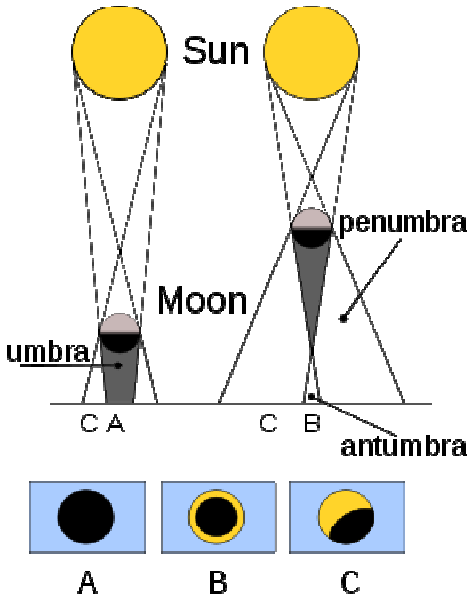
◉ கிரகணங்கள்

சர்வதேச தேதி	கிரகணம்	தோன்றுதல்
20 & 21 மே 2012 20&21 May 2012	பகுதி சூரிய கிரகணம் Annular Solar eclipse	வடகிழக்கு இந்தியாவில் தெரியும்
4 ஜூன் 2012 4 June 2012	பகுதி சந்திர கிரகணம் Partial Lunar Eclipse	இந்தியாவில் தெரியாது
13 & 14 நவம்பர் 2012 13 & 14 Nov 2012	முழு சூரிய கிரகணம் Total Solar eclipse	இந்தியாவில் தெரியாது
28 நவம்பர் 2012 28 Nov 2012	புறநிழல் சந்திர கிரகணம் Penumbral Lunar Eclipse	இந்தியாவில் தெரியும்

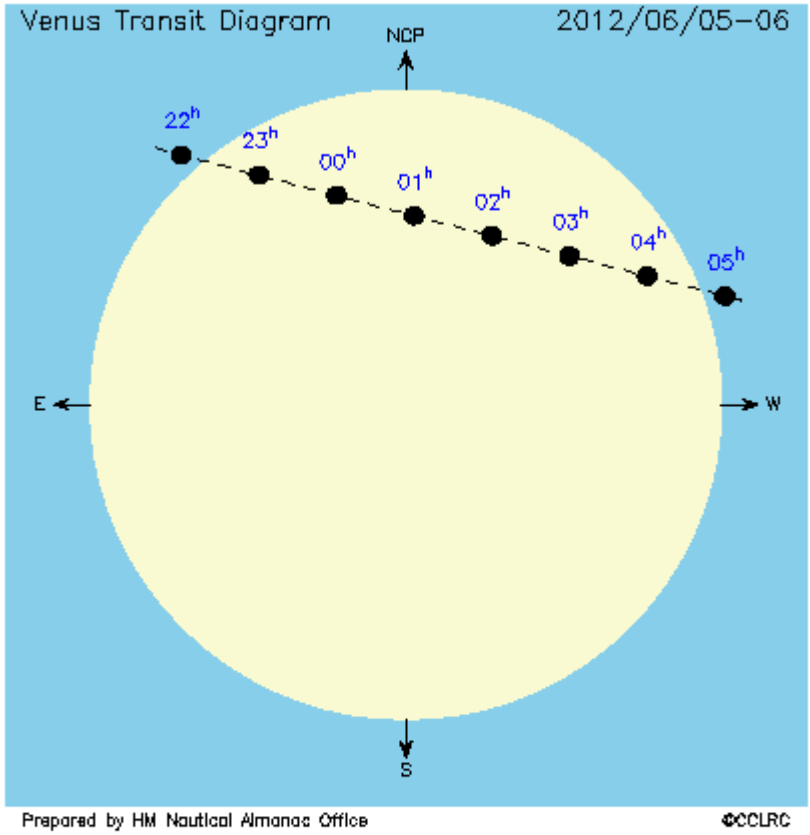


A Total eclipse in the umbra.
B Annular eclipse in the antumbra.
C Partial eclipse in the penumbra

◉ சுக்கிரன் சூரிய விட்டத்தை கடத்தல்

5 & 6 June 2012 Venus Transit

இந்தியாவில் தெரியும்



Geocentric Circumstances

Exterior ingress on	2012/06/05 at $22^h09^m40^s6$ UT
Interior ingress on	2012/06/05 at $22^h27^m28^s7$ UT
Minumum separation on	2012/06/06 at $01^h29^m35^s9$ UT of 554".4
Interior egress on	2012/06/06 at $04^h31^m42^s8$ UT
Exterior egress on	2012/06/06 at $04^h49^m30^s9$ UT

சுக்கிரன் கடப்பு

6.6.2012

சுக்கிரன் கிரகம் சூரியனின் விட்டத்தை கடக்கும் மிகஅற்புதமான நிகழ்வு 6.6.2012 அன்று சென்னையில் தெரியும். இதை பிர்லா கோளரங்கத்தில் தகுந்த கண் பாதுகாப்புடன் நுன்னொளி கருவி மூலம் காணலாம்.

6.6.2012 அன்று சூரிய உதயத்திற்கு முன்னரே சுக்கிரன் சூரியனின் விளிம்பை தொட்டுவிடுகிறது. மொத்தம் 6 மணி 40 நிமிடங்கள் நிகழும் .

சென்னையில் சூரிய உதயத்தில் சுக்கிரன் கருப்பு புள்ளியாக சூரியனின் விட்டத்தின் உள்புறம் தெரியும்

சென்னையில் இந்திய நேரப்படி காலை 10:21 வரை இந்த நிகழ்வை காணலாம்

சென்னை சூரிய உதயம் 5:43

மீண்டும் நூறு ஆண்டுகளுக்கு பிறகு
2117 Dec 11 அன்று சுக்கிர கடவு நிகழும்

பாலு சரவண சர்மா
புரோகிதர் - ஜோதிடர் - பஞ்சாங்க கணிதம்
www.prohithar.com

Thanks to Positional Astronomy Centre, Kolkata, India

ECLIPSES, 2012

In the year 2012, there are two eclipses of the Sun, one eclipse of the Moon and one transit of Venus.

I	May	20-21	Annular eclipse of the Sun	320-327
II	June	4	Partial eclipse of the Moon	332
III	June	5-6	Transit of Venus	334 - 338
IV	November	13-14	Total eclipse of the Sun	328 - 331

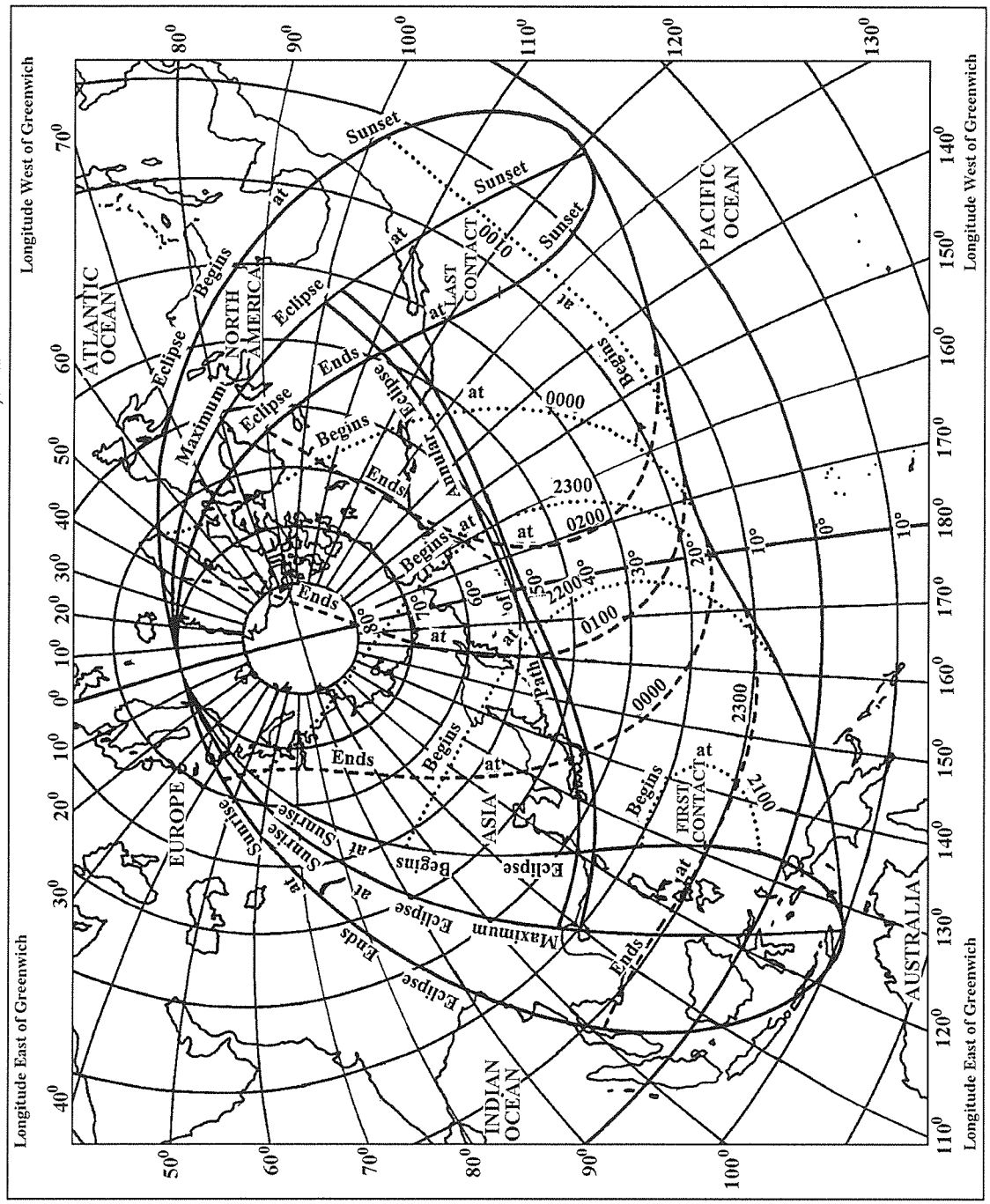
In addition, there is a penumbral eclipse of the Moon	November 28	333

I-Annular Eclipse of the Sun, May 20-21, 2012, Sunday-Monday.
Visible in India

ELEMENTS OF THE ECLIPSE						
Universal Time of Conjunction in Right Ascension : May 20^{d} 23^{h} 59^{m} $9^{s}.055$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	3	52	44.12	3	52	44.12
Hourly Motion			125.99			10.03
	°	'	"	°	'	"
Declination	20	39	28.82	20	13	18.34
Hourly Motion		3	28.81			30.25
Equatorial Horizontal Parallax		54	3.85			8.69
True Semi-diameter		14	43.89		15	50.25

CIRCUMSTANCES OF THE ECLIPSE										
	Universal Time			Indian Standard Time			Latitude		Longitude	
	d	h	m	d	h	m	°	'	°	'
Eclipse begins	20	20	56.1	21	2	26.1	+10	53.2	+131	03.7
Central eclipse begins	20	22	09.0	21	3	39.0	+21	08.9	+108	42.4
Greatest eclipse*	20	23	52.8	21	5	22.8	+49	05.4	+176	16.6
Central eclipse ends	21	1	36.5	21	7	06.5	+32	54.7	-101	10.1
Eclipse ends	21	2	49.4	21	8	19.4	+22	48.0	-124	-16.7

*Magnitude of the eclipse = 0.945 : Maximum duration of annular phase = 5m 42s


ANNULAR SOLAR ECLIPSE OF MAY 20-21, 2012
Longitude East of Greenwich
Longitude West of Greenwich
ATLANTIC OCEAN
NORTH AMERICA
PACIFIC OCEAN
EUROPE
ASIA
INDIAN OCEAN
AUSTRALIA
Sunset
Eclipse Begins
Eclipse Ends
Maximum Eclipse
Sunrise
Annular Path
FIRST CONTACT
LAST CONTACT
0000
0100
0200
2300
2200
2100
The timings of beginning and ending are expressed in UT

ECLIPSES, 2012

BESSELIAN ELEMENTS OF THE ANNULAR ECLIPSE OF THE SUN

MAY 20-21

Terrestrial Time (TT)		Co-ordinates of the Centre of Shadow on the Fundamental Plane		Direction of the Axis of Shadow *					Radius of Penumbra and Umbra on the Fundamental Plane	
h	m	x	y	sin d	cos d	μ °	'	"	l_1	l_2
20	50	-1.595153	0.306580	+0.345205	+0.938527	133	21	16.9	+0.566511	+0.020025
21	00	-1.511335	0.316064	+0.345228	+0.938519	135	51	17.3	+0.566516	+0.020030
	10	-1.427514	0.325541	+0.345250	+0.938511	138	21	17.6	+0.566520	+0.020034
	20	-1.343688	0.335011	+0.345273	+0.938502	140	51	18.0	+0.566524	+0.020038
	30	-1.259859	0.344473	+0.345296	+0.938494	143	21	18.4	+0.566527	+0.020041
	40	-1.176027	0.353927	+0.345318	+0.938486	145	51	18.7	+0.566530	+0.020044
	50	-1.092190	0.363374	+0.345341	+0.938477	148	21	19.1	+0.566532	+0.020046
22	00	-1.008352	0.372813	+0.345364	+0.938469	150	51	19.4	+0.566533	+0.020047
	10	-0.924510	0.382244	+0.345386	+0.938461	153	21	19.8	+0.566534	+0.020048
	20	-0.840665	0.391668	+0.345409	+0.938452	155	51	20.2	+0.566535	+0.020049
	30	-0.756818	0.401084	+0.345431	+0.938444	158	21	20.5	+0.566535	+0.020049
	40	-0.672969	0.410492	+0.345454	+0.938436	160	51	20.9	+0.566534	+0.020048
	50	-0.589117	0.419893	+0.345477	+0.938427	163	21	21.2	+0.566533	+0.020047
23	00	-0.505263	0.429286	+0.345499	+0.938419	165	51	21.6	+0.566531	+0.020045
	10	-0.421408	0.438671	+0.345522	+0.938411	168	21	22.0	+0.566529	+0.020043
	20	-0.337549	0.448048	+0.345544	+0.938402	170	51	22.3	+0.566526	+0.020040
	30	-0.253690	0.457418	+0.345567	+0.938394	173	21	22.7	+0.566523	+0.020037
	40	-0.169830	0.466780	+0.345590	+0.938386	175	51	23.0	+0.566519	+0.020033
	50	-0.085967	0.476134	+0.345612	+0.938377	178	21	23.4	+0.566515	+0.020029
24	00	-0.002104	0.485480	+0.345635	+0.938369	180	51	23.8	+0.566510	+0.020024
	10	0.081760	0.494819	+0.345657	+0.938361	183	21	24.1	+0.566504	+0.020019
	20	0.165626	0.504149	+0.345680	+0.938352	185	51	24.5	+0.566498	+0.020013
	30	0.249491	0.513472	+0.345702	+0.938344	188	21	24.8	+0.566492	+0.020006
	40	0.333357	0.522787	+0.345725	+0.938336	190	51	25.2	+0.566484	+0.019999
	50	0.417225	0.532093	+0.345747	+0.938328	193	21	25.6	+0.566477	+0.019991
25	00	0.501091	0.541392	+0.345770	+0.938319	195	51	25.9	+0.566469	+0.019983
	10	0.584958	0.550683	+0.345793	+0.938311	198	21	25.9	+0.566460	+0.019974
	20	0.008826	0.559967	+0.345815	+0.938303	200	51	26.6	+0.566451	+0.019965
	30	0.752692	0.569242	+0.345838	+0.938294	203	21	26.6	+0.566441	+0.019955
	40	0.836559	0.578509	+0.345860	+0.938286	205	51	27.0	+0.566430	+0.019945
	50	0.920425	0.587768	+0.345883	+0.938278	208	21	27.4	+0.566419	+0.019934
26	00	1.004290	0.597019	+0.345905	+0.938269	210	51	27.7	+0.566408	+0.019923
	10	1.088154	0.606262	+0.345928	+0.938261	213	21	28.1	+0.566396	+0.019911
	20	1.172018	0.615497	+0.345950	+0.938253	215	51	28.4	+0.566383	+0.019899
	30	1.255879	0.624724	+0.345973	+0.938244	218	21	28.8	+0.566370	+0.019886
	40	1.339740	0.633943	+0.345995	+0.938236	220	51	29.2	+0.566357	+0.019872
	50	1.423600	0.643154	+0.346018	+0.938228	223	21	29.5	+0.566342	+0.019858
27	00	1.507457	0.652357	+0.346040	+0.938219	225	51	29.9	+0.566328	+0.019843

$\tan f_1 = 0.004620$ $\tan f_2 = 0.004597$

TT hr	d °	'	"	Variations per minute x'	y'	μ' '	"
21	20	11	45	+0.008 382	+0.000 948	15	00
22	20	12	14	+0.008 384	+0.000 943	15	00
23	20	12	44	+0.008 386	+0.000 939	15	00
24	20	13	14	+0.008 386	+0.000 940	15	00
25	20	13	44	+0.008 387	+0.000 929	15	00
26	20	14	13	+0.008 386	+0.000 924	15	00

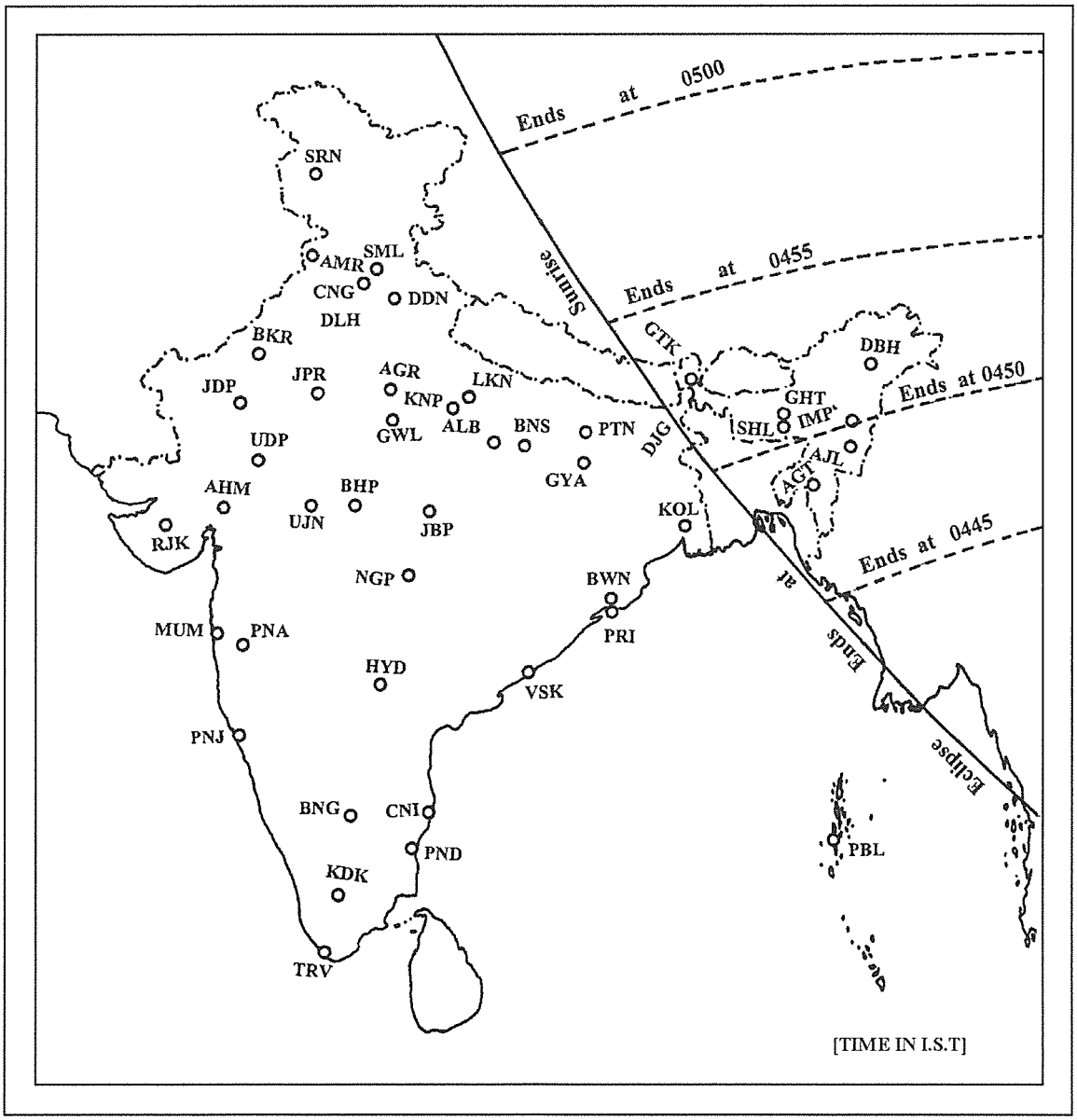
$\xi' = 0.004364\rho\cos\phi'\cos(\mu+\lambda)$ $\eta' = 0.004364\xi\sin d$

*d stands for declination and μ , hour angle

PATH OF CENTRAL PHASE DURING THE ANNULAR ECLIPSE OF THE SUN
MAY 20-21

Terrestrial Time (TT)	Northern Limit		Central Line		Southern Limit		Central Line
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration of annularity
	° ′	° ′	° ′	° ′	° ′	° ′	
Limit	+22 22.2	+107 45.7	+21 08.9	+108 42.4	+19 56.6	+109 37.3	- -
h m							
22 20	+30 12.4	+126 14.7	+29 50.7	+128 40.6	+29 25.3	+130 52.2	4 43
30	34 21.5	134 33.2	33 46.2	136 21.4	33 09.7	138 02.5	4 55
40	37 30.2	140 42.5	36 48.4	142 13.5	36 06.3	143 39.4	5 05
50	40 06.9	+145 58.3	39 20.8	+147 17.8	+38 34.7	+148 33.3	5 14
23 00	+42 21.4	+150 47.8	+41 32.0	+151 58.1	+40 42.7	+153 04.9	5 21
10	44 18.5	155 24.8	43 26.1	156 26.8	42 34.0	157 25.7	5 27
20	46 00.3	159 57.8	45 05.2	160 51.5	44 10.7	161 42.5	5 33
30	47 28.0	164 32.3	46 30.6	165 17.4	45 33.8	166 00.2	5 37
40	48 42.0	169 12.3	47 42.4	169 48.1	46 43.7	170 22.1	5 40
50	+49 42.2	+174 00.6	+48 40.8	+174 26.3	+47 40.3	+174 50.8	5 42
24 00	+50 28.1	+176 59.4	+49 25.3	+179 14.0	+48 23.5	-180 31.8	5 42
10	50 59.0	-175 49.8	49 55.2	-175 47.1	48 52.5	175 44.2	5 41
20	51 13.8	170 25.6	50 09.6	170 35.9	49 06.4	170 45.1	5 38
30	51 11.2	164 46.7	50 07.2	165 10.9	49 04.2	165 33.0	5 34
40	50 49.4	158 51.3	49 46.4	159 30.3	48 44.3	160 06.1	5 29
50	+50 06.0	-152 36.0	+49 04.9	-153 30.8	+48 04.4	-154 21.2	5 22
25 00	+48 57.2	-145 54.3	+47 59.2	-147 06.4	+47 01.5	-148 12.8	5 15
10	47 16.3	138 32.6	46 23.3	140 04.9	45 30.0	141 29.9	5 05
20	44 49.5	129 58.2	44 05.0	131 58.6	43 19.1	133 48.5	4 54
30	+40 51.4	-118 19.2	+40 28.9	-121 21.4	+40 00.1	-123 59.9	4 40
Limit	+34 06.1	-100 06.1	+32 54.7	-101 10.1	+31 44.1	-102 11.8	- -

ANNULAR SOLAR ECLIPSE OF MAY 20-21, 2012



ANNULAR ECLIPSE OF THE SUN, MAY 20-21
LOCAL CIRCUMSTANCES RELATING TO INDIA

ENDING OF ECLIPSE FOR STATIONS IN INDIA
TIME IN I.S.T

Latitude (North)	Longitude (East of Greenwich)					
	80°	84°	88°	92°	96°	100°
36°	h m 5 01.0	h m 5 00.0	h m 4 59.3	h m 4 59.0	h m 4 59.1	h m 4 59.5
32°	- - (05 09)	4 57.0	4 56.1	4 55.4	4 55.2	4 55.4
28°	- - (05 17)	- - (05 01)	4 52.9	4 52.0	4 51.4	4 51.2
24°	- - (05 25)	- - (05 09)	- - (04 53)	4 48.6	4 47.7	4 47.1
20°	- - (05 32)	- - (05 16)	- - (05 00)	4 45.2	4 43.9	4 43.1
16°	- - (05 39)	- - (05 23)	- - (05 07)	- - (04 51)	4 40.2	4 38.9
12°	- - (05 45)	- - (05 29)	- - (05 13)	- - (04 57)	- - (04 41)	4 34.7

Note : (1) "- -" indicates eclipsed Sun rises at the stations.
(2) "( )" indicates figures in the brackets are sunrise times.

ECLIPSES, 2012

ANNULAR ECLIPSE OF THE SUN, MAY 20-21

LOCAL CIRCUMSTANCES OF THE ECLIPSE RELATING TO CERTAIN PLACES IN INDIA AND NEIGHBOURHOOD WHERE THE PARTIAL PHASE IS VISIBLE

Place	Eclipse begins (I.S.T) h m	Greatest phase (I.S.T) h m	Eclipse ends (I.S.T) h m	P °	V °	Sunrise Time (I.S.T.)
Agartala	- -	- -	4 48.4	87	152	4 41
Aizawl	- -	- -	4 48.0	86	152	4 36
Coochbehar	- -	- -	4 51.1	91	154	4 44
Darjeeling	- -	- -	4 52.1	93	154	4 46
Dibrugarh	- -	- -	4 50.9	90	153	4 18
Gangtok	- -	- -	4 52.2	93	154	4 45
Guwahati	- -	- -	4 50.5	90	153	4 35
Imphal	- -	- -	4 48.5	87	152	4 30
Itanagar	- -	- -	4 50.9	90	153	4 25
Kohima	- -	- -	4 49.3	88	153	4 26
Shillong	- -	- -	4 49.8	89	153	4 36
Sibsagar	- -	- -	4 50.3	89	153	4 22
Silchar	- -	- -	4 48.8	88	152	4 34
Siliguri	- -	- -	4 51.6	92	154	4 47
Tamelong	- -	- -	4 49.0	88	152	4 28
Chittagong	- -	- -	4 47.5	86	152	4 40
Dhaka	- -	- -	4 48.8	88	152	4 44
Kathmandu	- -	- -	4 53.5	95	155	4 57
Yangon	- -	- -	4 40.6	75	148	4 33
Thimpu	- -	- -	4 52.0	93	154	4 40

Note: P and V stand for position angles of respective points of contact measured (in degree) From north point and vertex of the solar limb respectively.

"- -" Eclipse begins or at greatest phase before the Sunrise at the station.

THE ANNULAR ECLIPSE OF THE SUN
MAY 20-21
WESTERN LIMIT OF VISIBILITY OF THE ECLIPSE

Latitude	Begins at Sunrise		Maximum at Sunrise		Ends at Sunrise	
	Longitude	Time (I.S.T)	Longitude	Time (I.S.T)	Longitude	Time (I.S.T)
°	° '	h m	° '	h m	° '	h m
+ 5	+132 44	02 28.3	+118 08	03 26.7	+103 33	04 25.0
6	132 32	02 27.6	117 39	03 27.1	102 46	04 26.7
7	132 18	02 27.0	117 09	03 27.6	102 00	04 28.2
8	132 02	02 26.6	116 38	03 28.2	101 14	04 29.8
9	131 43	02 26.3	116 07	03 28.8	100 30	04 31.2
10	131 23	02 26.2	115 35	03 29.4	99 46	04 32.6
11	131 01	02 26.1	115 02	03 30.1	99 02	04 34.0
12	130 37	02 26.2	114 28	03 30.8	98 19	04 35.4
13	130 11	02 26.4	113 54	03 31.5	97 36	04 36.7
14	129 43	02 26.7	113 18	03 32.3	96 54	04 37.9
15	129 13	02 27.1	112 42	03 33.1	96 12	04 39.2
16	128 41	02 27.6	112 06	03 34.0	95 30	04 40.4
17	128 08	02 28.2	111 28	03 34.9	94 48	04 41.5
18	127 32	02 29.0	110 49	03 35.8	94 06	04 42.7
19	126 55	02 29.8	110 10	03 36.8	93 24	04 43.8
20	126 17	02 30.7	109 30	03 37.8	92 43	04 44.9
21	125 36	02 31.7	108 48	03 38.9	92 01	04 46.0
22	124 53	02 32.8	108 06	03 40.0	91 19	04 47.1
23	124 09	02 34.0	107 23	03 41.1	90 37	04 48.2
24	123 23	02 35.3	106 39	03 42.3	89 55	04 49.2
25	122 35	02 36.7	105 54	03 43.5	89 13	04 50.2
26	121 46	02 38.2	105 08	03 44.7	88 30	04 51.2
27	120 55	02 39.7	104 21	03 46.0	87 47	04 52.2
28	120 01	02 41.4	103 32	03 47.3	87 03	04 53.2
29	119 06	02 43.1	102 43	03 48.6	86 20	04 54.2
30	118 09	02 44.9	101 52	03 50.0	85 35	04 55.2
31	117 11	02 46.8	101 01	03 51.4	84 50	04 56.1
32	116 10	02 48.7	100 07	03 52.9	84 05	04 57.1
33	115 07	02 50.8	99 13	03 54.4	83 19	04 58.0
34	+114 03	02 52.9	+98 17	03 55.9	+82 32	04 59.0

Note:- (1) As a result of atmospheric refraction, the Sun is visible about half a degree above the horizon at the stated moment. At that time, the rising of the upper limb of the Sun occurs at places about a degree west of the above line.

(2) The beginning, the middle and the ending phases of the eclipse are not visible at places to the west of the respective lines, as the phases occur before sunrise.

ECLIPSES, 2012

IV-Total Eclipse of the Sun, November 13-14, 2012, Tuesday- Wednesday.

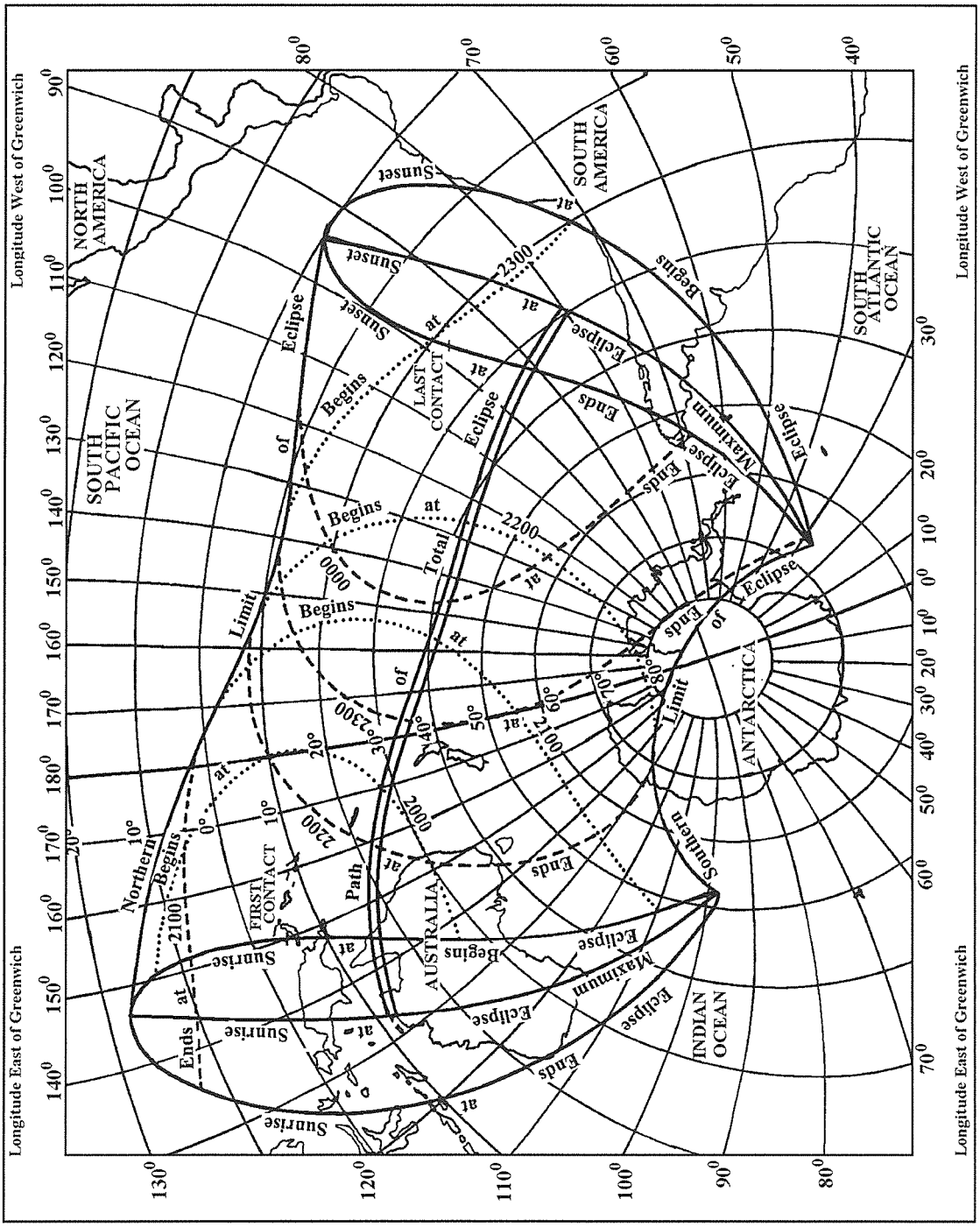
Not visible in India

ELEMENTS OF THE ECLIPSE						
Universal Time of Conjunction in Right Ascension : November 13^d 22^h 18^m $4^s.971$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	15	18	7.81	15	18	7.81
Hourly Motion			158.59			10.25
	°	'	"	°	'	"
Declination	- 18	38	8.91	- 18	15	6.76
Hourly Motion		- 6	22.56			-38.99
Equatorial Horizontal Parallax		61	21.4			8.89
True Semi-diameter		16	43.1		16	12.1

CIRCUMSTANCES OF THE ECLIPSE										
	Universal Time			Indian Standard Time			Latitude		Longitude	
	d	h	m	d	h	m	°	'	°	'
Eclipse begins	13	19	38.0	14	1	08.0	-4	27.6	+150	08.3
Central eclipse begins	13	20	36.1	14	2	06.1	-11	57.2	+133	04.6
Greatest eclipse*	13	22	11.8	14	3	41.8	-39	57.7	+198	39.7
Central eclipse ends	13	23	47.4	14	5	17.4	-29	32.6	-79	58.3
Eclipse ends	14	0	45.6	14	6	15.6	-22	08.7	-97	33.9

*Magnitude of the eclipse = 1.051 : Maximum duration of total phase = 4m 06s

TOTAL SOLAR ECLIPSE OF NOVEMBER 13-14, 2012



BESSELIAN ELEMENTS OF THE TOTAL ECLIPSE OF THE SUN
NOVEMBER 13-14

Terrestrial Time (TT)		Co-ordinates of the Centre of Shadow on the Fundamental Plane		Direction of the Axis of Shadow *					Radius of Penumbra and Umbra on the Fundamental Plane	
h	m	x	y	sin d	cos d	μ °	'	"	l_1	l_2
19	30	-1.619269	-0.110757	-0.312683	+0.949858	116	23	53.2	+0.537444	-0.008897
	40	-1.523602	-0.126550	-0.312713	+0.949848	118	53	53.2	+0.537451	-0.008891
	50	-1.427929	-0.142336	-0.312742	+0.949838	121	23	53.2	+0.537457	-0.008885
20	00	-1.332251	-0.158114	-0.312771	+0.949829	123	53	53.2	+0.537462	-0.008879
	10	-1.236569	-0.173884	-0.312801	+0.949819	126	23	52.8	+0.537466	-0.008875
	20	-1.140880	-0.189647	-0.312830	+0.949809	128	53	52.8	+0.537470	-0.008871
	30	-1.045187	-0.205402	-0.312859	+0.949800	131	23	52.8	+0.537473	-0.008868
	40	-0.949490	-0.221149	-0.312889	+0.949790	133	53	52.8	+0.537476	-0.008866
	50	-0.853788	-0.236888	-0.312918	+0.949780	136	23	52.8	+0.537477	-0.008864
21	00	-0.758084	-0.252619	-0.312947	+0.949771	138	53	52.8	+0.537478	-0.008863
	10	-0.662376	-0.268342	-0.312977	+0.949761	141	23	52.4	+0.537478	-0.008863
	20	-0.566663	-0.284057	-0.313006	+0.949751	143	53	52.4	+0.537478	-0.008864
	30	-0.470948	-0.299764	-0.313035	+0.949742	146	23	52.4	+0.537476	-0.008865
	40	-0.375231	-0.315463	-0.313065	+0.949732	148	53	52.4	+0.537474	-0.008867
	50	-0.279510	-0.331153	-0.313094	+0.949722	151	23	52.1	+0.537472	-0.008870
22	00	-0.183788	-0.346836	-0.313123	+0.949713	153	53	52.1	+0.537468	-0.008873
	10	-0.088064	-0.362510	-0.313152	+0.949703	156	23	52.1	+0.537464	-0.008877
	20	0.007663	-0.378176	-0.313182	+0.949693	158	53	52.1	+0.537459	-0.008882
	30	0.103390	-0.393833	-0.313211	+0.949684	161	23	52.1	+0.537454	-0.008888
	40	0.199118	-0.409483	-0.313240	+0.949674	163	53	51.7	+0.537447	-0.008894
	50	0.294849	-0.425124	-0.313270	+0.949664	166	23	51.7	+0.537440	-0.008901
23	00	0.390578	-0.440756	-0.313299	+0.949655	168	53	51.7	+0.537432	-0.008909
	10	0.486308	-0.456380	-0.313328	+0.949645	171	23	51.7	+0.537424	-0.008918
	20	0.582040	-0.471995	-0.313357	+0.949635	173	53	51.7	+0.537415	-0.008927
	30	0.677770	-0.487602	-0.313387	+0.949626	176	23	51.4	+0.537405	-0.008937
	40	0.773499	-0.503200	-0.313416	+0.949616	178	53	51.4	+0.537394	-0.008948
	50	0.869229	-0.518790	-0.313445	+0.949607	181	23	51.4	+0.537382	-0.008959
24	00	0.964956	-0.534370	-0.313474	+0.949597	183	53	51.4	+0.537370	-0.008971
	10	1.060682	-0.549942	-0.313504	+0.949587	186	23	51.0	+0.537357	-0.008984
	20	1.156408	-0.565506	-0.313533	+0.949578	188	53	51.0	+0.537344	-0.008998
	30	1.252131	-0.581060	-0.313562	+0.949568	191	23	51.0	+0.537330	-0.009012
	40	1.347852	-0.596605	-0.313591	+0.949558	193	53	51.0	+0.537314	-0.009027
	50	1.443572	-0.612142	-0.313621	+0.949549	196	23	50.6	+0.537299	-0.009043
25	00	1.539287	-0.627670	-0.313650	+0.949539	198	53	50.6	+0.537282	-0.009059

$\tan f_1 = 0.004726$ $\tan f_2 = 0.004702$

TT hr	d °	'	"	Variations per minute x'	y'	μ' '	"
20	-18	13	35	+0.009 568	+0.001 577	15	00
21	-18	14	13	+0.009 571	+0.001 572	15	00
22	-18	14	51	+0.009 572	+0.001 567	15	00
23	-18	15	29	+0.009 573	+0.001 562	15	00
24	-18	16	07	+0.008 573	+0.001 557	15	00

$\xi' = 0.004364\rho\cos\phi'\cos(\mu+\lambda)$ $\eta' = 0.004364\xi\sin d$

*d stands for declination and μ, hour angle

PATH OF CENTRAL PHASE DURING THE TOTAL ECLIPSE OF THE SUN
NOVEMBER 13-14

Terrestrial Time (TT)	Northern Limit		Central Line		Southern Limit		Central Line
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration of annularity
	° ′	° ′	° ′	° ′	° ′	° ′	
Limit	-11 26.2	+133 22.4	-11 57.2	+133 04.6	-12 28.3	+132 46.6	- -
h m							
20 40	-16 09.0	+146 15.9	-16 17.4	+144 52.2	-16 23.1	+143 21.9	2 06
50	-21 23.8	+157 57.6	-21 47.1	+157 03.5	-22 09.6	+156 08.0	2 37
21 00	-24 56.6	+165 06.7	-25 25.4	+164 19.4	-25 53.6	+163 31.2	2 57
10	27 49.4	170 47.1	28 22.0	170 03.8	28 54.2	169 19.7	3 14
20	30 17.3	+175 44.2	30 53.1	175 04.2	31 28.6	174 23.4	3 29
30	32 26.8	-179 41.9	33 05.3	+179 41.4	33 43.6	+179 03.9	3 40
40	34 21.1	175 19.9	35 02.0	-175 53.0	35 42.8	-176 27.0	3 50
50	-36 01.9	-171 02.3	-36 44.9	-171 31.5	-37 27.9	-172 01.4	3 57
22 00	-37 30.1	-166 43.9	-38 14.9	-167 08.6	-38 59.7	-167 33.9	4 02
10	38 45.7	162 20.4	39 32.0	162 40.0	40 18.4	163 00.0	4 04
20	39 48.7	157 48.1	40 36.1	158 01.9	41 23.6	158 15.9	4 04
30	40 38.4	153 03.5	41 26.4	153 10.9	42 14.5	153 18.3	4 01
40	41 13.6	148 03.3	42 01.7	148 03.6	42 49.9	148 03.6	3 56
50	-41 32.9	-142 43.3	-42 20.4	-142 36.0	-43 08.0	-142 28.1	3 48
23 00	-41 33.8	-136 58.2	-42 20.0	-136 42.8	-43 06.2	-136 26.4	3 37
10	41 13.0	130 40.4	41 57.0	130 16.3	42 40.9	129 51.0	3 24
20	40 24.7	123 36.3	41 05.3	123 02.9	41 45.6	122 27.9	3 08
30	38 57.9	115 18.2	39 33.4	114 34.0	40 08.3	113 47.9	2 49
40	-36 24.0	-104 28.6	-36 50.3	-103 27.3	-37 15.6	-102 23.2	2 25
Limit	-29 01.8	-80 19.1	-29 32.6	-79 58.4	-30 03.5	-79 37.2	- -

II- Partial Eclipse of the Moon, June 4, 2012, Monday.

Not visible in India.

Eclipse will be visible in the region covering western and central parts of the Americas, the Pacific Ocean, Antarctica, Australasia, Japan and eastern Asia.

The places from where the beginning of the umbral phase is visible at the time of moonset are parts of Brazil, the United States of America and Canada.

The places from where the ending of umbral phase is visible at the time of moonrise are parts of Indian Ocean, eastern parts of China and Russia.

ELEMENTS OF THE ECLIPSE

Universal Time of Opposition in Right Ascension : June $4^d\ 11^h\ 1^m\ 30^s.961$

	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	16	51	33.02	4	51	33.02
Hourly Motion			162.42			10.29
	°	'	"	°	'	"
Declination	-21	39	54.37	22	30	15.54
Hourly Motion			-54.68			16.78
Equatorial Horizontal Parallax		61	4.63			8.67
True Semi-diameter		16	38.54		15	48.03

CIRCUMSTANCES OF THE ECLIPSE

	Universal Time			Indian Standard Time			Position Angle measured from the North Point of Moon's Limb (N.E.S.W.)	The Moon being in the Zenith in			
								Latitude		Longitude	
	d	h	m	d	h	m	°	°	'	°	'
Moon enters penumbra	4	8	46.5	4	14	16.5	144	-20	38	-133	26
Moon enters umbra	4	9	59.3	4	15	29.3	144	-21	39	-150	55
Middle of the eclipse*	4	11	03.2	4	16	33.2	--	-21	40	-166	13
Moon leaves umbra	4	12	07.1	4	17	37.1	217	-21	41	+178	29
Moon leaves penumbra	4	13	19.9	4	18	49.9	239	-21	42	+160	45

*Magnitude of the eclipse =0.376 (Moon's diam =1.0). Distance between the centers at middle 3020".3

Radius of shadow cone at Moon's distance : Penumbra 4707".5, Umbra 2773".5

EASTERN AND WESTERN LIMITS OF VISIBILITY

Eastern Limit Moonset at beginning (9h 59.3m U.T.)						Western Limit Moonrise at ending (12h 07.1m U.T.)					
Latitude	Longitude		Latitude	Longitude		Latitude	Longitude		Latitude	Longitude	
°	°	'	°	°	'	°	°	'	°	°	'
-50	-32	41	+10	-64	56	-50	+60	12	+10	+92	30
40	41	28	20	69	13	40	68	59	20	96	48
30	47	40	30	74	10	30	75	13	30	101	45
20	52	37	40	80	22	20	80	09	40	107	58
-10	56	54	50	89	09	-10	84	28	50	116	46
+0	-60	55	+60	-104	20	+0	+88	29	+60	+132	00

The eclipse is visible in the region west of the eastern limit and east of the western limit. Here, Moonset and Moonrise times relate to visibility of the center of the Moon on the horizon.

ECLIPSES, 2012

PENUMBRAL ECLIPSE OF THE MOON, November 28, 2012, Wednesday.

CIRCUMSTANCES OF THE ECLIPSE											
	Universal Time			Indian Standard Time			Position Angle from the North Point of Moon's Limb (N.E.S.W)**	The Moon being in the Zenith in			
								Latitude		Longitude	
	d	h	m	d	h	m	°	°	'	°	'
Moon enters penumbra	28	12	12.6	28	17	42.6	43	+20	22	+172	50
Middle of the eclipse*	28	14	33.0	28	20	03.0	-	+20	28	+138	52
Moon leaves penumbra	28	16	53.4	28	22	23.4	309	+20	33	+104	54

* Penumbral magnitude of eclipse : 0.942

** N.E.S.W stands for North, East, South and West

Note : - A penumbral eclipse of the Moon is not to be taken as an eclipse of the Moon in the ordinary sense, as the Moon is not covered by the real shadow of the Earth during such an eclipse.

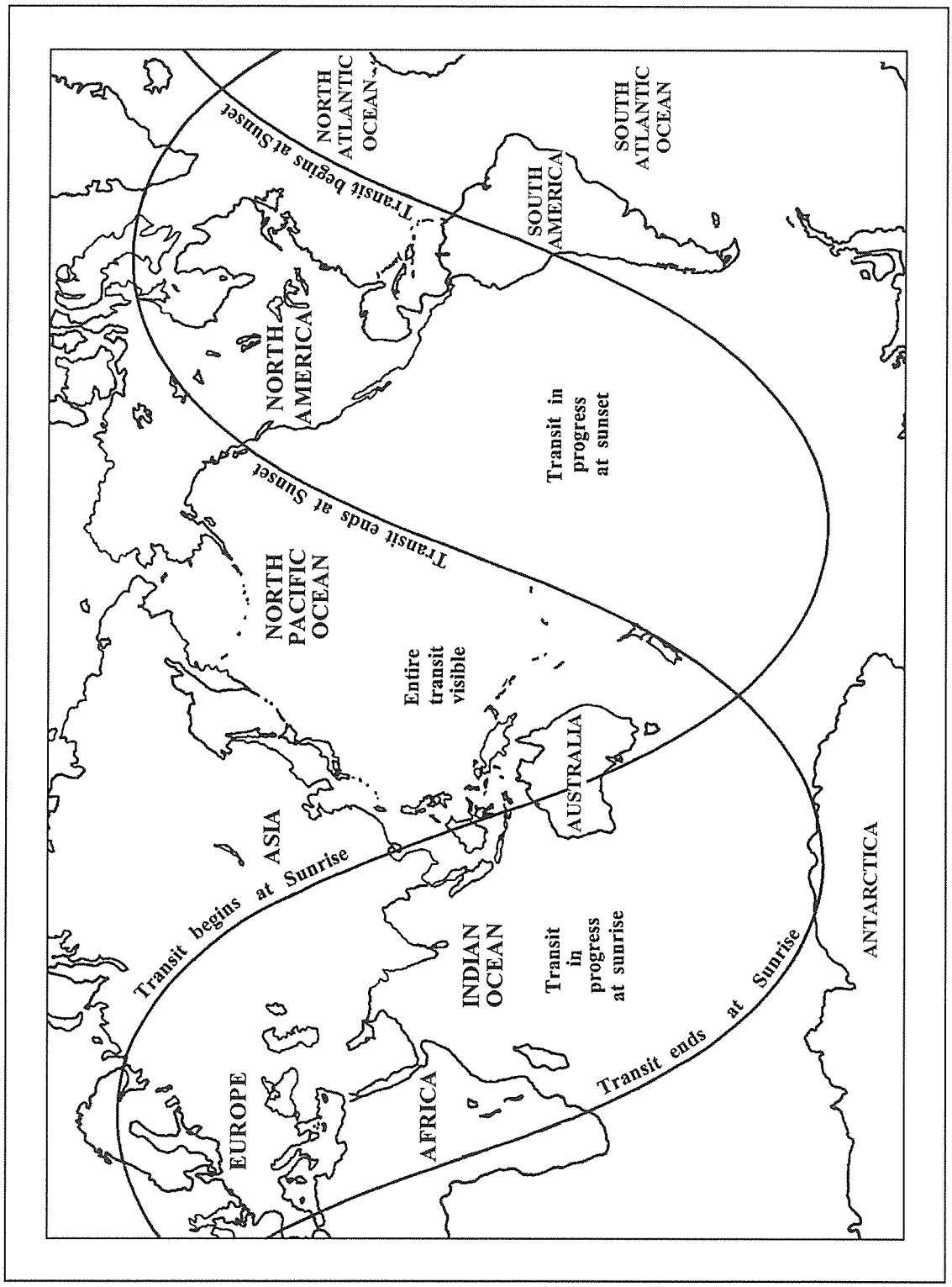
III. Transit of Venus over the disc of the Sun, June 5-6, 2012, Tuesday-Wednesday

Visible in India

The entire transit will be visible in the eastern Asia, eastern Australia, north western North America, the Arctic, and the north Pacific Ocean. The beginning of the event will not be visible from any place of India as the event will be in progress before sunrise.

CIRCUMSTANCES OF THE TRANSIT													
	Universal Time				Indian Standard Time				Position Angle from the North Point of Sun's Disc (P)	Venus being in the Zenith in			
										Latitude		Longitude	
	d	h	m	s	d	h	m	s	°	°	'	°	'
Ingress, exterior contact	5	22	09	39.9	6	03	39	39.9	41	+22	52	-152	34
Ingress, interior contact	5	22	27	25.2	6	03	57	25.2	38	+22	52	-157	03
Least angular distance*	6	01	29	37.0	6	06	59	37.0	-	+22	50	+157	13
Egress, interior contact	6	04	31	44.7	6	10	01	44.7	293	+22	47	+111	29
Egress, exterior contact	6	04	49	25.9	6	10	19	25.9	290	+22	47	+107	01

Least angular distance* = 9′ 14″.4


TRANSIT OF VENUS OF JUNE 5-6, 2012
Transit begins at Sunset
Transit ends at Sunset
Transit begins at Sunrise
Transit ends at Sunrise
NORTH ATLANTIC OCEAN
SOUTH ATLANTIC OCEAN
NORTH AMERICA
SOUTH AMERICA
NORTH PACIFIC OCEAN
Transit in progress at sunset
Entire transit visible
ASIA
AUSTRALIA
INDIAN OCEAN
Transit in progress at sunrise
EUROPE
AFRICA
ANTARCTICA

Transit of Venus over the disc of the Sun, June 5-6, 2012.

LOCAL CIRCUMSTANCES RELATING TO CERTAIN PLACES IN INDIA AND NEIGHBOURHOOD

Place	Ingress Exterior contact	Ingress Interior contact	Egress Interior contact h	m	s	Egress Exterior contact h	m	s	Sunrise h	m
Agartala	** **	** **	10	3	49.8	10	21	02.6	4	38
Ahmadabad	** **	** **	10	5	35.5	10	22	48.7	5	54
Aizawl	** **	** **	10	3	42.0	10	20	54.8	4	33
Ajmer	** **	** **	10	5	27.8	10	22	40.4	5	40
Allahabad	** **	** **	10	4	48.5	10	22	00.9	5	14
Amritsar	** **	** **	10	5	30.1	10	22	42.3	5	27
Bengaluru	** **	** **	10	4	53.7	10	22	08.6	5	54
Bhagalpur	** **	** **	10	4	19.2	10	21	31.6	4	53
Bhopal	** **	** **	10	5	09.6	10	22	22.5	5	35
Bhubaneswar	** **	** **	10	4	18.0	10	21	31.1	5	08
Cannanore	** **	** **	10	5	04.3	10	22	19.5	6	05
Chandigarh	** **	** **	10	5	17.7	10	22	29.8	5	19
Chennai	** **	** **	10	4	38.2	10	21	52.8	5	43
Cochin	** **	** **	10	4	55.2	10	22	10.8	6	04
Cooch Behar	** **	** **	10	4	05.1	10	21	17.4	4	40
Cuttack	** **	** **	10	4	17.8	10	21	30.9	5	07
Darjeeling	** **	** **	10	4	12.7	10	21	24.9	4	42
Dehradun	** **	** **	10	5	11.6	10	22	23.6	5	16
Delhi	** **	** **	10	5	15.0	10	22	27.2	5	24
Dibrugarh	** **	** **	10	3	33.5	10	20	45.9	4	14
Dwarka	** **	** **	10	5	52.1	10	23	05.7	6	09
Gandhinagar	** **	** **	10	5	35.3	10	22	48.5	5	54
Gangtok	** **	** **	10	4	11.8	10	21	23.9	4	41
Gauhati	** **	** **	10	3	52.8	10	21	05.2	4	32
Gaya	** **	** **	10	4	29.8	10	21	42.2	5	03
Haridwar	** **	** **	10	5	10.8	10	22	22.9	5	16
Hazaribagh	** **	** **	10	4	24.8	10	21	37.4	5	02
Hubli	** **	** **	10	5	11.1	10	22	25.3	5	57
Hyderabad	** **	** **	10	4	55.9	10	22	09.7	5	42
Imphal	** **	** **	10	3	37.1	10	20	49.8	4	27
Itanagar	** **	** **	10	3	42.7	10	20	55.0	4	22
Jaipur	** **	** **	10	5	22.1	10	22	34.7	5	35

"** **" indicates the event occurs before sunrise.

Transit of Venus over disc of the Sun, June 5-6, 2012.

LOCAL CIRCUMSTANCES RELATING TO CERTAIN PLACES IN INDIA AND NEIGHBOURHOOD

Place	Ingress Exterior contact	Ingress interior contact	Egress interior contact			Egress Exterior contact			Sunrise	
			h	m	s	h	m	s	h	m
Jalandhar	** **	** **	10	5	24.8	10	22	36.9	5	23
Jammu	** **	** **	10	5	30.6	10	22	42.7	5	25
Kannyakumari	** **	** **	10	4	45.6	10	22	01.5	6	02
Kavalur	** **	** **	10	4	45.0	10	21	59.8	5	48
Kavaratti	** **	** **	10	5	17.3	10	22	32.9	6	16
Kohima	** **	** **	10	3	35.5	10	20	48.1	4	22
Kolhapur	** **	** **	10	5	18.2	10	22	32.4	6	00
Kolkata	** **	** **	10	4	05.4	10	21	18.2	4	52
Koraput	** **	** **	10	4	33.6	10	21	47.0	5	23
Kozikode	** **	** **	10	5	02.2	10	22	17.4	6	04
Kurnool	** **	** **	10	4	54.5	10	22	08.7	5	46
Lucknow	** **	** **	10	4	54.8	10	22	07.1	5	14
Madurai	** **	** **	10	4	43.9	10	21	59.5	5	57
Mangalore	** **	** **	10	5	10.0	10	22	25.0	6	05
Midnapore	** **	** **	10	4	11.3	10	21	24.1	4	57
Mount Abu	** **	** **	10	5	36.4	10	22	49.4	5	51
Mumbai	** **	** **	10	5	30.1	10	22	44.0	6	03
Murshidabad	** **	** **	10	4	07.8	10	21	20.3	4	48
Muzaffarpur	** **	** **	10	4	28.1	10	21	40.4	4	56
Mysore	** **	** **	10	4	58.5	10	22	13.4	5	59
Nagpur	** **	** **	10	4	56.7	10	22	09.8	5	32
Nalgonda	** **	** **	10	4	50.5	10	22	04.3	5	39
Nashik	** **	** **	10	5	26.5	10	22	40.1	5	56
Nellore	** **	** **	10	4	43.5	10	21	57.8	5	42
Nowgong	** **	** **	10	5	00.3	10	22	12.8	5	23
Panaji	** **	** **	10	5	18.7	10	22	33.1	6	03
Patna	** **	** **	10	4	28.2	10	21	40.5	4	59
Pondicherry	** **	** **	10	4	39.2	10	21	54.1	5	48
Port Blair	** **	** **	10	3	18.6	10	20	33.7	4	56
Pune	** **	** **	10	5	24.2	10	22	38.1	5	59

"** **" indicates the event occurs before sunrise

Transit of Venus over disc of the Sun, June 5-6, 2012.

LOCAL CIRCUMSTANCES RELATING TO CERTAIN PLACES IN INDIA AND NEIGHBOURHOOD

STATION	Ingress Exterior contact	Ingress interior contact	Egress interior contact			Egress Exterior contact			Sunrise	
			h	m	s	h	m	s	h	m
Puri	** **	** **	10	4	17.0	10	21	30.2	5	09
Raipur	** **	** **	10	4	43.5	10	21	56.5	5	22
Rajamundry	** **	** **	10	4	35.1	10	21	48.8	5	29
Rajkot	** **	** **	10	5	44.7	10	22	58.2	6	04
Ranchi	** **	** **	10	4	24.4	10	21	37.1	5	03
Sambalpur	** **	** **	10	4	31.0	10	21	44.0	5	13
Shillong	** **	** **	10	3	50.6	10	21	03.1	4	33
Shimla	** **	** **	10	5	16.9	10	22	28.9	5	18
Sibsagar	** **	** **	10	3	36.0	10	20	48.4	4	19
Shilchar	** **	** **	10	3	43.5	10	20	56.1	4	31
Siliguri	** **	** **	10	4	11.5	10	21	23.8	4	44
Silvassa	** **	** **	10	5	29.4	10	22	42.9	5	57
Srinagar	** **	** **	10	5	31.1	10	22	43.1	5	21
Sringeri	** **	** **	10	5	06.8	10	22	21.6	6	01
Tamelong	** **	** **	10	3	37.9	10	20	50.6	4	25
Thanjavur	** **	** **	10	4	39.7	10	21	54.9	5	51
Thiruvanantapuram	** **	** **	10	4	50.4	10	22	06.3	6	05
Tiruneveli	** **	** **	10	4	44.6	10	22	00.3	6	00
Trichur	** **	** **	10	4	56.4	10	22	11.8	6	02
Udaipur	** **	** **	10	5	31.2	10	22	44.1	5	48
Ujjain	** **	** **	10	5	19.1	10	22	32.0	5	42
Vadodara	** **	** **	10	5	30.6	10	22	43.8	5	53
Varanasi	** **	** **	10	4	39.6	10	21	52.0	5	07
Vijayawada	** **	** **	10	4	42.2	10	21	56.1	5	36
Chittagong	** **	** **	10	3	44.3	10	20	57.1	4	37
Colombo	** **	** **	10	4	27.8	10	21	43.9	5	54
Dhaka	** **	** **	10	3	54.5	10	21	07.1	4	41
Karachi	** **	** **	10	6	04.2	10	23	17.7	6	12
Kathmandu	** **	** **	10	4	30.3	10	21	42.5	4	53
Lahore	** **	** **	10	5	31.3	10	22	43.5	5	28
Yangon	** **	** **	10	3	05.7	10	20	19.9	4	32
Rwalpindi	** **	** **	10	5	38.0	10	22	50.1	5	28
Islamabad	** **	** **	10	5	37.5	10	22	49.6	5	27
Thimpu	** **	** **	10	4	05.1	10	21	17.3	4	36

"** **" indicates the event occurs before sunrise.

OCCULTATIONS, 2012

PLANETS BY THE MOON

Sl. No	Date and Ingress - Egress Times (U.T.)		Planet	Magnitude of Planet	Area of Visibility
		h -- h			
1.	Apr.12	08.4 -10.9	Pluto	14.1	Most of Antarctica
2.	May 9	16.2-19.1	Pluto	14.0	Antarctica except Graham Land
3.	June 6	01.9-04.8	Pluto	14.0	Most of Antarctica
4.	June 17	07.7-08.7	Jupiter	-2.0	Extreme northern Canada
5.	July 3	11.0-13.6	Pluto	14.0	Antarctica
6.	July 15	00.9-05.2	Jupiter	-2.1	Europe except British Isles and Scandinavia, northern Africa, Middle East, Russia, northern China, Japan, Korea
7.	July 30	18.7-21.6	Pluto	14.0	South tip of South America, Antarctica
8.	Aug.11	19.1-23.8	Jupiter	-2.2	Most of Indonesia, Marshall Is., Hawaiian Island
9.	Aug.13	18.2-22.6	Venus	-4.5	Eastern Asia, Japan, North America except the north east, Mexico
10.	Aug.27	00.4-04.0	Pluto	14.1	Most of Antarctica and south America
11.	Sept.8	09.1-13.1	Jupiter	-2.4	Central and southern south America
12.	Sept.19	19.1-23.4	Mars	1.2	Central south America, French Polynesia
13.	Sept.23	05.3-09.4	Pluto	14.1	Southern Australia, New Zealand, French Polynesia
14.	Oct.5	19.6-22.4	Jupiter	-2.6	Southernmost parts of Australia, Southern Ocean
15.	Oct.20	12.0-16.3	Pluto	14.1	Southern Africa, Sri Lanka, western Indonesia
16.	Nov.2	00.4-03.4	Jupiter	-2.7	Most of south Africa, Southern Ocean
17.	Nov.16	21.2-25.4	Pluto	14.1	Western Micronesia, Pacific Ocean, Central America, north- western South America
18.	Nov.29	00.6-03.3	Jupiter	-2.8	Most of southern South America, South Africa
19.	Dec.12	00.8-03.0	Mercury	-0.5	Most of Antarctica
20.	Dec.14	10.4-144	Pluto	-2.6	North-eastern tip of South America, central Africa, western India
21.	Dec.25/26	21.9-02.0	Jupiter	-2.8	Central south America, Southern Africa

ELEMENTS OF OCCULTATIONS OF PLANETS

Sl. No.	T_0 (U.T. of Conj. in R.A.)			H_0		Y	x′	y′	Body Occulted					
									Right Ascension			Declination		
	d	h	m	h	m				h	m	s	°	′	″
1.	Apr.12	9	22.5	4	06.1	-1.0567	0.5836	0.0849	18	40	25.84	-19	12	24.40
2.	May 9	17	27.3	13	59.4	-0.9362	0.5953	0.0861	18	39	32.85	-19	13	1.55
3.	June 6	3	9.3	1	31.6	-09180	0.6042	0.0870	18	37	22.75	-19	15	45.63
4.	June 17	8	26.6	22	13.4	1.2460	0.5357	0.0594	3	57	15.46	19	39	24.78
5.	July 3	12	5.7	12	18.9	-0.9854	0.6056	0.0831	18	34	32.88	-19	20	29.46
6.	July 15	3	6.3	18	17.9	0.5516	0.5389	0.0394	4	21	54.77	20	44	39.23
7.	July 30	19	59.1	22	02.7	-0.9247	0.5992	0.0783	18	31	50.07	-19	26	30.31
8.	Aug.11	21	27.6	14	08.0	-0.0999	0.5409	0.0222	4	42	32.02	21	27	21.16
9.	Aug.13	20	16.0	11	22.2	0.5702	0.5132	-0.0675	6	24	30.59	19	56	25.38
10.	Aug.27	2	2.0	5	54.9	-0.7107	0.5909	0.0727	18	29	58.98	-19	32	50.38
11.	Sept.8	11	4.5	5	19.8	-0.6881	0.5428	0.0121	4	56	27.60	21	49	37.32
12.	Sept.19	21	20.0	6	15.4	-0.2277	0.5674	-01078	15	1	21.58	-17	53	24.23
13.	Sept.23	7	17.0	12	57.7	-0.3843	0.5877	0.0716	18	29	31.02	-19	39	1.56
14.	Oct. 5	21	0.8	16	59.4	-1.0115	0.5462	0.0078	5	1	10.91	21	55	11.08
15.	Oct.20	14	8.6	21	35.7	-.05460	0.5932	0.0745	18	30	39.09	-19	43	54.92
16.	Nov.2	1	51.2	23	42.8	-0.9708	0.5514	0.0109	4	55	27.50	21	46	16.33
17.	Nov.16	23	18.5	8	31.0	0.1123	0.6037	0.0775	18	33	16.37	-19	46	58.91
18.	Nov.29	1	3.8	0	55.3	-1.0428	0.5546	0.3951	4	41	47.99	21	24	39.34
19.	Dec.12	1	13.4	14	39.9	-08853	0.5695	0.9297	15	58	4.86	-18	51	7.77
20.	Dec.14	12	25.8	23	23.1	0.2766	0.6117	0.0831	18	36	58.39	-19	47	52.30
21.	Dec.25/ 26	0	0.5	1	53.5	-0.4537	0.5512	0.3800	4	26	36.08	20	58	5.27

ELEMENTS (contd.)

Sl. No.	*l*	*a*
1.	0.2725	1.00
2.	0.2725	1.00
3.	0.2725	1.00
4.	0.2726	1.00
5.	0.2725	1.00
6.	0.2726	1.00
7.	0.2725	1.00
8.	0.2726	1.00
9.	0.2736	1.00
10.	0.2725	1.00
11.	0.2726	1.00
12.	0.2728	1.00
13.	0.2725	1.00
14.	0.2727	1.00
15.	0.2725	1.00
16.	0.2727	1.00
17.	0.2725	1.00
18.	0.2727	1.00
19.	0.2731	1.00
20.	0.2725	1.00
21.	0.2727	1.00

OCCULTATIONS, 2012

BRIGHT STAR BY THE MOON

Sl. No.	Date and Ingress - Egress Time (U.T)		Star	Magnitude of Star	Area of Visibility
		h -- h			
1.	July 25	15.6-17.1	Spica	0.98	Part of Antarctica, southern tip of South America.
2.	Aug. 21	20.8-23.8	Spica	0.98	New Zealand, most of Antarctica.
3.	Sept. 18	3.3-6.6	Spica	0.98	Southern Indian Ocean, Mauritius, most of Antarctica.
4.	Nov. 11/12	23.9-3.3	Spica	0.98	Southern Indian Ocean, Mauritius, most of Antarctica.
5.	Dec. 9	10.3-13.7	Spica	0.98	Southern Pacific Ocean, most of Antarctica, southern south America.

OCCULTATIONS, 2012

ELEMENTS OF OCCULTATIONS OF STAR

Sl. No.	T_0 (U.T. of Conj. in R.A.)			H_0		Y	x′	y′	Body occulted					
									Right Ascension			Declination		
	d	h	m	h	m				h	m	s	°	′	″
1.	July 25	17	1.4	23	50.7	-1.2512	0.5683	-0.1817	13	25	52.25	-11	13	39.52
2.	Aug. 21	22	21.5	31	08.7	-0.9390	0.5717	-0.0052	13	25	51.93	-11	13	37.65
3.	Sept. 18	05	22.3	15	46.6	-0.8198	0.5790	-0.1826	13	25	51.70	-11	13	36.02
4.	Nov. 11/12	01	59.5	16	00.0	-0.7929	0.5853	-0.1811	13	25	52.05	-11	13	36.91
5.	Dec. 9	12	27.8	4	10.5	-0.7779	0.5791	-0.1799	13	25	52.73	-11	13	40.33

$l = 0.2725$ * and a = 1.0027*

* Elements l and a have identical values correct upto last significant digit (as reported) in occultations of bright star above.