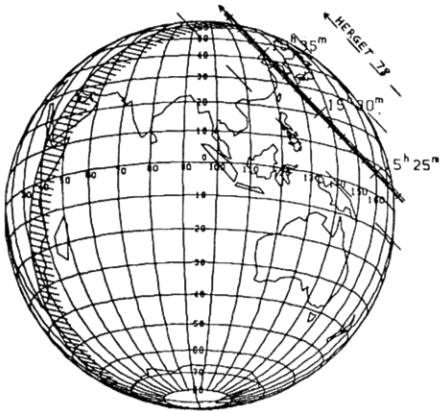
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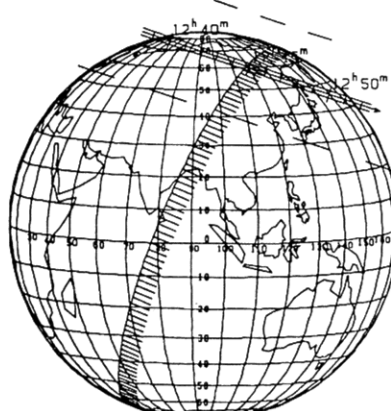
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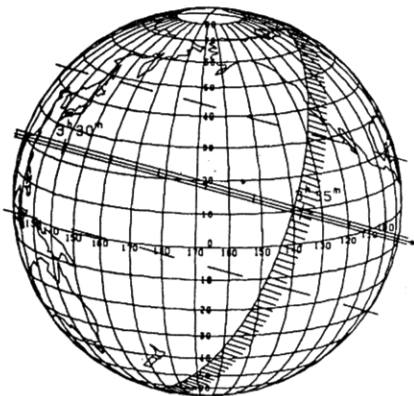
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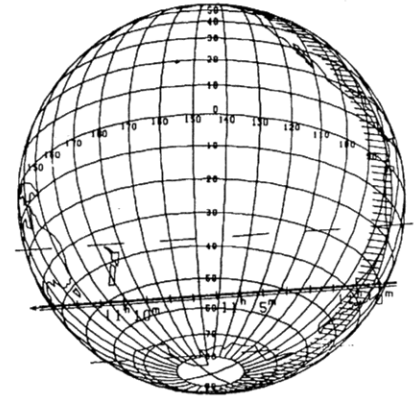
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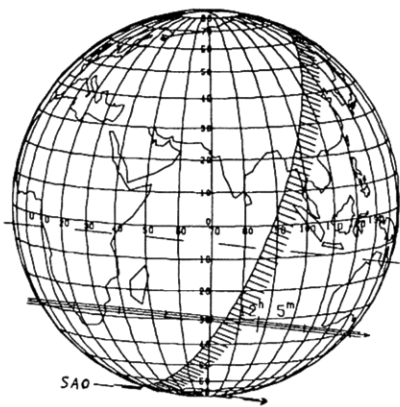
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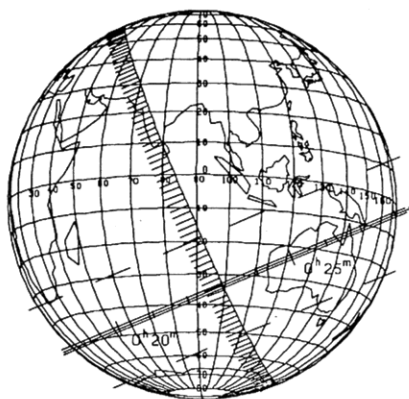
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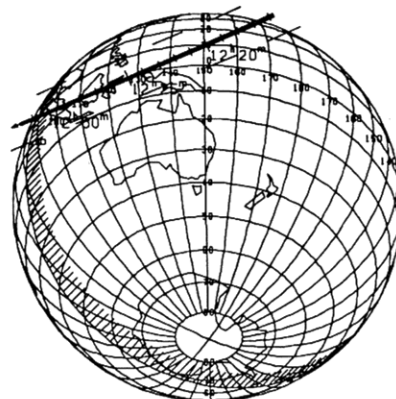
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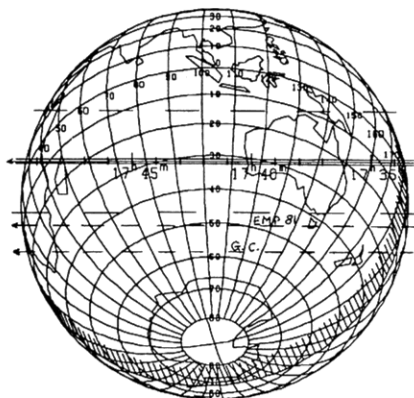
SAO 117560 by Io 1984 Jun 1



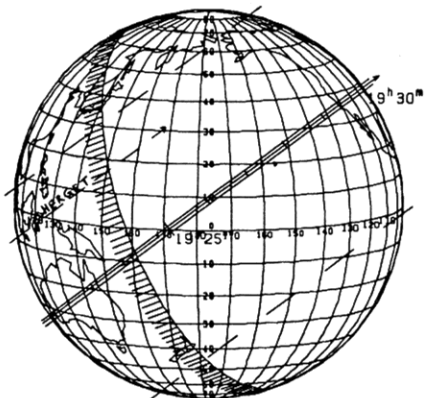
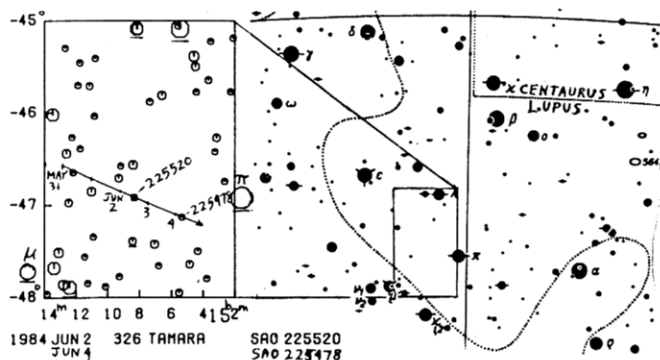
SAO 146574 by Aglaja 1984 Jun 2



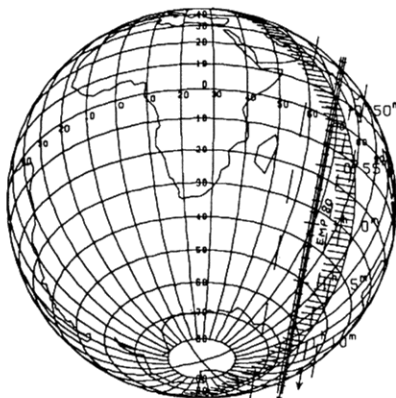
SAO 225520 by Tamara 1984 Jun 2



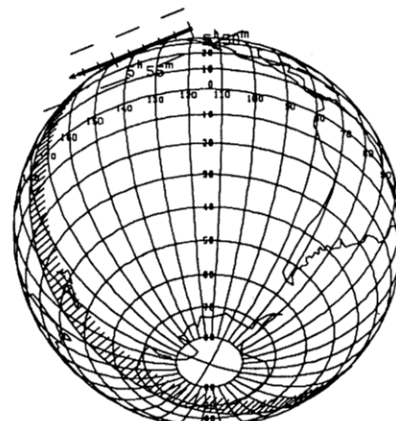
SAO 227909 by Marianna 1984 Jun 2



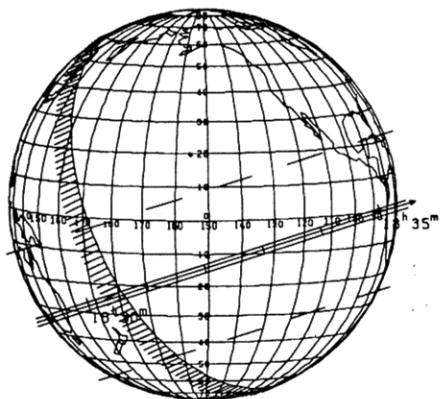
Anonymous by Hektor 1984 Jun 2



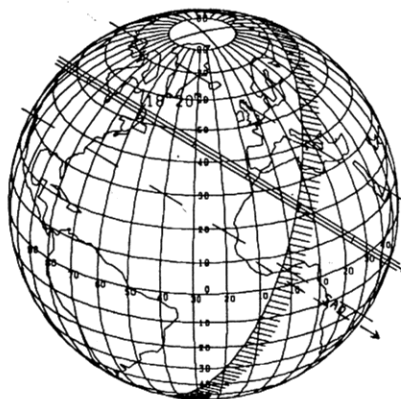
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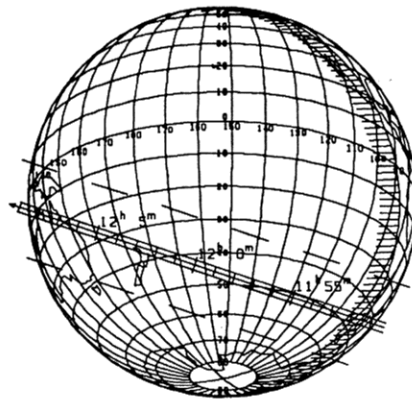
SAO 225478 by Tamara 1984 Jun 4



Anonymous by Eugenia 1984 Jun 4

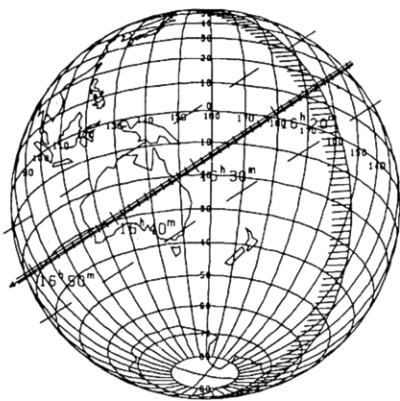


SAO 80995 by Egeria 1984 Jun 8

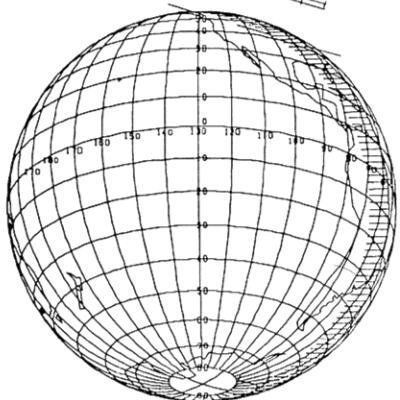


L944915 by Interamnia 1984 Jun 10

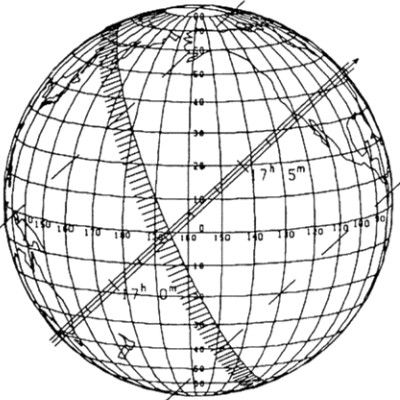
SAO 189495 by Dido 1984 Jun 14



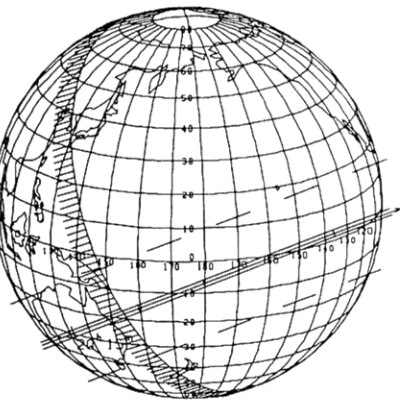
L944503 by Interamnia 1984 Jun 18



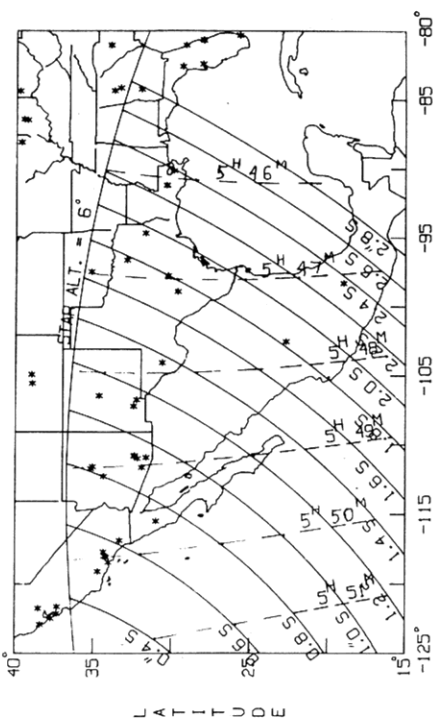
Anonymous by Hektor 1984 Jun 20



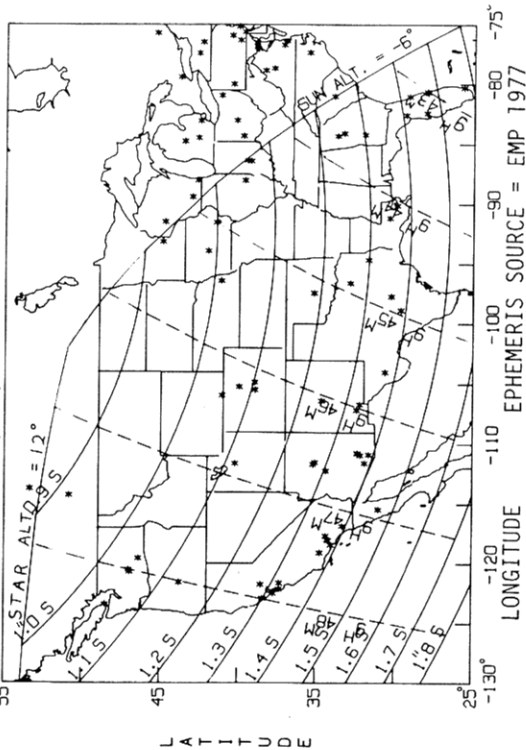
Anonymous by Iris 1984 Jun 23



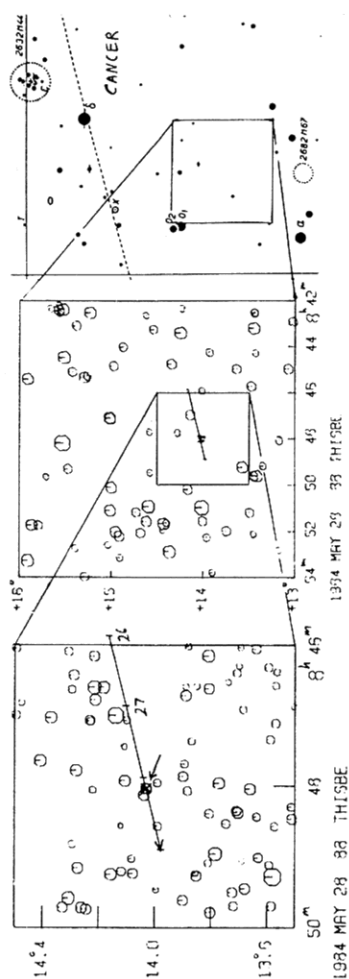
1984 6 4 (326) TAMARA SAO 225478
DIAMETER 90 KM = 0".13



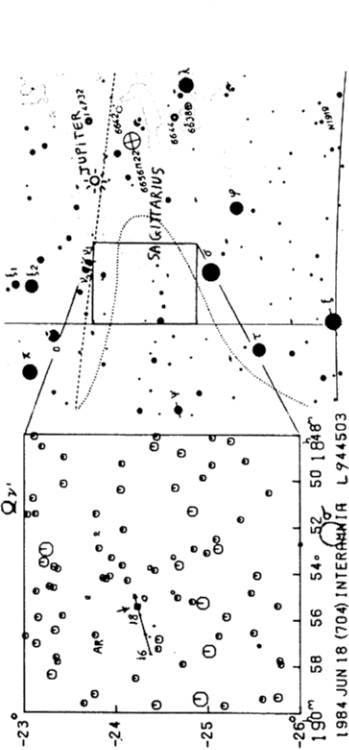
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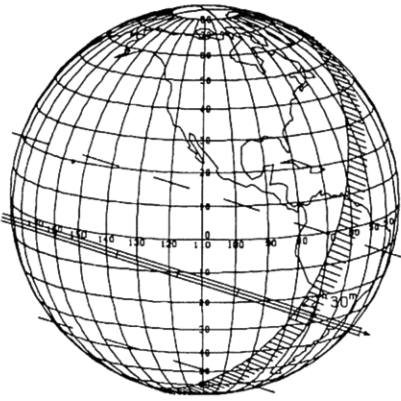
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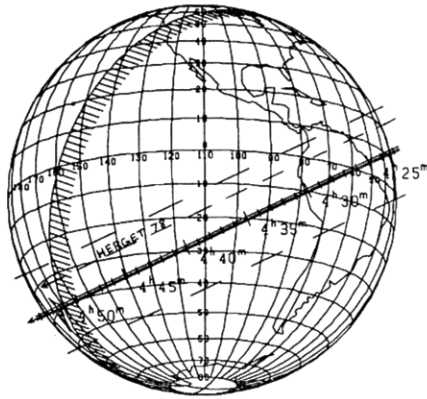
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1984 JUN 18 (704) INTERAMNIA L-944503



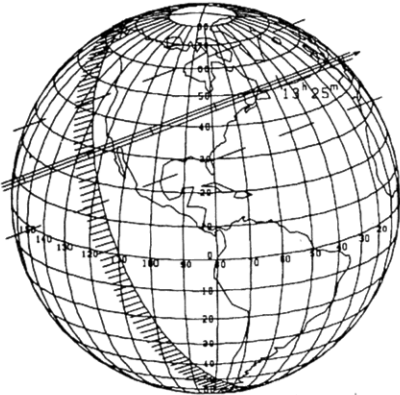
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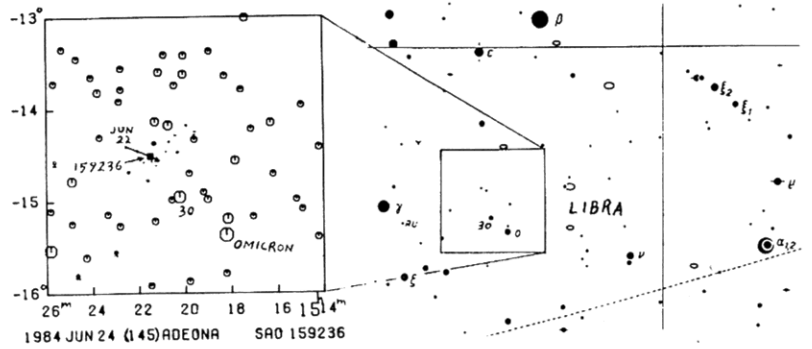
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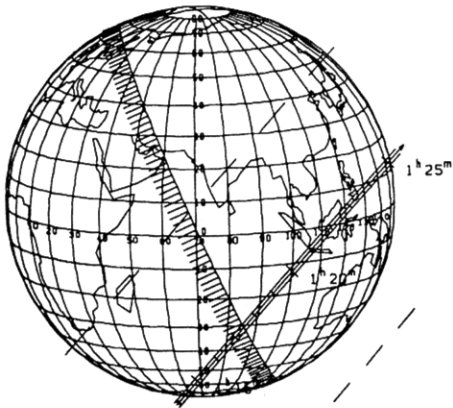
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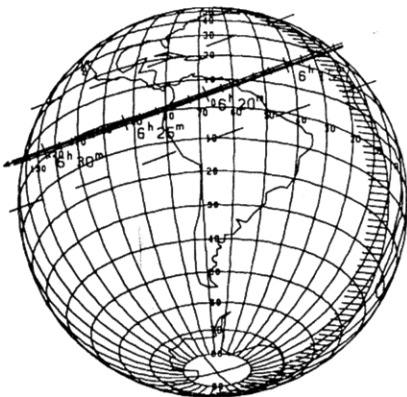
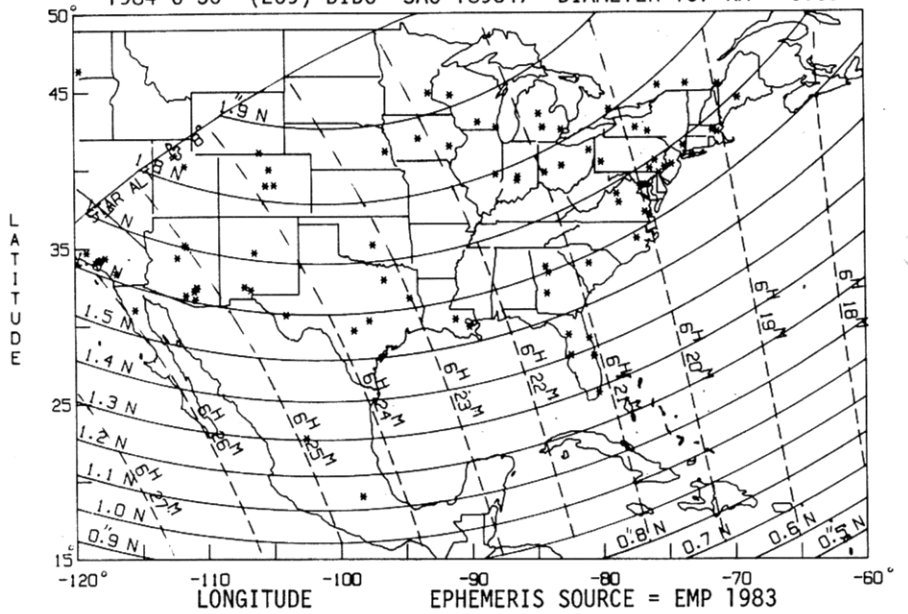
Anonymous by Iris 1984 Jun 27



1984 6 30 (209) DIDO SAO 189347 DIAMETER 137 KM = 0"09



Anonymous by Hektor 1984 Jun 29



SAO 189347 by Dido 1984 Jun 30

