

Observed Ancient Solar Eclipses

virtual laboratory for archaeometry

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The 2026 Canon SAROS is based on our constant deceleration Model of the Earth's rotation:

$$\Delta T = a + c * t^2 \text{ [s]} \quad \text{où } t = (36524.24)^{-1} * (JD - 2'378'497) \text{ [cy]} \text{ with } JD_0: +1800.01.01$$

It reflects the [stability of the sea level](#) over the last 6 millenia, a period we call the [Heliocene](#).

Retrodictions are generated by Xavier JUBIER's [5MCSE](#) freeware in the **&dT=xxxx** url-mode.

c = 32.4 [s cy⁻²] lies within PANG's limits for ancient SE, i.e.: $27.5 > c < 32.5$ [s cy⁻²].

a = - 20 [s], an offset to take into account the mini post-Maunders rebound effect.

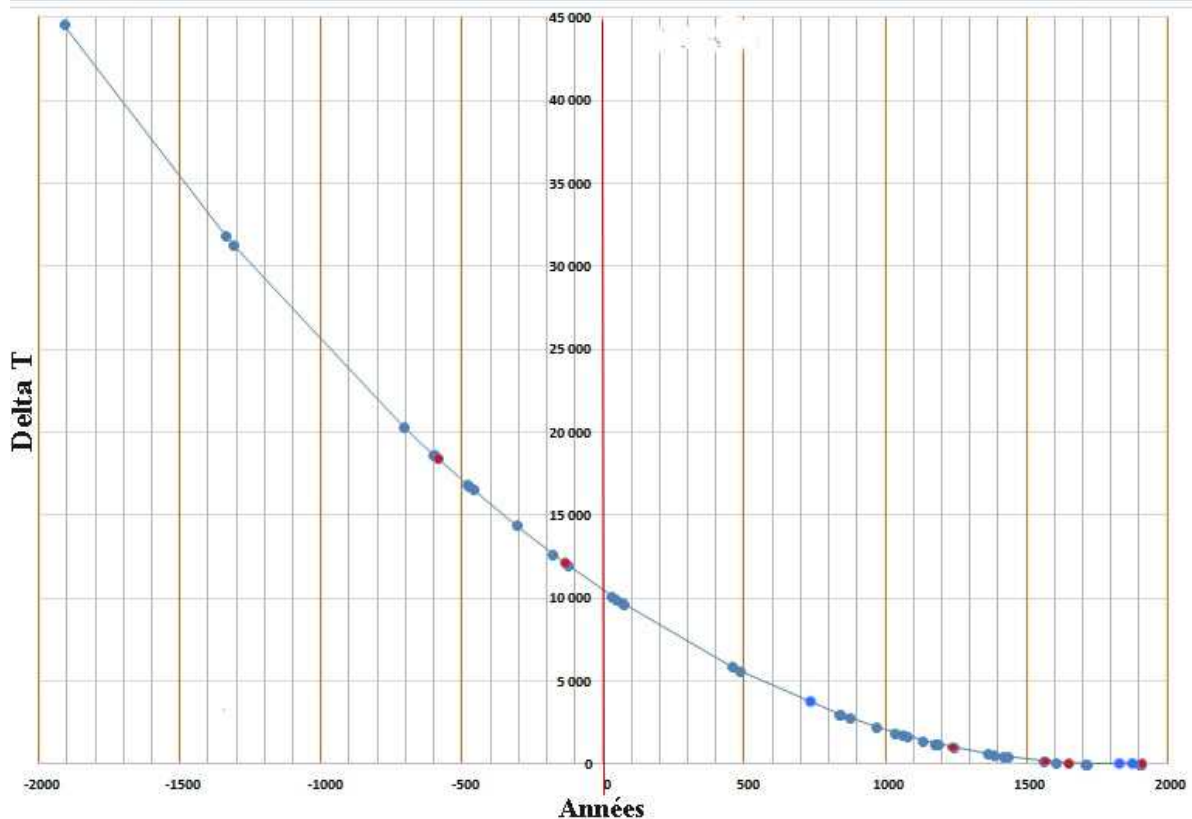
The period is limited **from -1911 up to +1912**. After this time, **c decreases** with the "geomorphic exit" out of the Heliocene, see [daily measurements of LOD](#) (Length Of Day).

The Canon SAROS lists **50 documented solar eclipses** prior to the creation of the Bureau Int.'l de l'Heure in 1913. Important are the eclipses anchoring [Calendrical Eras](#) (*Nilotic, HuangDi, AUC, Seleucid, Hirji, Anno Domini*). In our critical review appeared the case of two clergymen: the iman of Cordoba, in 218 AH and the bishop of Mende, in 1239 AD who misused the expression: *stars appear in the sky as if it were midnight*, while they were outside of the path of totality.

The retrodictive power of our [OASE DeltaT-Model](#) is comforted by 6 fairly well documented observation reports of **4 total & 2 pearled** solar eclipses in :

- 584.05.28 River Halas Battlefield: ALYATTES + Miletus: THALES .
- 135.04.15 Babel Tower: ARSACE V (alias MITHRIDATES I *Philhellène*) .
- +1239.06.03 Cardeña Monastery .
- +1567.04.09 Vatican Observatory: Christopher CLAVIUS .
- +1652.04.08 Carrickfergus : John WYBARD .
- +1912.04.17 Ovar #10: F.M. da COSTA LOBO / Plaisance-Gd CroixXing: Léon GAUMONT / Becklingen #4: R.R. SCHORR / Hagenau #3: K.R.GRAFF .

In the chart Delta T vs Years of Christophe de Reyff, those 6 events are marked in red .



Notes on the Canon SAROS: **1./** Most entries are derived from [Quotations about Solar Eclipses](#), compiled by David LeConte. **2./** 1 SAROS cycle lasts **6585.321 days** (18yr,10-12d.,8 h.), e.g. Chinese astronomers observed the -708 & -600 solar eclipses: [SAROS 44 eclipses # 07 & 13](#). **3./** On 1900.05.28, à Wadesboro, Nevil Maskelyne has been the first to shot a [clip of a Solar eclipse](#)

-584.05.28. Closing the controversy over how Thales of Miletus did predict to the Lydian king Alyattes a partial solar eclipse, let's remind that at a given observation site, solar eclipses tend statistically to cluster, mostly with a time span of 18 or 17 lunar months. Thanks to the efficient Milesian numerical system, [Thales](#), the worthy offspring of the Phoenician Cadmos, obviously kept track of 25 years of natural phenomenon observations. Analysing those data, he discovered partial solar eclipse time series [clusters](#), the first proto-scientific model enabling the prediction, several lunar months ahead of time, of the forthcoming late-afternoon partial solar eclipse. He became famous while king Alyattes did stage the end of his long lasting war against the Medes.



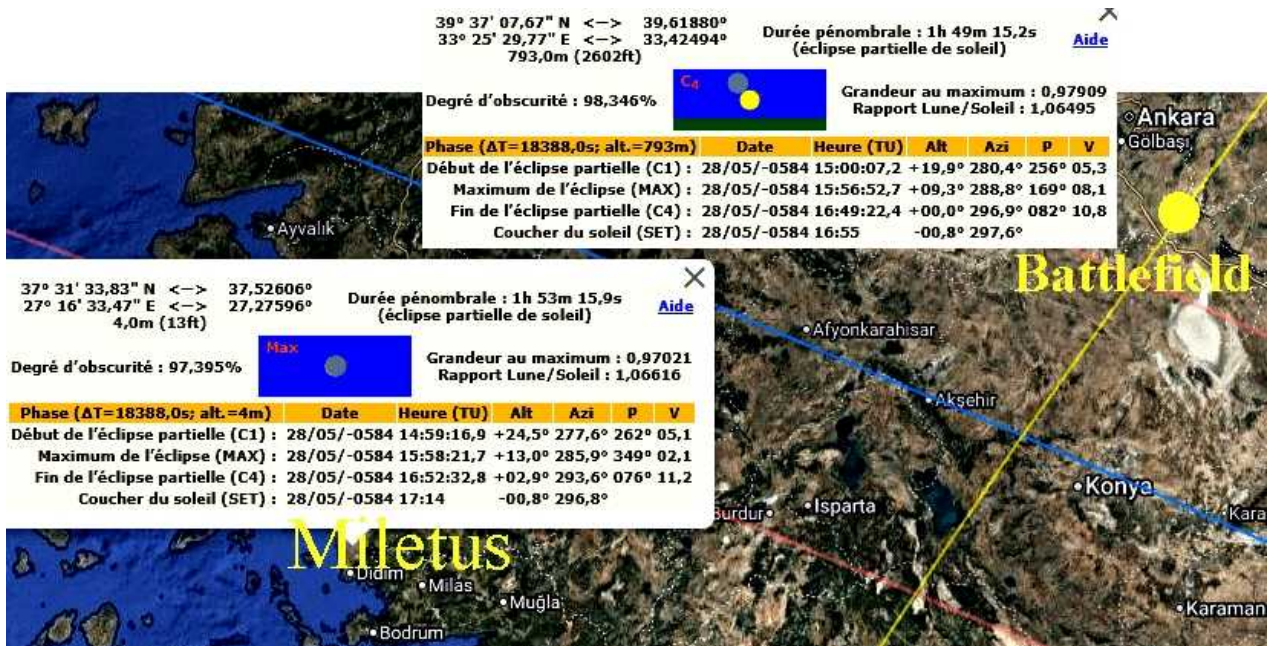
This artefact is the sole contemporary testimony of this solar eclipse : the dot on the lion's eye represents the solar eclipse. The name of the king: Walwet, meant *Lion* in Lydian. Walwet (Alyattes in Greek) seized the opportunity of the peace treaty to mint [the very 1st coin](#). This prestige coin is *double*, here superposed (Photoshop 76% opacity). Later, his son Croesus will mint anepigraphic coins with dots surrounded by rays.

The list of the relevant solar eclipses over Miletus cast light on this prediction: after a cluster of 17 moons, the next *visible* eclipse will occur at the upcoming 18th new moon. Six centuries later, Pliny the Elder [retrodicted in term of AUC](#) the year of Thales eclipse as **CLXX**.

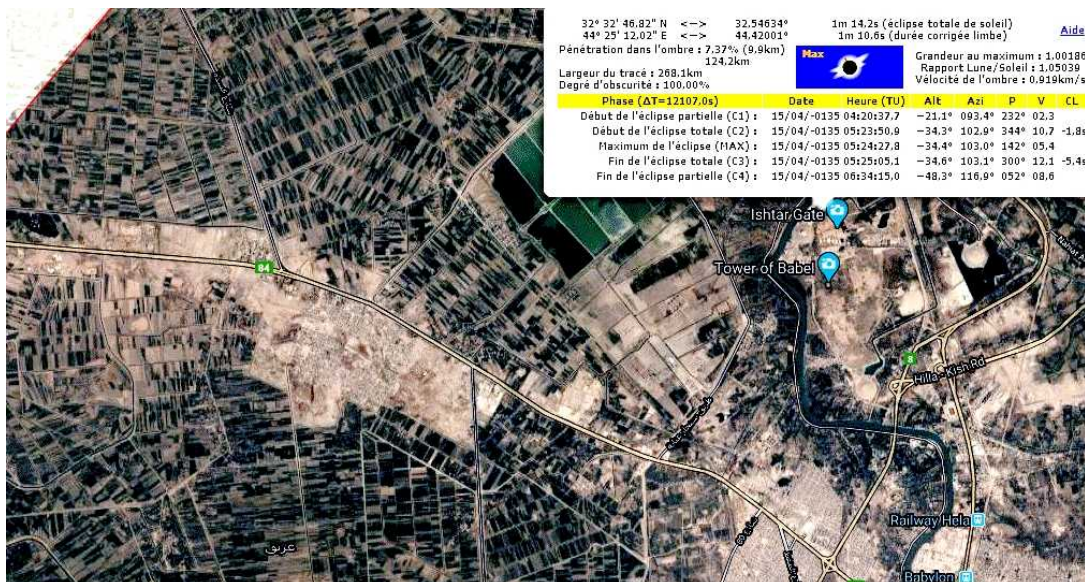
#	Time-lapse Lunations		Solar eclipses over Miletus		Height	%	Saros #57			
			Date (<i>Local Time</i>)	<i>sunset / sunrise</i>						
1	223	35	18 [-610.04.17 / 17:58	18:39	7° CI	<20%			
2			17 [-609.09.30 / 08:37		30°	58%			
3			18 [-607.02.13 / 15:42		20°	76%			
4			18 [-606.07.30 / 09:41		53°	62%			
5				-602.05.18 / 08:11		36°	49%		-05	
6		35	18 [-596.07.09 / 05:09	04:47	3°	72%			
7				17 [-595.12.23 / 16:55	17:00	-0.1°			61%
8				18 [-593.05.09 / 08:19		36°			46%
9		35	17 [-587.07.29 / 19:17	19:26	0.6°	93%			
10				18 [-586.12.14 / 11:04		27°			74%
11				18 [-584.05.28 / 17:58	19:14	13°			97%
				<i>Thales prediction</i>						

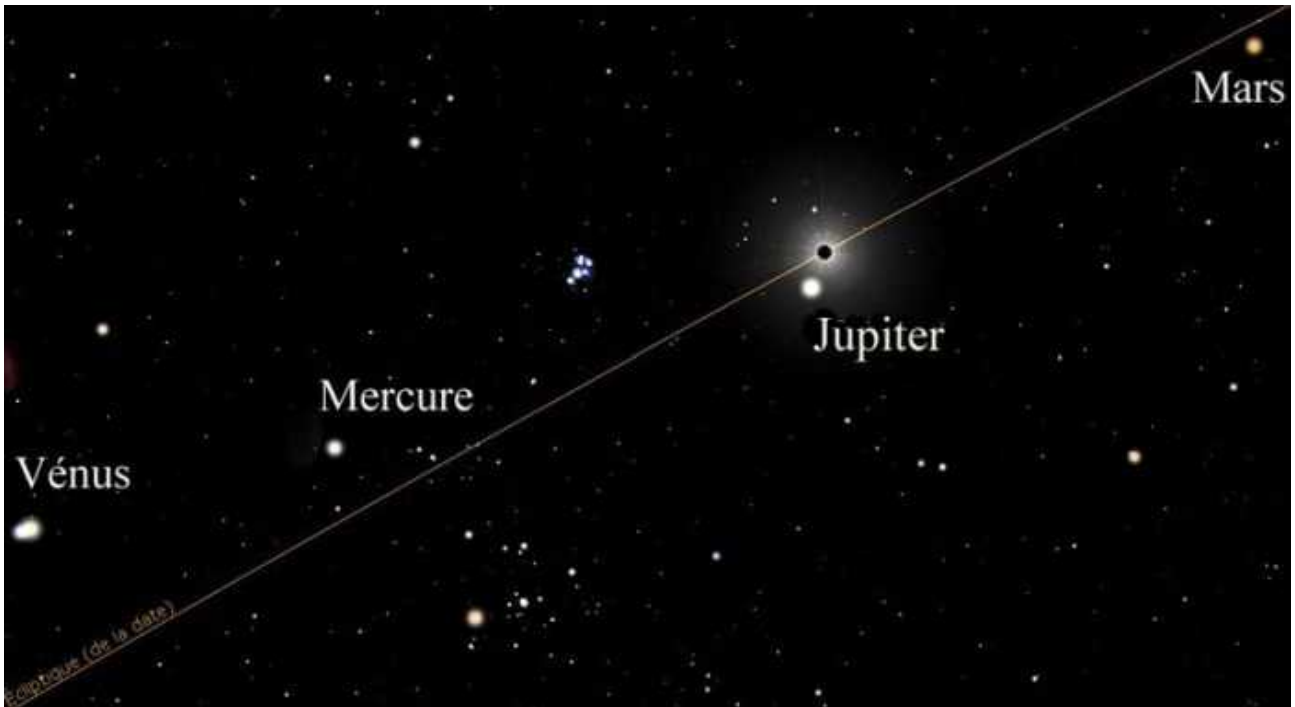
Thales' double stroke of luck has been the particularly elevated phase of the eclipse over Miletus, and a most spectacular double sunset at the battle field on the river Halys, 600 km north-east from Miletus: reaching 98% at 17:56 local time, 9° over the horizon, and finishing at 18:49, leaving 5 minutes to the sun to fully shine again.

The exact site of the battle has not been reported but a fair guess is the vicinity of Karakeçili.

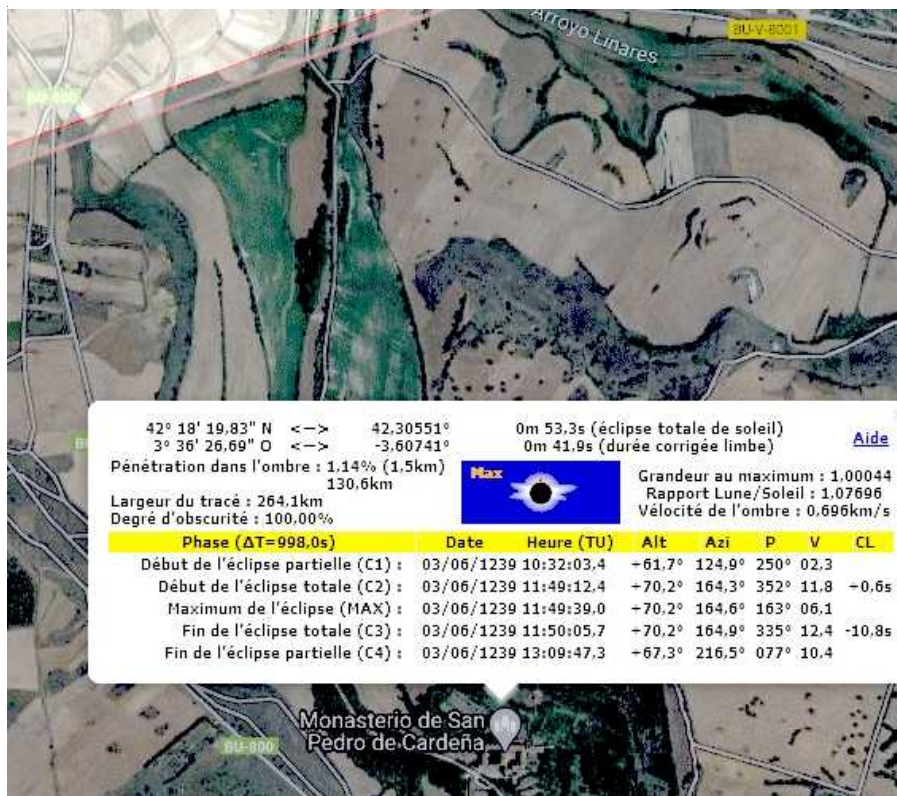


-135.04.15. The two reports of observation of this solar eclipse by Babylonian astronomers are engraved on clay tablets and the date is written as **175.13.29** according to the [Seleucid Era](#) Lunar Calendar). The exact observation site is unfortunately unknown, but our guess bent toward *the Babel Tower*!

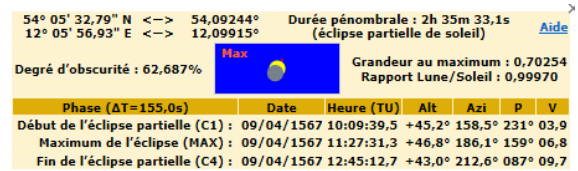
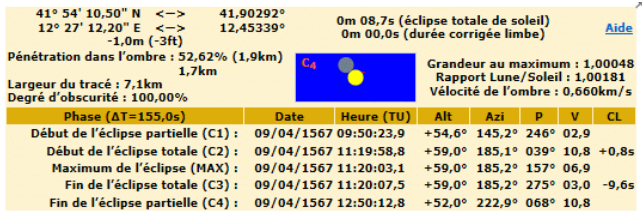




+1239.06.03. This eclipse has been observed at a *dozen of sites*, all well centered in the totality path. The site nearest of the Monastery of Cardeña at the Northern edge of the totality corridor strongly constrains the DeltaT-Model. In p. 373 of its “Chronicon”, the date is given in terms of the [ERA Hispanica](#) as : *Era de MCCLXXVII. Años III.Nonas de Junio à medio dia oscureció el Sol è fizose noche, è vieron el Cielo estrellado*



+1567.04.09 This *pearled* eclipse which occurred over Vatican City has been reported by Christopher Clavius. The same Clavius saw, 7 years earlier, a 1½ minute long total solar eclipse over Coimbra and he had the chance to observed this exceptional pearled solar eclipse...



Tycho Brahe wrote to Clavius on 1600.01.05 from Benatky (near Prague) that as a young man he observed this eclipse in Rostock, *the phase there being about 7 dijits*... The retrodiction of this eclipse confirms beautifully the observation of the astronomer.

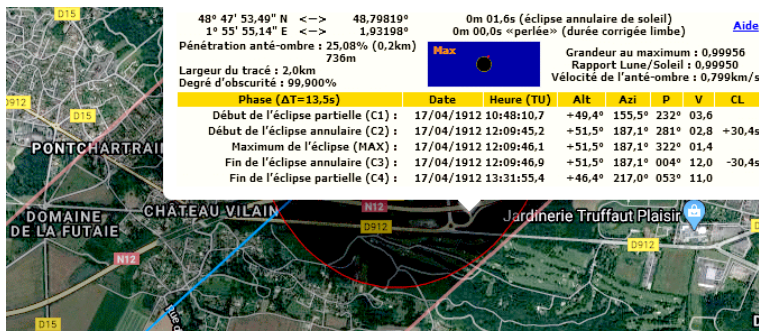
+1652.04.08 Carrickfergus, Dr. John Wybard reported: "*Luna momento quasi, et eximproviso, totam se intra Disci Solis orbitam seu ambitum (quatenus conspectui nostro appareret) tam agiliter injiciebat; ut circumagere aut circumvolutare videretur, sicut catillus, seu lapis molaris superior; Sole tunc circum-circa, ejus limbum seu marginem splendidulo vel corusco, apparente.*" "The Moon, as if at that moment, and unexpectedly, threw itself so very nimbly between the entire path or circuit of the Sun's disc (in so far as it appeared to our sight); so that it seemed to move in a circle or roll around, like a plate or upper mill-stone; with the Sun, glowing or rather **shimmering, all around its rim or edge**"... indeed, an interesting description of the coron



+1912.04.17 Abundant material has been collected during this *pearled* solar eclipse. **In Ovar at observation site #10** Francisco Miranda da COSTA LOBO was the only local observer lucky enough to be at the right spot. He took a short a movie and measured a laps of 14 sec between C2&C3 centered at 11:42:57, off by 27 sec.



At Plaisance, at the Crossing of La Grand' Croix, Léon GAUMONT took also a [clip](#) at 12:09:49 (only 3 sec off the Max).



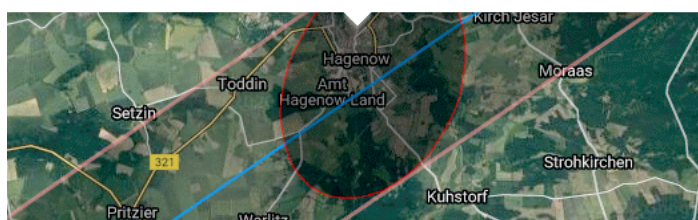
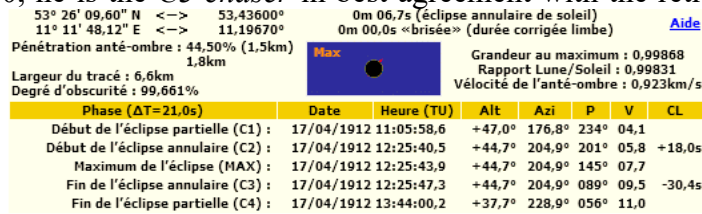
900 m over the Bridge of Rethondes, the position of the Balloon Globule (Northside of Aisne, over Rethondes, 150m West from Bridge) was off totality by over 1500 m. A. Nicolleau took a picture & read Paul Tissandier read the chronometer at 12:11:51 (11 sec off).



At Becklingen in site#4 Richard Schorr took a good picture at 12:23:49, only 1.7 sec off the max at 12:23:47.3. His measurement of C3 was 12:24:01.5 (off by 10 sec)



In Hagenau in site #3 Kazimiers Romuald Graff made most useful observations. With C3 at 12:25:49.0, he is the C3 chaser in best agreement with the retrodicted C3: 12:25:47.3.



SAROS / #	JD (Julian Day) Common Era yy.mm.dd Anchored Era	ΔT [s]	Appellation Site GPS Co-ordinates	Universal Time @ Max. Eclipse Sun Altitude	Magnitude. type Duration [m/s]
23/ -22	1 023 332 -1911.09.24	44'581	PANG Double Sunset Sanmiao Changde E111.7° / N29.03	10:26 4.3°	0.979 annular 1m 14s
26/ 02	1 232 852 -1337.05.14 Nilotic	31'856	AKHENATEN Thèbes E32.65/N25.70 Tell el-Amarna E30.90 /N27.57	12:09 53° 12:05 56°	0.944 1.013 4m 32s
35/ -04	1 242 390 -1311.06.24	31'328	MURSILI II bad omen Amasya E 35.82 / 40.68	11:08 63°	1.009 2m 24s
44/ 07	1 462 659 -708.07.17 HuangDi	20'351	LU HUAN GONG春秋1 Jining-RénChén District E116.596 / N35.406	07:48 42°	1.019 3m 27s
44/ 13	1 502 170 -600.09.20 HuangDi	18'630	LU XUAN GONG春秋2 Jining E116.596 / N35.406	07:52 30°	0.86 penumbra 2h 11m
57/ -04	1 507 900 -584.05.28 AUC 170 (PLINYI)	18'388	THALES Milet E27.27/ N37.53 ALYATTES Double Sunset Lydians-Medes Battle E33.414/N39.611	15:58 13° 15:57 9°	0.966 penumbra : 1h 53m 0.980 pen.: 1h 49m
57/ -02	1 507 900 -548.06.19	17'835	LU XIANG GONG春秋3 Jining E116.596 / N35.406	06:06 62°	1.030 5m 44s
50/ 05	1 545 847 -480.04.19	16'818	GAUBIL Chin. Ann. # 35 Shanghai E121.47 /N31.25	05:05 62°	1.017 4m 19s
50/ 06	1 552 432 -462.04.30	16'553	Cult of TANIT Carthage E10.32 /N36.83 PINDAR Thèbes E23.32 /N38.32	12:35 60° 12:50 47°	0.988 0.978
69/ -19	1 608 421 -309.08.15	14'382	AGATHOCLES' escape Syracuse E15.298 /N37.047	06:31 27°	1.000 0m 42s
56/ 21	1 655 376 -180.03.04	12'679	Chang'an E108.94 / N34.26	07:33 34°	1.007 2m 20 s
75/ -10	1 671 854 -135.04.15 Seleucid 175	12'107	ARSACE V (Mithridates I) Babel Tower/ BM45745 E44.421 / N32.536 HIPPARCHUS Rhodes E28.22 / N36.45 Souan E32.89 / N24.09	05:24 34° 05:03 21°	1.001 1m 14 s 0.78 1.006 1m 53 s
79/ -20	1 674 630 -128.11.20	12'012	HIPPARCHUS Çanakkale/Hellespont E26.402 / N40.148 Alexandrie E29.9 / N 31.2	13:47 11° 14:01 11°	1.004 0m 14s 0.791
62/ 17	1 731 978 +29.11.24	10'131	PHLEGON Niceaea (Iznik) E27.172 /N 38.420	08:34 26°	1.004 1m 13s

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75/ 00	1 737 706 +45.08.01 AUC 798	9'952	CLAUDIUS Birthday (Dio Cassius) Rome E41.91 / N12.49	08:29 48°	0.32
62/19	1 745 149 +65.12.16	9'722	BUDDHA's rise (CHU dynasty) Xuzhou (Jiangsu) E117.15 / N 34.25	02:17 26°	1.002 1m 03s
79/ -09	1 747 069 +71.03.20	9'663	PLUTARCH Athène E23.727 / N37.97	09:30 48°	0.996 partial 0m 28s
91/-06	1 887 103 +454.08.10	5'844	ZU Chongzhi Jiankang (Nanjing) E118.74 / N32.10	00:45 41°	1.001 1m 03s
97/-16	1 897 852 +484.01.14	5'591	MARINUS Double Dawn Athène E23.72 / 37.97	05:48 -0.1°	0.996
105/-22	1 989 012 +733.08.14 AD 733	3'664	BEDE the Venerable Jarrow Monastery W1,4839 / N54,948	08:49 33°	0.910
96/ 06	2 025 557 +833.09.17 Hijri 218	3'005	YAHYA b.Mu'amar Cordoue W4,778 / N37.874	09:55 41°	0.966
90/ 17	2 027 993 +840.05.05	2'964	csg - 0915 - 204 St-Gallen E 9.376 / N 47.423 ANDREAS Bergomatis Bergamo E9.66 / N45.70	12:42 55° 12:43 56°	1.006 3m 02s 1.015 4m 25s
98/ 03	2 040 129 +873.07.28 Hijri 259	2'761	Abu IRANSHARI Neyshapur E36.24 / N 58.79	01 :36 4°	0.966 central annular 4m 27
115/-19	2 074 976 +968.12.22	2'217	Leo the DEACON Constantinople E28.957 / N41.002	09:18 24°	1.007 2m 08s
111/-06	2 098 541 +1033.06.29	1'883	...vraiment terrible Cluny E4.659 / N 46.434	11:17 66°	0.986 central annular
102/ 04	2 108 759 +1061.06.20	1'747	AL-JAWSI Baghdad E44.366 / N33.31	04:35 31°	1.017 3m 20s
102/ 05	2 115 344 +1079.07.01 ERA 1117	1'662	Digitarq 145770 Coimbra O8.431 / N40.286	13:37 68°	1.026 5m 01s
102/ 08	2 135 100 +1133.08.02	1'419	HONORE d'Autun Regensburg E12.088 / N49.018	11:47. 56°	1.015 3m 56s
96/ 25	Hijri 571 2 150 692 +1176.04.11 Seleucid 1487	1'240	IBN al ATHIR Cirze E42.17 / N 37.42 MICHEL the Syrian Antioch E36.16 / N36.20	04 :40 24° 04:36 19°	1.022 3m 21s 1.010 2m 30s

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121/-23	2 151 578 +1178.09.13	1'395	ADELBERT III Mende E3.498 / N44.517	11:16 47°	1.010 3m 03s
115/-07	2 154 000 +1185.05.01	1'204	Novgorod E31.27 / N 58.53	14:27 26°	1.016 3m 20s
115/-04	ERA 1277 2 173 756 +1239.06.03	998	Coimbra W8.412/N40.221 Cardena W3.60734/N42.3044 1 Toledo W4.02 / N39.85 Mende E3.498/N 44.517 Montpellier E3.88/N43.61 Firenze E11.21/N43.8 Siena E11.3/ N 43.3 Arezzo E11.87/N43.46 Cesena E12.25/N44.15 Split E16.47/N43.53	11:39 / 69° 11:50/ 70° 11:47 / 72° 12:04 / 68° 12:04 / 69° 12:18 / 65° 12:18 / 66° 12:19 / 65° 12:20 / 64° 12:27 / 62°	1.019 / 5m 05s 1.000/ 0m 53s 1.005 / 3m 09s 0.979 partial 1.010 / 3m 59s 1.033 / 5m 45s 1.028 / 5m 39s 1.032 / 5m 44s 1.023 / 5m 17s 1.027 / 5m 28s
102/ 14	2 174 612 +1241.10.06	990	Split E16.43 / N43.50	12:01 35°	1.006 2m 21s
108/ 09	2 218 288 +1361.05.05	603	PANG's 2nd Double sunset Songjiang E121.2 / N31.0	10:24 2°	1.002 1m 04s
102/ 22	2 227 295 +1386.01.01	535	Montpellier E3.871/N43.611	09:48 18°	1.012 2m 22s
108/ 12	2 238 043 +1415.06.07	459	Montpellier E3.87/N43.61	05:57 18°	1.016 2m 57s
121/-09	2 243 773 +1431.02.12	421	Antonio dei VEGHI Perugia E12.388/43.112	14:40 20°	1.013 2m 33s
118/06	2 291 081 +1560.08.21	166	CLAVIUS (Chr. KLAU) Coimbra E8.412 / N40.221	11:49 57°	1.002 1m 33s
112/ 21	2 293 503 +1567.04.09	155	CLAVIUS Vatican E12.457 / N41.902 Tycho BRAHE Rostock E 12.10/ N54.09	11:20 59° 47°	1.000 0m 08s 0.70 partial
137/-24	2 307 559 1605.10.12	102	"La Noirceur" Marseille E5.373 / N43.296	13:06 34°	.982
133/ -11	2 324 539 +1652.04.08	51	John WYBARD Carrickfergus W5.764 / N 54.730	10:33 38°	1.003 1m 37s
133/ -05	2 344 294 +1706.05.12	8	Montpellier E3.871/N43.611	09:10 50°	1.033 3m 52s

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114/ 25	2 347 573 +1715.05.03	3	John FLAMSTEED Greenwich E0.0 / N51.4777	09:08 41°	1.012 3m 12s
133/-07	2 350 880 +1724.05.22	-1	CASSINI & LOUIS-XV Trianon: <i>Double sunset</i> E2.1042/N48.8141 DESLILE Observatoire Paris E2.33722 / N48.83639	C3 18:38:25.9 Obs: 18:38:05 C3 18:38:25.4 8°	1.0137 2m 19.70s 1.016 2m 26.2s
124/07	2 394 024 +1842.07.08	-14	François ARAGO Perpignan E2.895 / N 42.698 Montpellier E3.871/N43.611 Ippolito CAFFI Venice E12.34/N45.442	05:37 12° 05:38 13° 05:40 20°	1.018 2m 16s 1.009 1m 58s 1.002 1m 01s
143/-23	2 410 502 +1887.08.19	4	Double Dawn Wilhelm KRANZ Wannsee /Berlin	4: 1.5°	1.037 1m 36s
126 / 08	2 415 168 +1900.05.28	13	Théophile MOREUX Palmeral of Elche W 0.72 / N 38.26 A.C. CROMMELIN & E.W. MAUNDER El-Jazair / Algiers E3.07 / N 36.7 Nevil MASKELYNE Wadesboro W 80.08 / N 34.96	16:13 34° 16:18 30° 13:46 42°	1.007 1m 14s 1.003 0m 51s 1.024 1m 44s
143 /-22	2 417 088 +1905.08.30	16	Théophile MOREUX Sfax E 10.76 / N 34.74	13.43 48°	1.021 3m 29s
137/-07	2 419 510 +1912.04.17	21	F.M. da COSTA LOBO Ovar #10 W8.5977 /N40.854560 A. NICOLLEAU Balloon Globule E2.93697/N49.41497/900m Richard SCHORR Becklingen #4 E9.8994° / N52.8719° Kazimierz R. GRAFF Hagenow-Stadt (#3) E11.1972/N53.4353	MAX:11:42:30.1 obs .11:43:57±7 58° MAX:12:11:40.0 Obs. 12:11.51 51° MAX:12:23:47.3 Photo:12:23:58 46° C3: 12:25:47.3 Obs.12:25:49.0 45°	1.000 0m 01,3s 0.999 partial 0.998 annular 7.3 s 0.998 annular 6.7s