

Fenomeni astronomici del 2015

- Calendario
- Eclissi
- Luna
- Pianeti

2015 INTERNATIONAL YEAR OF LIGHT



dic/2015



INAF - OABo R.Di Luca

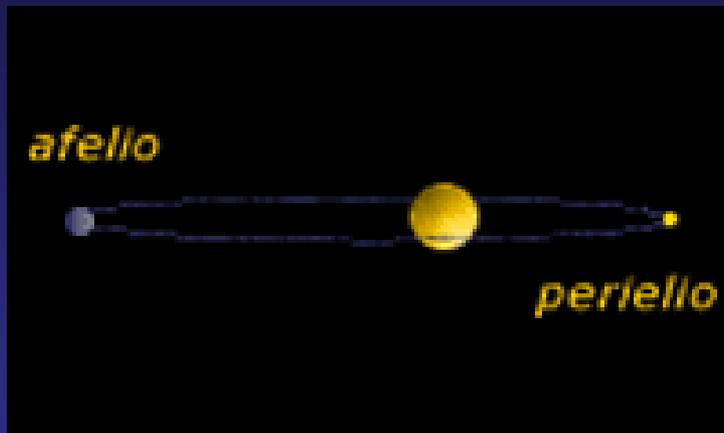


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IYL2015.INAF.IT È UN SITO INAF/SAIT

Date e ore degli afeli della Terra (Tempo universale)	
Anno	Luglio
2000	il 4 alle 00
2001	il 4 alle 14
2002	il 6 alle 04
2003	il 4 alle 06
2004	il 5 alle 11
2005	il 5 alle 05
2006	il 3 alle 23
2007	il 7 alle 00
2008	il 4 alle 08
2009	il 4 alle 02
2010	il 6 alle 11
2011	il 4 alle 15
2012	il 5 alle 03
2013	il 5 alle 15
2014	il 4 alle 00
2015	il 6 alle 19
2016	il 4 alle 16
2017	il 3 alle 20
2018	il 6 alle 17
2019	il 4 alle 22
2020	il 4 alle 12

Terra lungo l'orbita...
 minima e massima distanze



Date dei perielii (UTC)	
Anno	Gennaio
2000	il 3 alle 05
2001	il 4 alle 09
2002	il 2 alle 14
2003	il 4 alle 05
2004	il 4 alle 18
2005	il 2 alle 01
2006	il 4 alle 15
2007	il 3 alle 20
2008	il 3 alle 00
2009	il 4 alle 15
2010	il 3 alle 00
2011	il 3 alle 19
2012	il 5 alle 00
2013	il 2 alle 05
2014	il 4 alle 12
2015	il 4 alle 07
2016	il 2 alle 23
2017	il 4 alle 14
2018	il 3 alle 06
2019	il 3 alle 05
2020	il 5 alle 08

perielio 4 gennaio alle ore 7 - dist. 147.1 MKm
 afelio 6 luglio alle ore 19 - dist. 152.1 MKm

Equinozio di Primavera 20 Marzo alle 22:46

Solstizio d'Estate 21 Giugno alle 10:52

Equinozio d'Autunno 23 Settembre alle 22:30

Solstizio d'Inverno 21 Dicembre alle 23:04

Le date importanti del nostro calendario

46 A.C. Giulio Cesare riforma il calendario

Ottobre 1582 – calendario Gregoriano (Papa Gregorio XIII – Bologna 1502 / Roma 1585)



Le fasi lunari



In circa 29.5 giorni si ripete la medesima fase lunare (mese sinodico)
Ma la rivoluzione attorno alla Terra si compie in 27.3 giorni (mese sidereo)

In Mesopotamia attorno al 2500 A.C. i Sumeri avevano un calendario di 360 giorni , 12 lunazioni + 6 giorni

Ne è derivata probabilmente la attuale suddivisione della circonferenza in 360 parti, chiamati gradi.

La suddivisione del cerchio in circa 6 volte il raggio ha probabilmente generato il nostro sistema sessagesimale



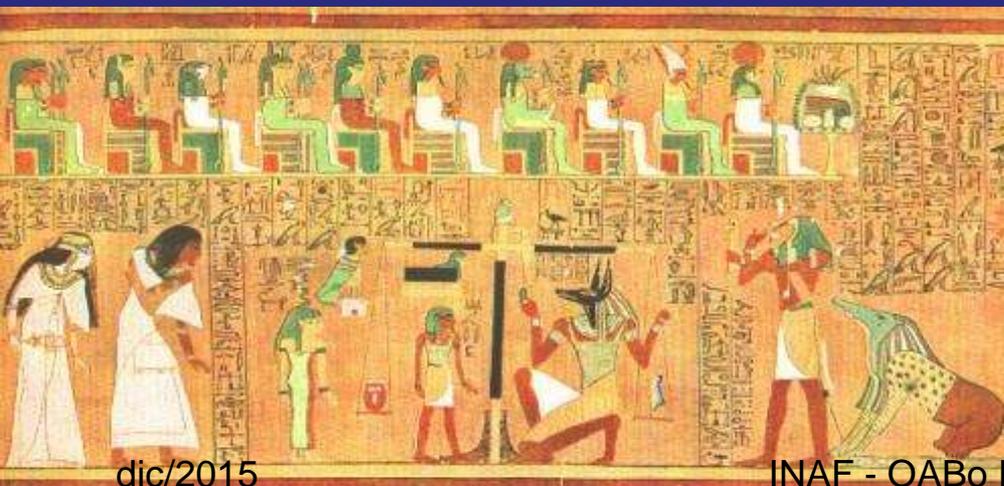
Circa nello stesso periodo nell'Egitto dei Faraoni il calendario era puramente solare, composto da 365 giorni

12 mesi di 30 giorni più 5 giorni di correzione

Fondamentale l'osservazione di Sirio all'alba dopo la congiunzione con il Sole

Non avevano un anno bisestile! Le date erano rigide e vi era un scorrimento rispetto alle stagioni

Non se ne preoccupavano visto che in 1460 anni sarebbe tornato in fase ... ?



dic/2015

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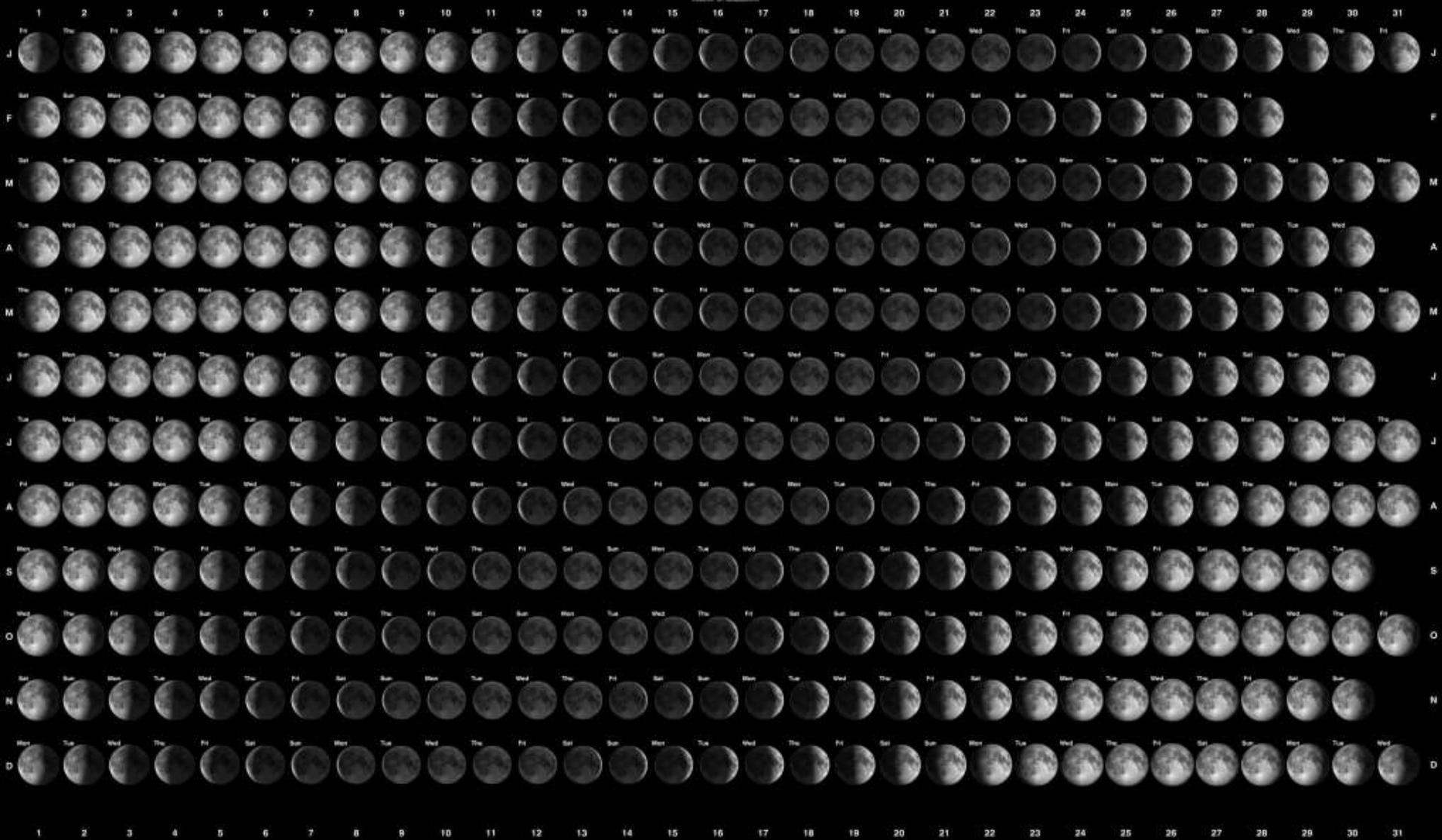
Le date importanti del nostro calendario

46 A.C. Giulio Cesare riforma il calendario

Ottobre 1582 – calendario Gregoriano (Papa Gregorio XIII – Bologna 1502 / Roma 1585)



NORTHERN HEMISPHERE MOON PHASE CALENDAR 2015



Fasi lunari nel 2015

Year	New Moon		First Quarter		Full Moon		Last Quarter	
2015					Jan 5	04:53	Jan 13	09:47
	Jan 20	13:14	Jan 27	04:48	Feb 3	23:09	Feb 12	03:50
	Feb 18	23:47	Feb 25	17:14	Mar 5	18:06	Mar 13	17:48
	Mar 20	09:36 T	Mar 27	07:43	Apr 4	12:06 p	Apr 12	03:44
	Apr 18	18:57	Apr 25	23:55	May 4	03:42	May 11	10:36
	May 18	04:13	May 25	17:19	Jun 2	16:19	Jun 9	15:42
	Jun 16	14:05	Jun 24	11:03	Jul 2 02:20	Jul 8	20:24	
	Jul 16	01:24	Jul 24	04:04	Jul 31 10:43	Aug 7	02:03	
	Aug 14	14:54	Aug 22	19:31	Aug 29	18:35	Sep 5	09:54
	Sep 13	06:41 P	Sep 21	08:59	Sep 28	02:50 t	Oct 4	21:06
	Oct 13	00:06	Oct 20	20:31	Oct 27	12:05	Nov 3	12:24
	Nov 11	17:47	Nov 19	06:27	Nov 25	22:44	Dec 3	07:40
	Dec 11	10:29	Dec 18	15:14	Dec 25	11:11		

Due lune piene nello stesso mese !!

Eclissi del 2015



20 Mar : Eclisse totale di Sole

4 Apr : Eclisse totale di Luna

13 Set : Eclisse parziale di Sole

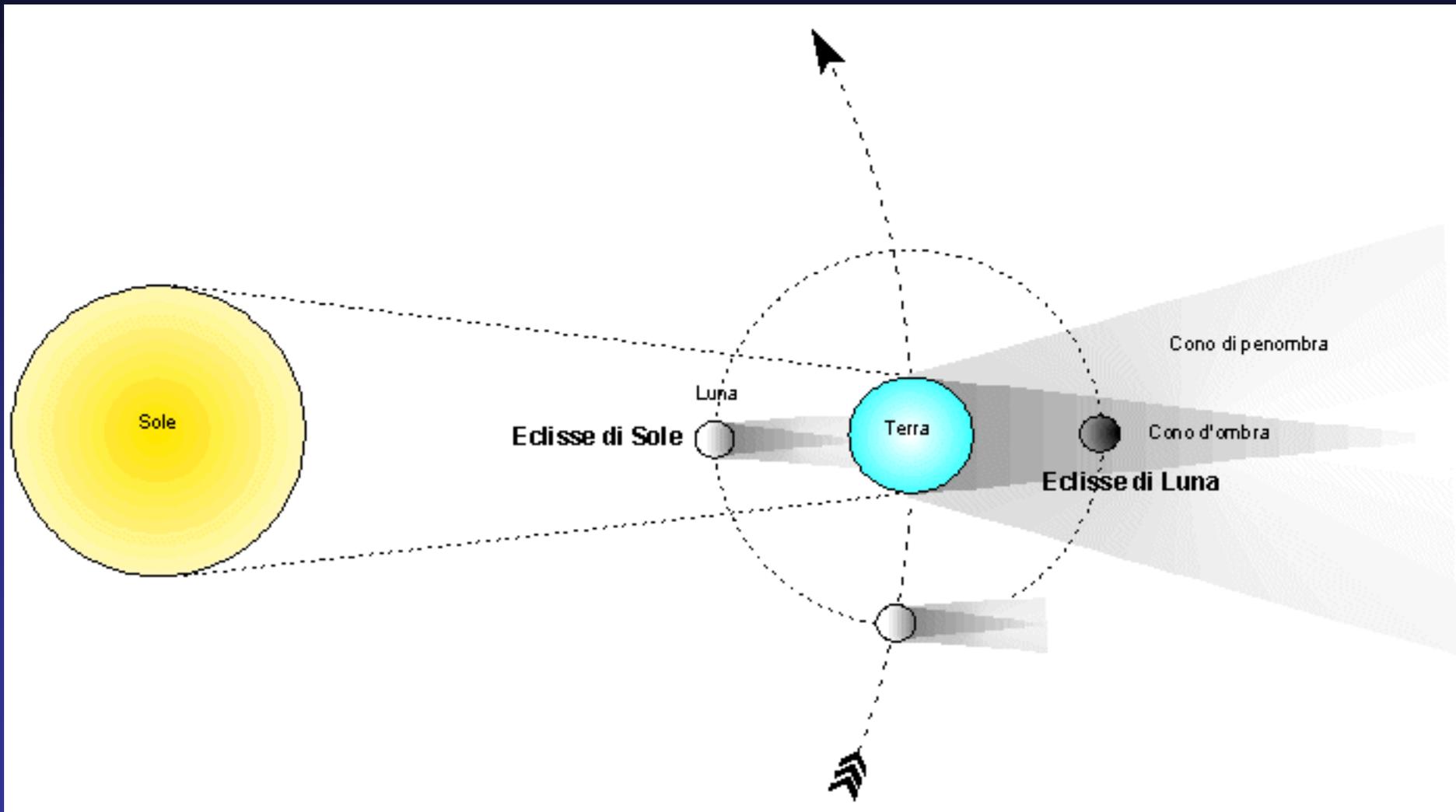
28 Set : Eclisse totale di Luna



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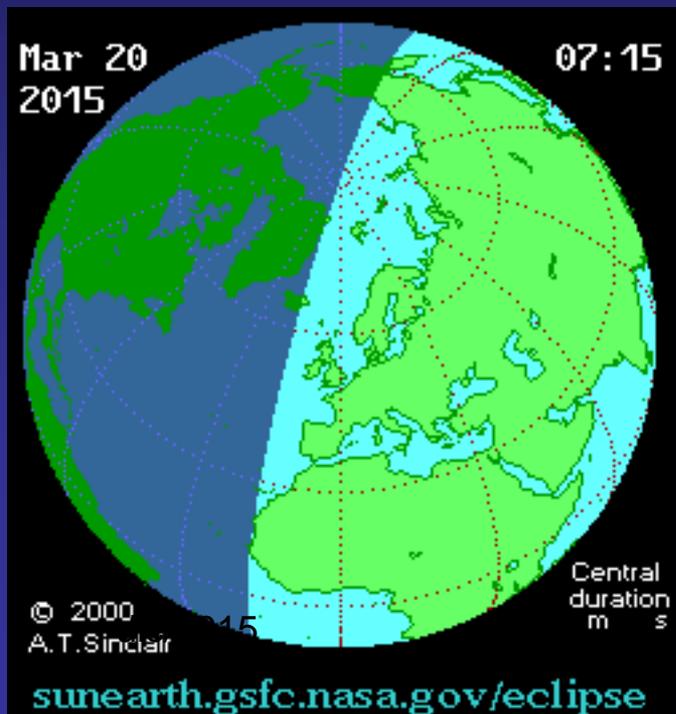
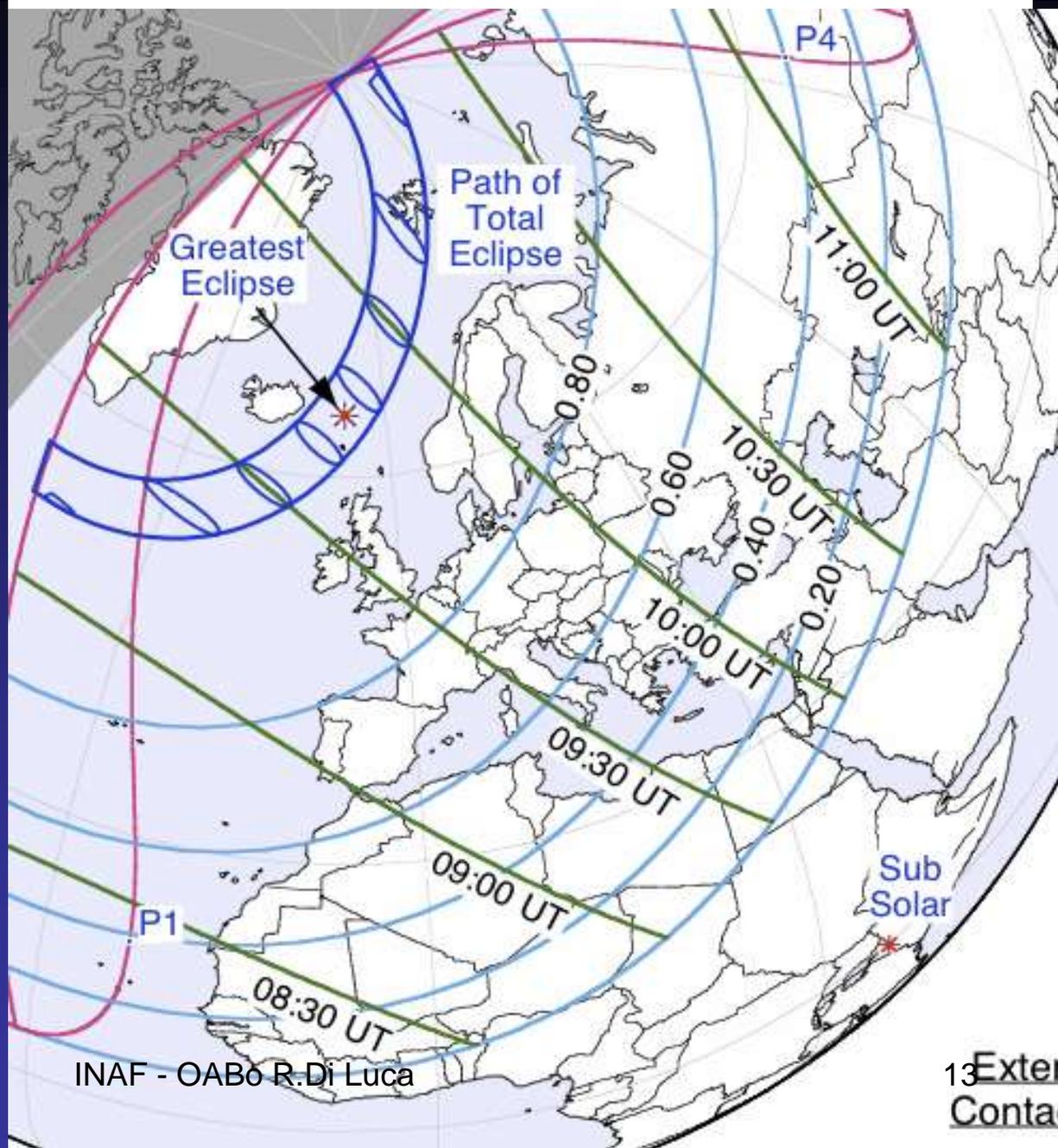


Come avvengono le eclissi



Total Solar Eclipse of 2015 Mar 20

20 Marzo Eclisse totale di Sole





100 Km



Ma da noi come si vedrà ?

Inizio 9:25

Fase massima 10:45

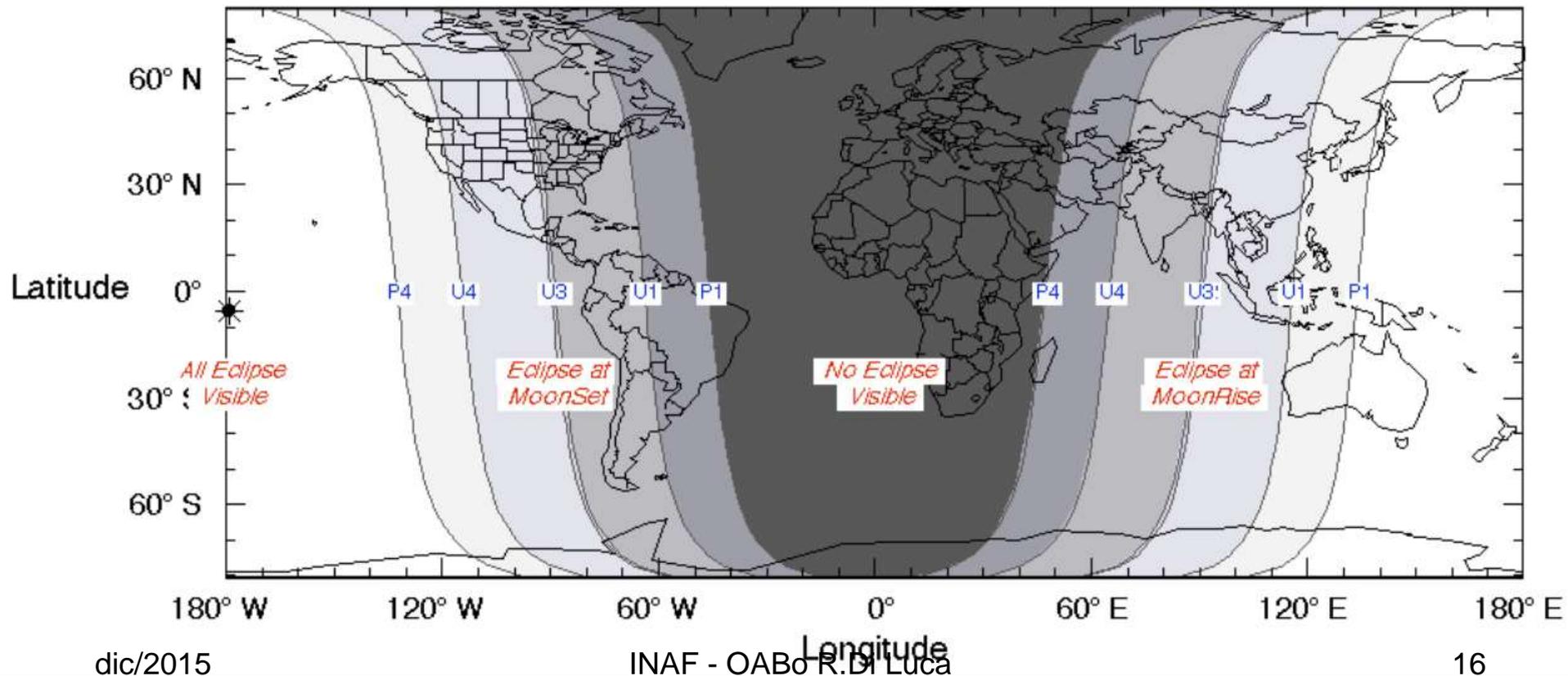
Fine 11:45



4 Aprile Eclisse totale di Luna

Non osservabile dall'Italia

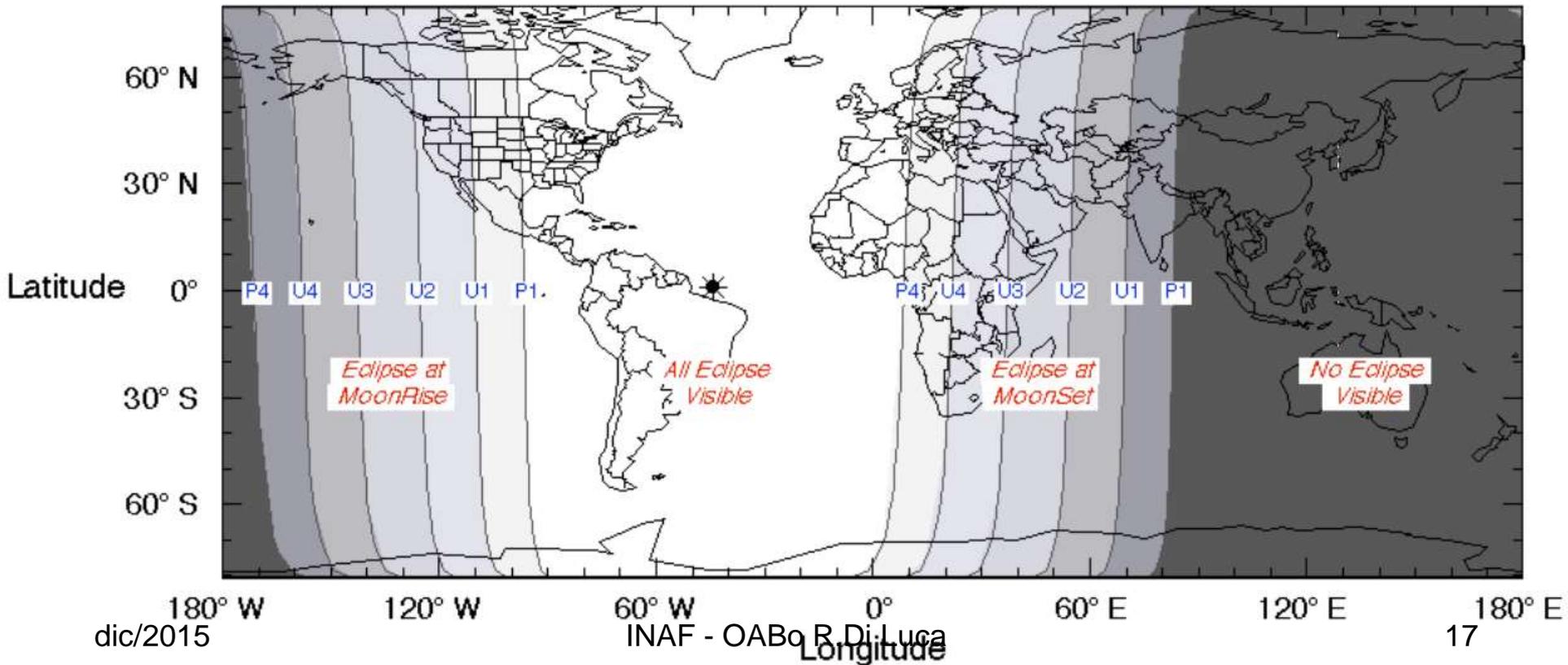
dalle 12:15 alle 15:44 (ora estiva)



28 settembre Eclisse totale di Luna

Osservabile dall'Italia !!!

dalle 3:07 alle 6:27 (ora estiva)

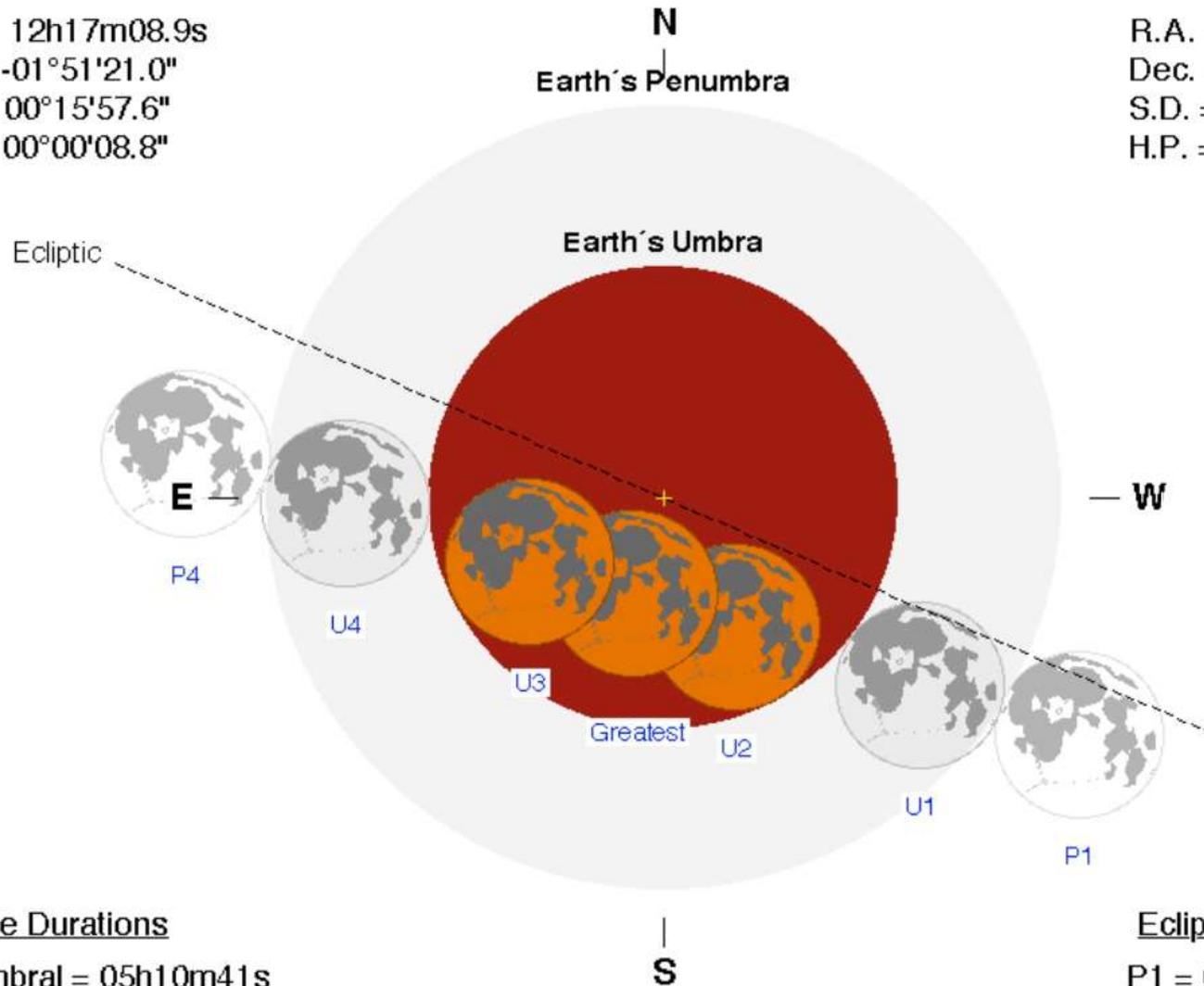


Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 12h17m08.9s
Dec. = -01°51'21.0"
S.D. = 00°15'57.6"
H.P. = 00°00'08.8"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 00h17m33.6s
Dec. = +01°32'03.7"
S.D. = 00°16'44.5"
H.P. = 01°01'26.6"



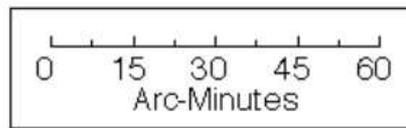
Eclipse Durations

Penumbral = 05h10m41s
Umbral = 03h19m52s
Total = 01h11m55s

Eclipse Contacts

P1 = 00:11:47 UT **43**
U1 = 01:07:11 UT **39**
U2 = 02:11:10 UT **30**
U3 = 03:23:05 UT **19**
U4 = 04:27:03 UT **8**
P4 = 05:22:27 UT **-2**

AT = 69 s
Rule = CdT (Danjon)
Eph. = VSOP87/ELP2000-85



INAF - OABO R. Di Luca
F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html



Partial Solar Eclipse of 2015 Sep 13

Ecliptic Conjunction = 06:42:23.9 TD (= 06:41:16.1 UT)

Greatest Eclipse = 06:55:19.2 TD (= 06:54:11.4 UT)

Eclipse Magnitude = 0.7875 Gamma = -1.1004

Saros Series = 125 Member = 54 of 73

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 11h23m54.6s

Dec. = +03°53'20.1"

S.D. = 00°15'53.6"

H.P. = 00°00'08.7"

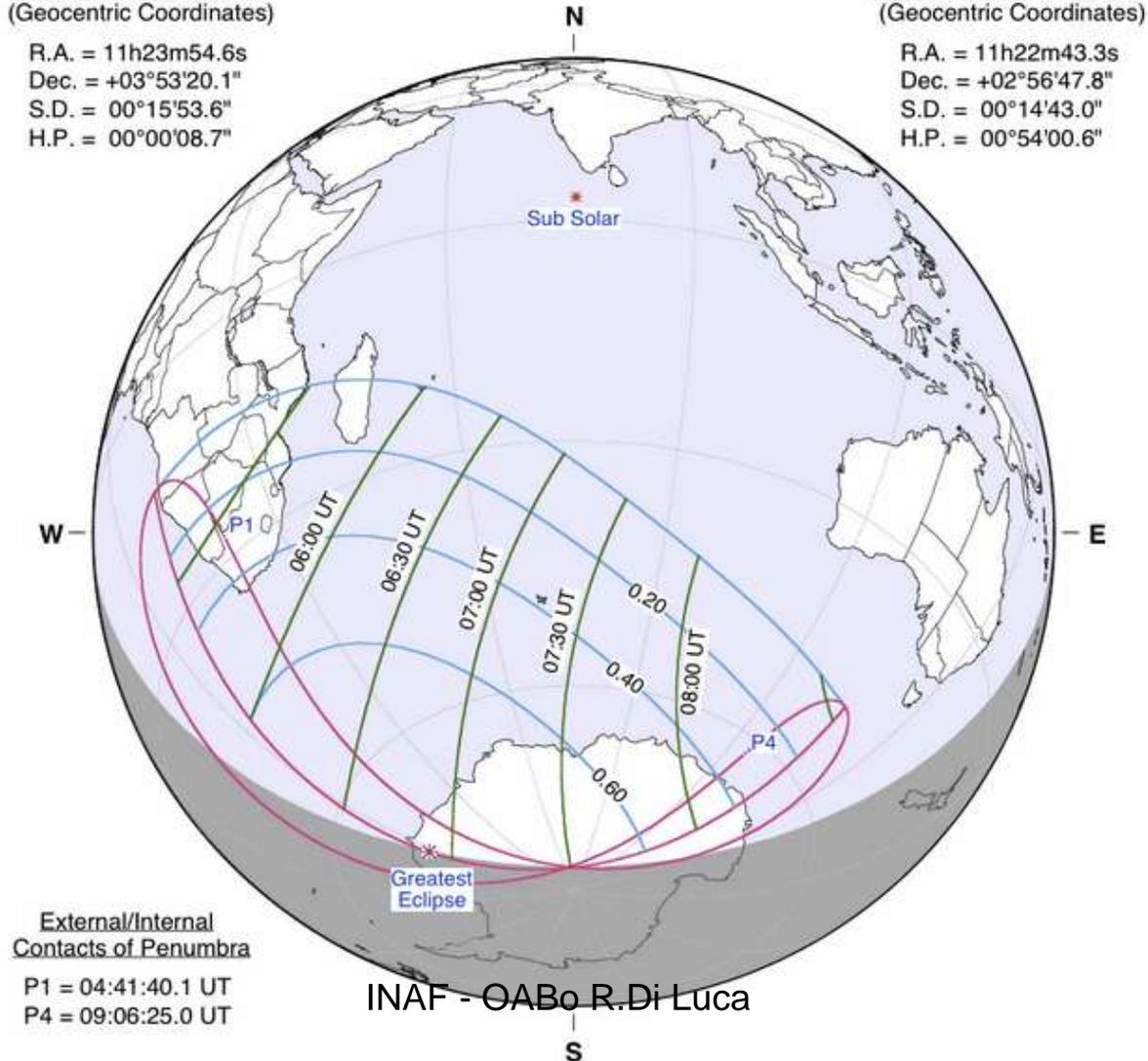
Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 11h22m43.3s

Dec. = +02°56'47.8"

S.D. = 00°14'43.0"

H.P. = 00°54'00.6"



External/Internal
Contacts of Penumbra

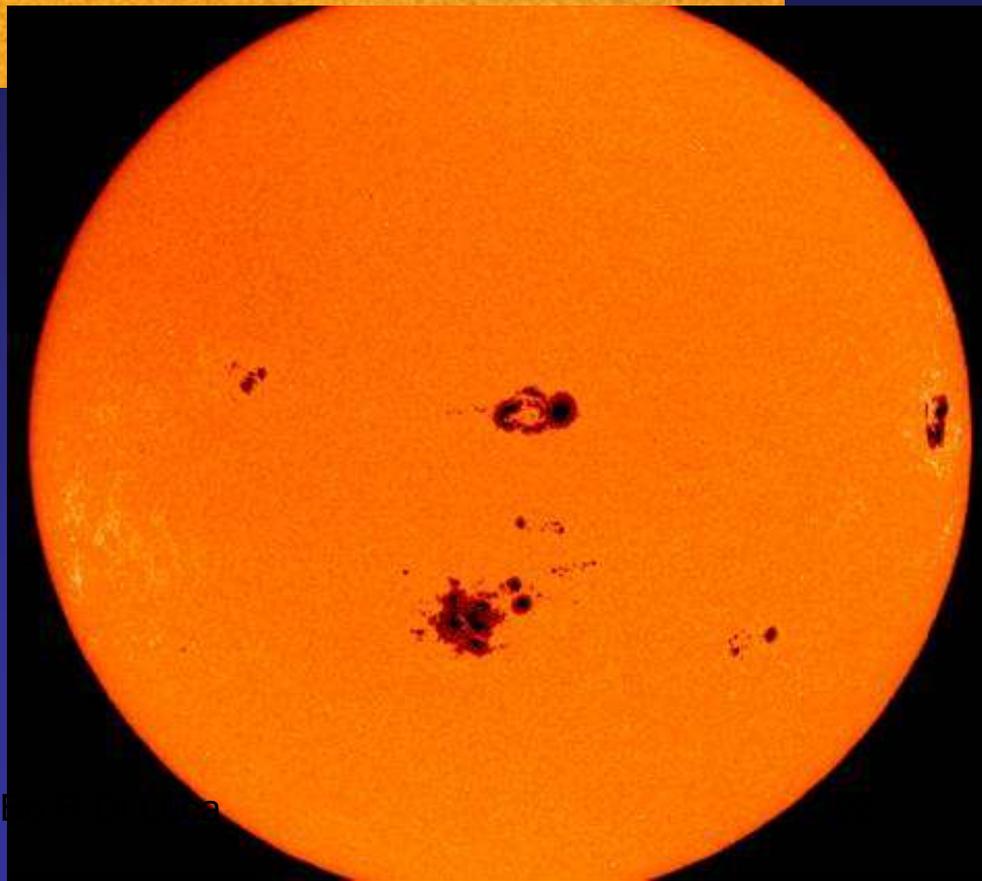
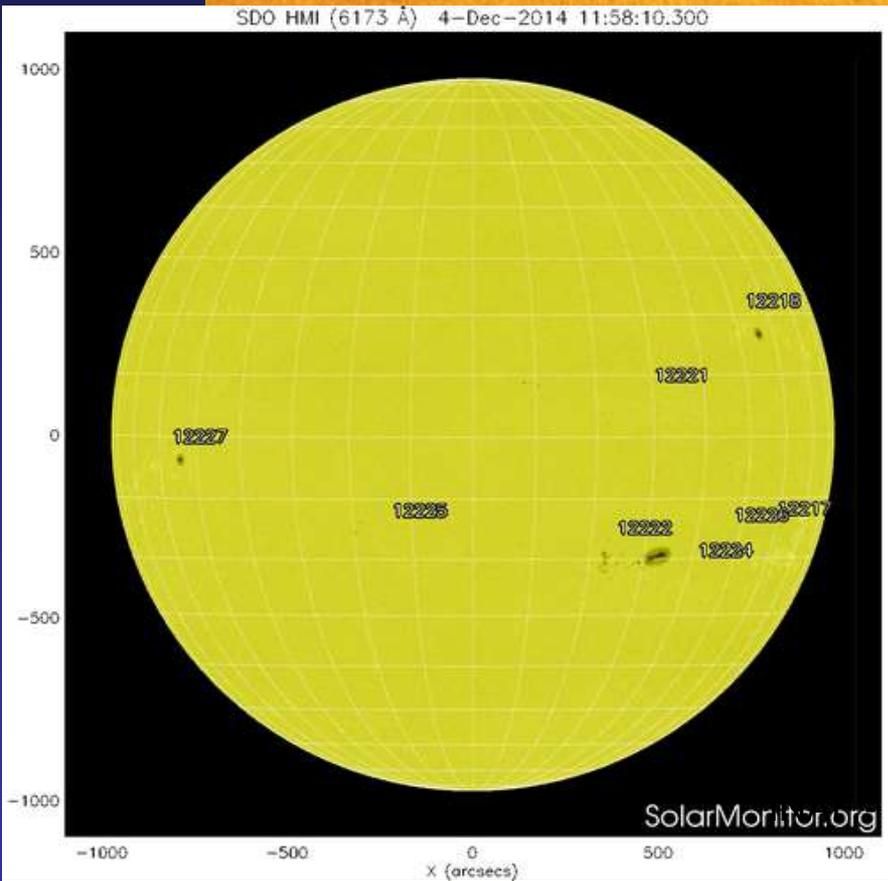
P1 = 04:41:40.1 UT

P4 = 09:06:25.0 UT

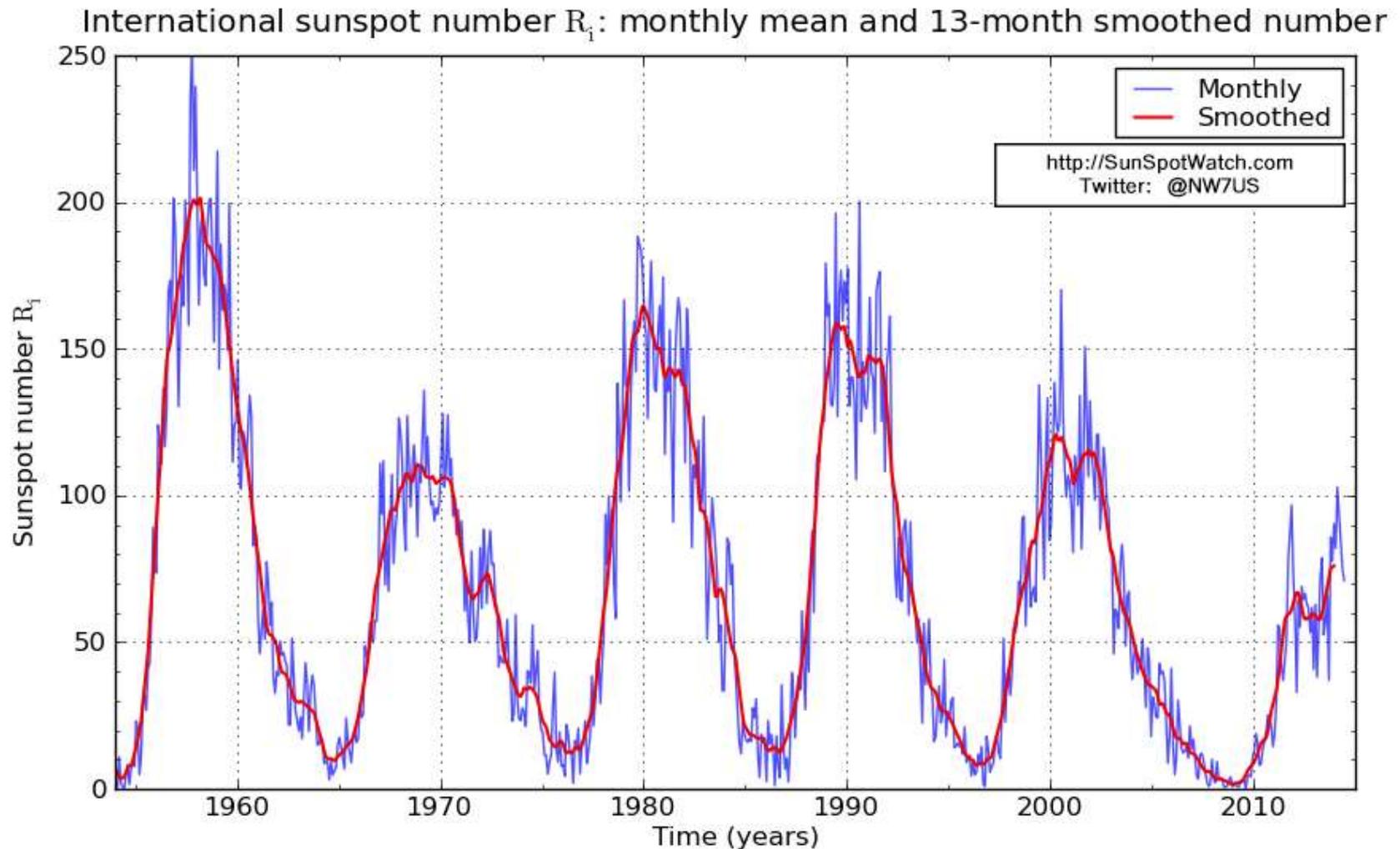
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SDO HMI (6173 Å) 4-Dec-2014 11:58:10.300



Numero delle macchie solari osservate 1960 - 2014



**Marte , Venere ,
Mercurio e Cupido**

**Francesco Gessi
(1588 – 1649)**

**Museo Davia -
Bargellini**



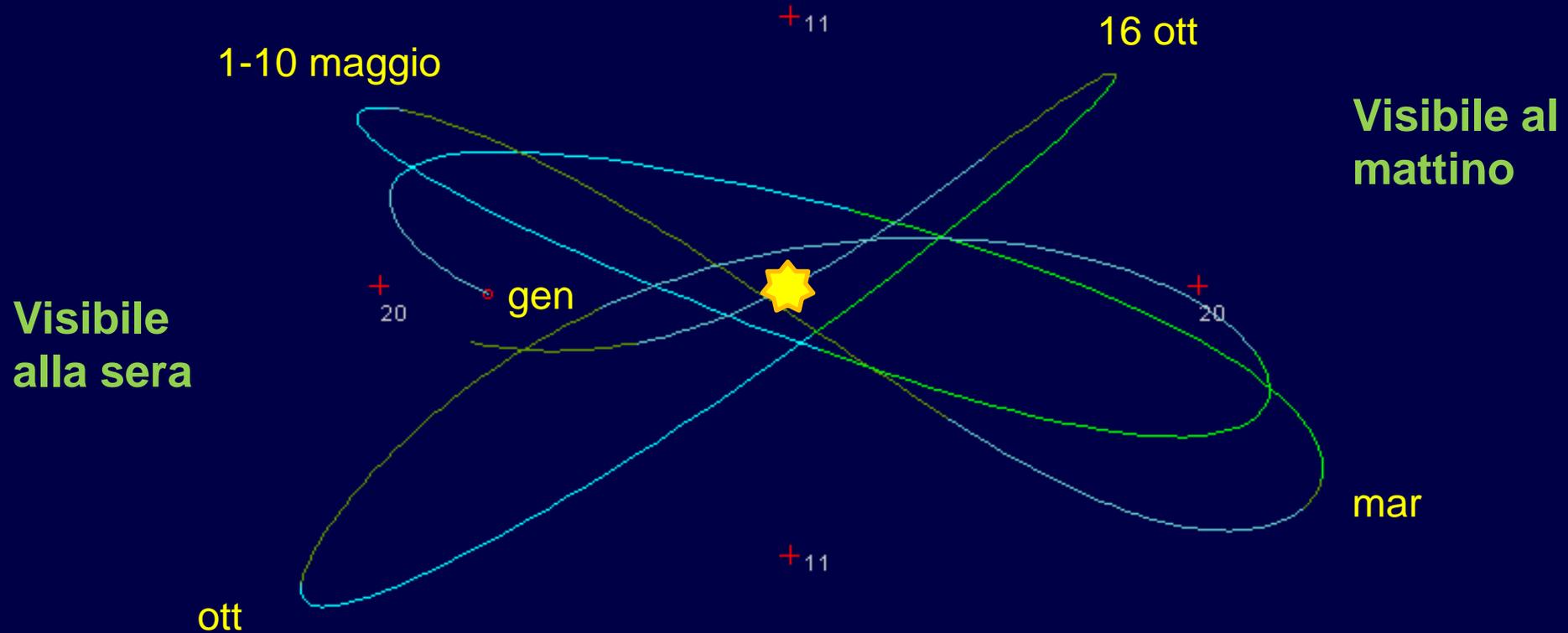
Il moto apparente di Mercurio attorno al Sole nel 2015

The dance of Mercury

Start date : 1/1/2015

End date : 31/12/2015

◇ Start date □ %s



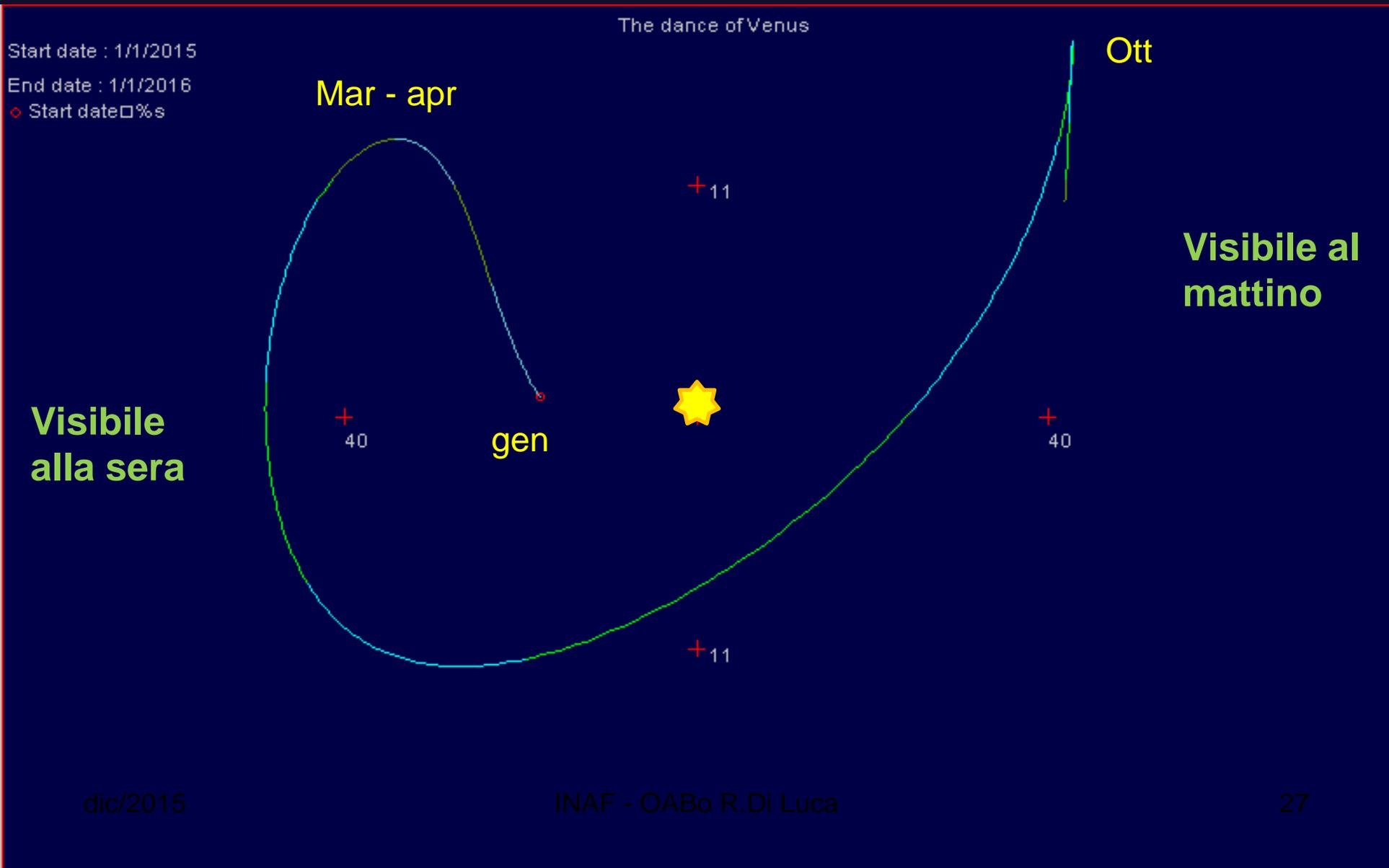


Mercury

W

NW

Il moto apparente di Venere attorno al Sole nel 2015



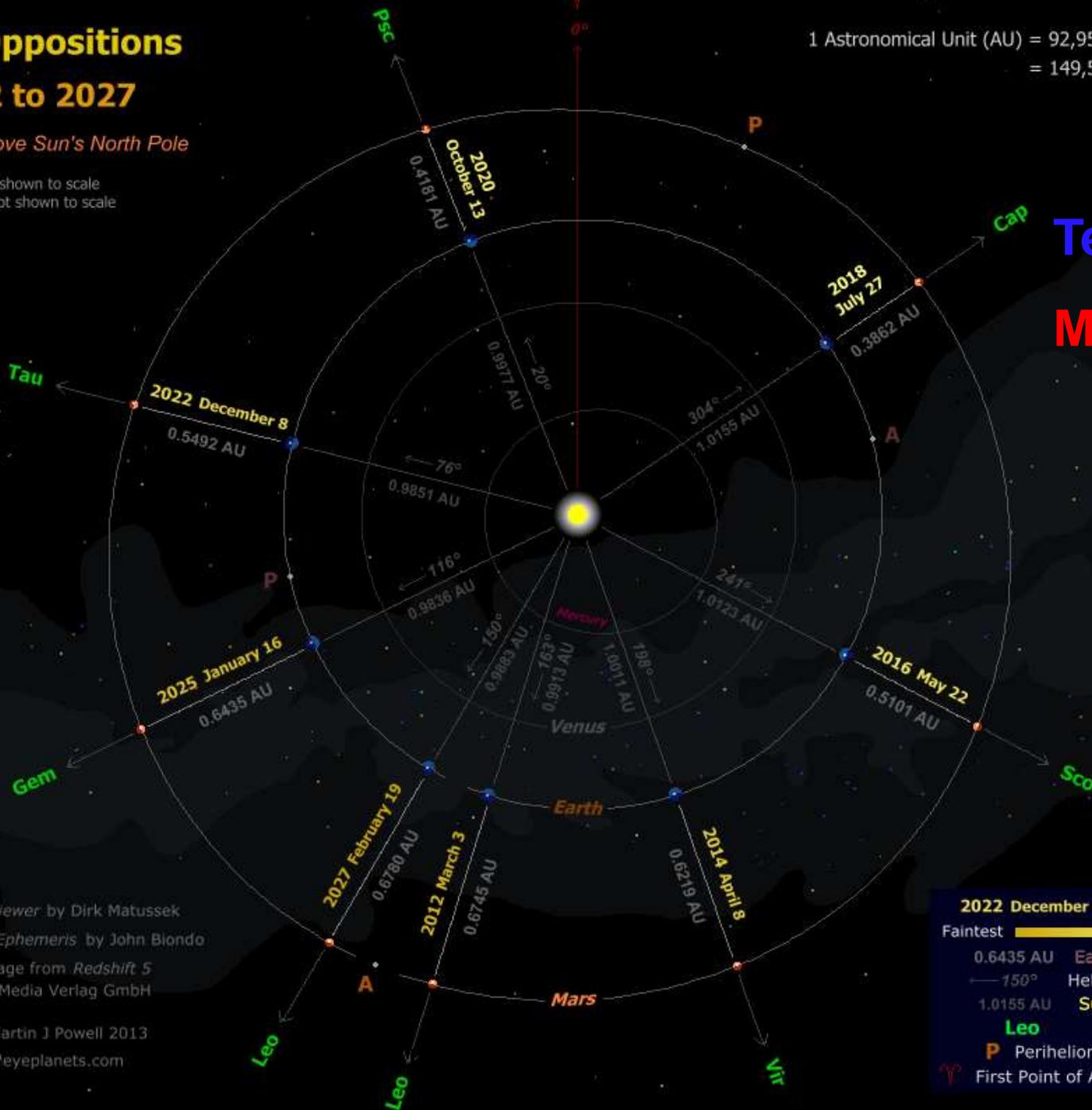
Mars Oppositions

2012 to 2027

View from above Sun's North Pole

Orbits shown to scale
Planets not shown to scale

1 Astronomical Unit (AU) = 92,955,806 statute miles
= 149,597,870 kilometres



Terra 365

Marte 687

Orbits from *Astroviewer* by Dirk Matussek

Data from *SkyGazer Ephemeris* by John Biondo

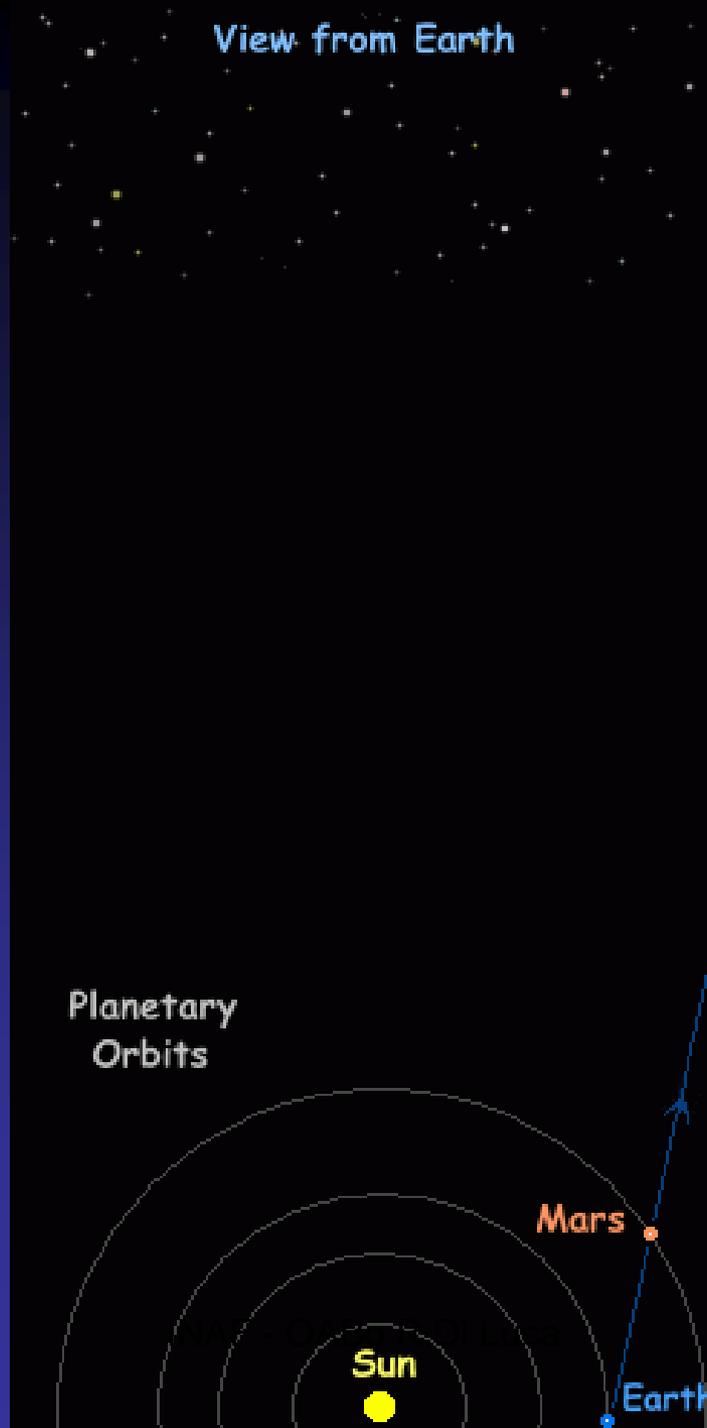
Background image from *Redshift 5*
by United Soft Media Verlag GmbH

Diagram © Martin J Powell 2013

www.nakedeyeplanets.com

2022 December 8 Opposition date
Faintest  Brightest
0.6435 AU Earth-Mars distance
150° Heliocentric longitude
1.0155 AU Sun-Earth distance
Leo Constellation
P Perihelion A Aphelion
♈ First Point of Aries (Vernal Equinox)

View from Earth



Jupiter

Saturn

Uranus

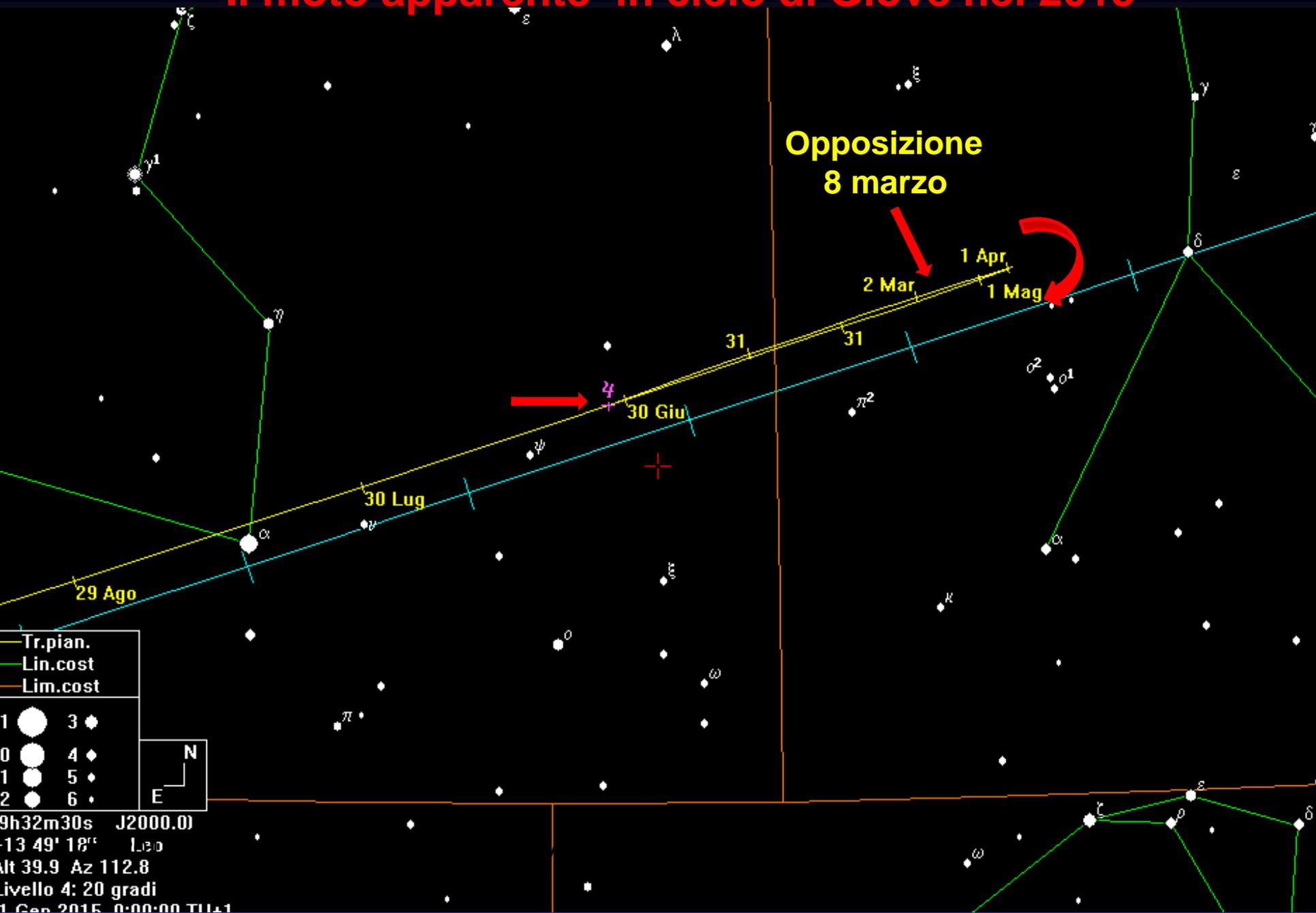
Neptune

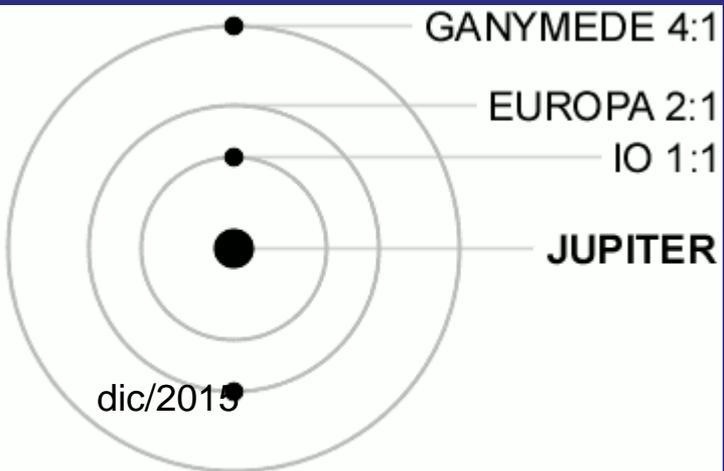
Earth →

← Pluto



Il moto apparente in cielo di Giove nel 2015





January 7, 1610	*	○	*
January 8		○	* * *
January 9			
January 10	*	*	○
January 11	* *		○
January 12	*	○	*
January 13	* *	○	* *

Triple transits of satellites of Jupiter, 1981–2040

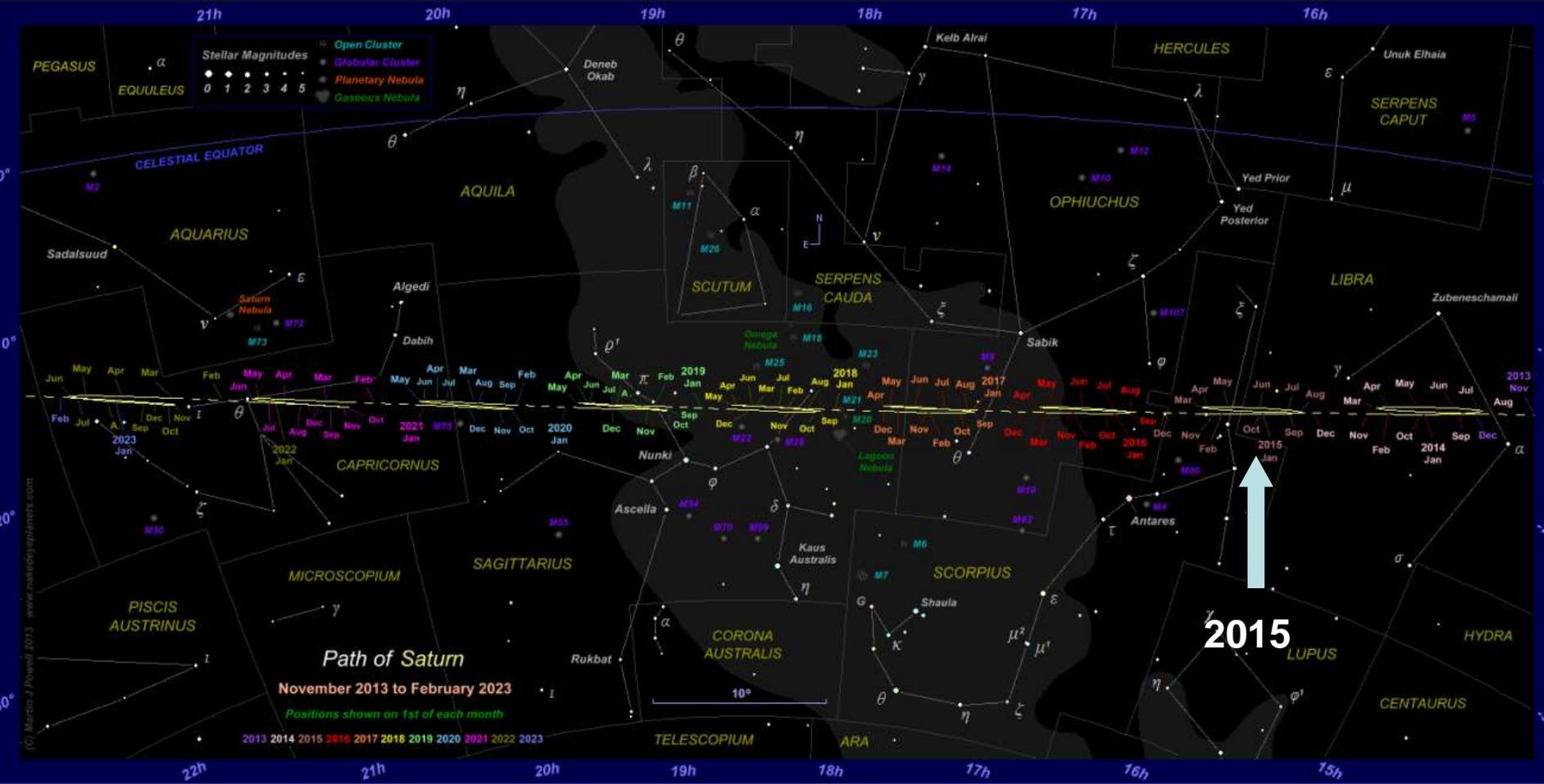
All times are in Universal Time

Date	Beginning	End	Events	Elong.	Note
	<i>h m</i>	<i>h m</i>		°	
1984 June 3	7 58	8 19	2S, 3T, 4S	152 W	A
1985 Jan. 23-24	22 42	0 50	1, 2, 4	7 W	
1986 May 8	1 32	2 34	1T, 2S, 4S	61 W	
1990 Aug. 30	7 12	7 33	1T, 3S, 4S	34 W	
1997 Jan. 30	5 25	7 15	1ST, 2ST, 4S; later 1T, 2ST, 4S	8 W	
1997 June 13	17 27	18 16	1S, 3S, 4T; later also 1T	121 W	B
1997 June 13	19 21	20 14	1T, 3T, 4T	121 W	
1997 Sept. 21*	19 23	21 28	2S, 3T, 4S	134 E	
1997 Nov. 11	2 58	5 50	1T, 3S, 4S; later 1S, 3S, 4S	85 E	
2003 Jan. 17-18*	23 05	1 10	1ST, 2S, 4T; later 1T, 2ST, 4T	162 W	
2003 Oct. 29-30	21 23	0 18	1S, 3S, 4T; later 1T, 3S, 4T	53 W	C
2004 Mar. 28	6 59	8 18	1T, 3T, 4S	153 E	
2004 Aug. 25*	18 44	20 24	1ST, 3T, 4T; later 1S, 3ST, 4T	21 E	
2010 Mar. 31	22 07	24 19	1S, 2S, 4T; later 1ST, 2ST, 4T	24 W	
2013 Oct. 12*	4 31	5 36	1S, 2S, 4S	90 W	
2014 June 3	15 34	19 43	2T, 3T, 4S; later 2S, 3S, 4S	38 E	D
2014 Dec. 21	15 16	16 52	1ST, 3T, 4S; later 1T, 3T, 4S	127 W	
2015 Jan. 24*	6 27	7 11	1ST, 2S, 4ST; later 1T, 2ST, 4ST	164 W	
2015 May 20-21*	22 52	0 34	1T, 3S, 4T; later also 1S	76 E	
2021 Aug. 15	15 17	15 47	2S, 3ST, 4T; later also 2T	175 W	
2025 Oct. 18	13 08	14 06	1T, 2S, 4S; later 1T, 2T, 4S	91 W	
2026 Dec. 11*	21 25	22 51	1S, 2S, 4T; later 1ST, 2T, 4T	113 W	
2032 Mar. 20	10 51	13 52	1S, 3S, 4S; later 1T, 3S, 4S	64 W	
2032 May 9	19 33	20 39	2S, 3T, 4S	108 W	
2032 Aug. 17*	22 26	23 34	1ST, 3ST, 4T; later 1S, 3S, 4T	148 E	
2032 Dec. 30	9 10	11 10	1T, 2ST, 4S; later 1ST, 2S, 4S	27 E	E
2037 Sept. 5*	3 27	4 39	1S, 2T, 4T; later also 1T	50 W	
2037 Oct. 8	18 25	21 03	1S, 3S, 4T; later 1T, 3S, 4T	78 W	
2038 Mar. 8*	3 40	3 40	1T, 3T, 4S	122 E	
2038 Aug. 5	17 38	17 53	1ST, 3S, 4S; later 1T, 3ST, 4S	2 W	
2038 Dec. 18*	4 11	6 51	1S, 2S, 4T; later 1T, 2T, 4T	115 W	

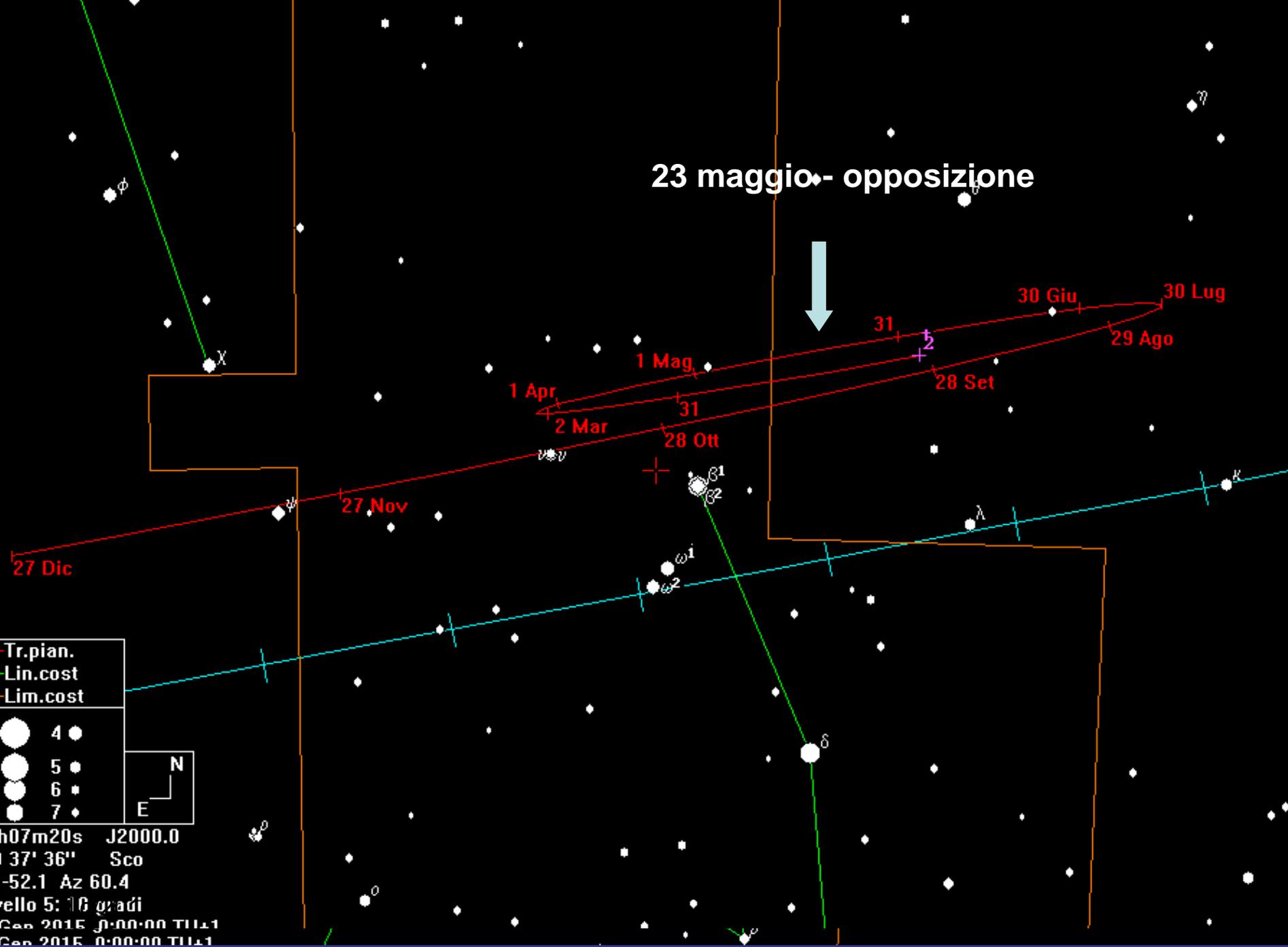
24 gennaio
Tramonta alle 7:40
Sara' basso circa 11 gradi

20 maggio
Tramonta alle 23:49
Sara' basso solo 9 gradi

Saturno ruota attorno al Sole in 29.4 anni terrestri



23 maggio - opposizione



Sciami meteorici

Shower	Activity	Maximum		Radiant		V_{∞} km/s	r	ZHR
		Date	λ_{\odot}	α	δ			
Antihelion Source (ANT)	Dec 10–Sep 10 –	March–April, late May, late June		see Table 6		30	3.0	4
Quadrantids (010 QUA)	Dec 28–Jan 12	Jan 04	283°16	230°	+49°	41	2.1	120
α -Centaurids (102 ACE)	Jan 28–Feb 21	Feb 08	319°2	210°	−59°	56	2.0	6
γ -Normids (118 GNO)	Feb 25–Mar 28	Mar 15	354°	239°	−50°	56	2.4	6
Lyrids (006 LYR)	Apr 16–Apr 25	Apr 22	32°32	271°	+34°	49	2.1	18
π -Puppids (137 PPU)	Apr 15–Apr 28	Apr 24	33°5	110°	−45°	18	2.0	Var
η -Aquariids (031 ETA)	Apr 19–May 28	May 06	45°5	338°	−01°	66	2.4	40*
η -Lyrids (145 ELY)	May 03–May 14	May 09	48°0	287°	+44°	43	3.0	3
June Bootids (170 JBO)	Jun 22–Jul 02	Jun 27	95°7	224°	+48°	18	2.2	Var
Piscis Austr. (183 PAU)	Jul 15–Aug 10	Jul 28	125°	341°	−30°	35	3.2	5
S. δ -Aquariids (005 SDA)	Jul 12–Aug 23	Jul 30	127°	340°	−16°	41	3.2	16
α -Capricornids (001 CAP)	Jul 03–Aug 15	Jul 30	127°	307°	−10°	23	2.5	5
Perseids (007 PER)	Jul 17–Aug 24	Aug 13	140°0	48°	+58°	59	2.2	100
κ -Cygnids (012 KCG)	Aug 03–Aug 25	Aug 18	145°	286°	+59°	25	3.0	3
Aurigids (206 AUR)	Aug 28–Sep 05	Sep 01	158°6	91°	+39°	66	2.5	6
Sept. ε -Perseids (208 SPE)	Sep 05–Sep 21	Sep 09	166°7	48°	+40°	64	3.0	5
Draconids (009 DRA)	Oct 06–Oct 10	Oct 09	195°4	262°	+54°	20	2.6	Var
S. Taurids (002 STA)*	Sep 10–Nov 20	Oct 10	197°	32°	+09°	27	2.3	5
δ -Aurigids (224 DAU)	Oct 10–Oct 18	Oct 11	198°	84°	+44°	64	3.0	2
ε -Geminids (023 EGE)	Oct 14–Oct 27	Oct 18	205°	102°	+27°	70	3.0	3
Orionids (008 ORI)	Oct 02–Nov 07	Oct 21	208°	95°	+16°	66	2.5	15*
Leonis Minorids (022 LMI)	Oct 19–Oct 27	Oct 24	211°	162°	+37°	62	3.0	2
N. Taurids (017 NTA)*	Oct 20–Dec 10	Nov 12	230°	58°	+22°	29	2.3	5
Leonids (013 LEO)*	Nov 06–Nov 30	Nov 18	235°27	152°	+22°	71	2.5	15*
α -Monocerotids (246 AMO)	Nov 15–Nov 25	Nov 22	239°32	117°	+01°	65	2.4	Var
Phoenicids (254 PHO)	Nov 28–Dec 09	Dec 06	254°25	18°	−53°	18	2.8	Var
Puppид-Velids (301 PUP)	Dec 01–Dec 15	(Dec 07)	(255°)	123°	−45°	40	2.9	10
Monocerotids (019 MON)	Nov 27–Dec 17	Dec 09	257°	100°	+08°	42	3.0	2
σ -Hydrids (016 HYD)	Dec 03–Dec 15	Dec 12	260°	127°	+02°	58	3.0	3
Geminids (004 GEM)	Dec 04–Dec 17	Dec 14	262°2	112°	+33°	35	2.6	120
Comae Ber. (020 COM)	Dec 12–Dec 23	Dec 16	264°	175°	+18°	65	3.0	3
Dec. L. Minorids (032 DLM)	Dec 05–Feb 04	Dec 20	268°	161°	+30°	64	3.0	5
Ursids (015 URS)	Dec 17–Dec 26	Dec 23	270°7	217°	+76°	33	3.0	10

Luna nuova

Primo quarto

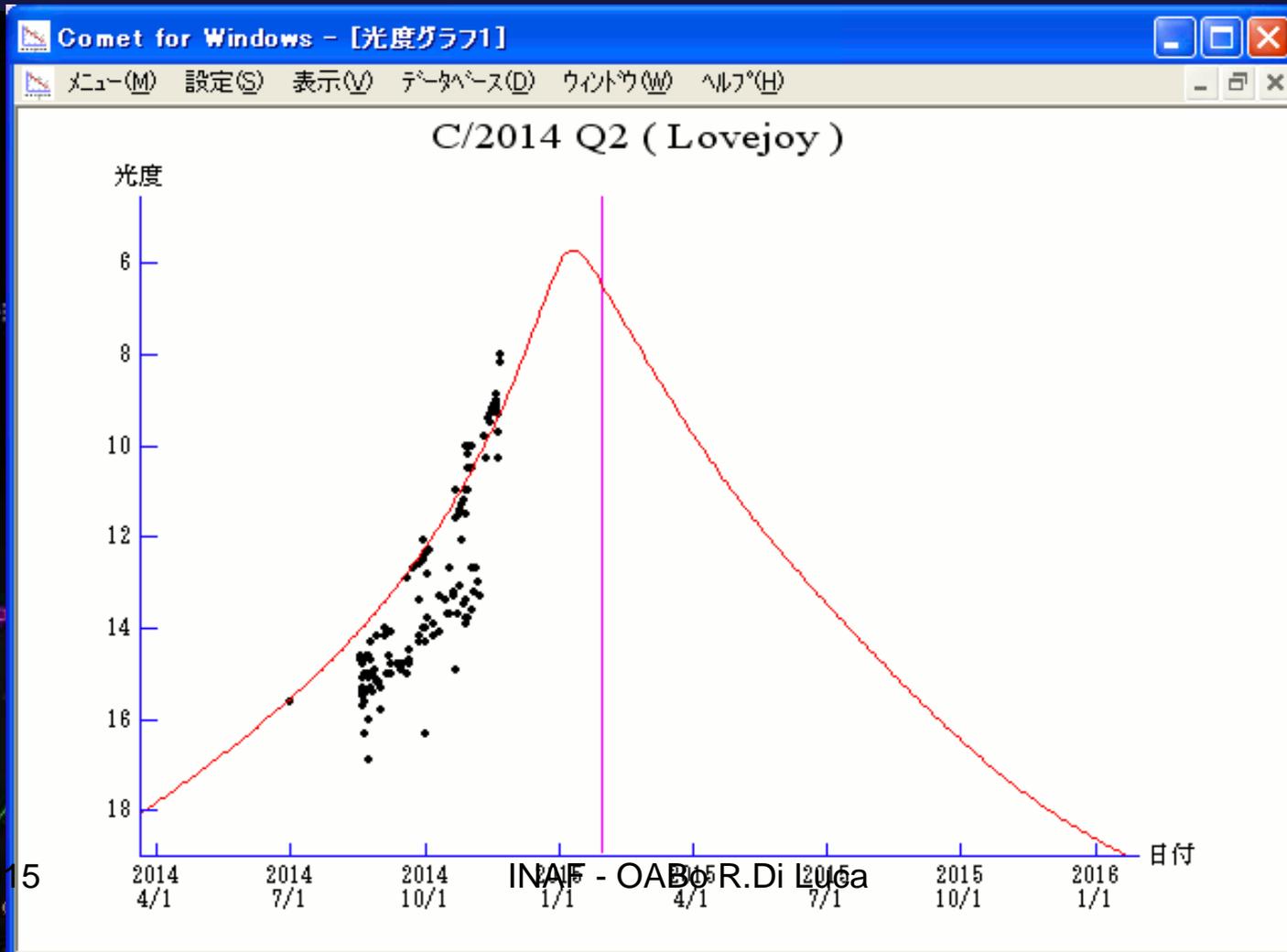
Ultimo quarto

COMETE

	T	q	P	N	H ₁	K ₁	Peak mag
Tenagra (2014 F2)	Jan 2.3	4.31			9.0	10.0	18
PanSTARRS (2013 W2)	Jan 4.4	4.45	34	1	13.5	5.0	18
P/PanSTARRS (2014 V1)	Jan 12.9	2.61	17.0	1	14.0	10.0	21
201P/LONEOS	Jan 14.6	1.34	6.43	2	12.7	10.0	14
Tenagra (2013 G9)	Jan 14.7	5.34			7.0	10.0	17
D/Brooks (1886 K1)	Jan 21.6	1.36	5.71	1	8.0	15.0	11 ?
Lovejoy (2014 Q2)	Jan 30.1	1.29			4.4	15.5	5 ?
7P/Pons-Winnecke	Jan 30.5	1.24	6.32	23	10.0	15.0	13
PanSTARRS (2014 G3)	Feb 2.6	4.70			9.0	10.0	19
309P/LINEAR	Feb 16.8	1.74	9.36	2	15.0	10.0	19
Catalina (2014 W6)	Feb 19.5	3.18			10.5	10.0	17
299P/Catalina-PanSTARRS	Feb 23.3	3.14	9.15	2	11.5	10.0	18
Catalina (2014 AA52)	Feb 27.7	2.00			10.0	10.0	15
92P/Sanguin	Mar 1.2	1.83	12.4	3	12.0	15.0	18
6P/d'Arrest	Mar 2.5	1.36	6.56	19	12.4	15.0	16
PanSTARRS (2014 Q6)	Mar 3.9	3.79			11.0	10.0	20
NEOWISE (2014 N3)	Mar 13.1	3.88			7.0	10.0	16
D/Barnard (1884 O1)	Mar 13.6	1.32	5.41	1	11.5	15.0	15 ?
44P/Reinmuth	Mar 24.1	2.12	7.10	10	8.5	15.0	16
P/LINEAR (2008 WZ96)	Mar 25.9	1.65	6.16	1	13.5	10.0	18
C/PANSTARRS (2012 F3)	Apr 1.8	3.50			6.5	10.0	14
86P/Wild	Apr 3.4	2.26	6.84	5	8.5	15.0	15
88P/Howell	Apr 6.2	1.36	5.48	7	1.8	42.6	9
42P/Neujmin	Apr 8.3	2.03	10.8	5	13.0	15.0	19
310P/Hill	Apr 18.5	2.38	8.47	2	13.5	10.0	19
174P/Echeclus (60558)	Apr 22.5	5.82	34.9	1	9.5	5.0	17
218P/LINEAR	Apr 23.2	1.17	5.45	2	16.0	10.0	15
113P/Spitaler	Apr 23.7	2.12	7.06	4	12.5	5.0	16
268P/Bernardi	Apr 27.4	2.42	9.76	1	13.5	10.0	19
308P/Lagerkvist-Carsenty	May 5.2	1.23	17.1	2	13.0	5.0	19
P/Zhao (2007 S1)	May 9.9	2.49	7.41	1	13.0	10.0	19

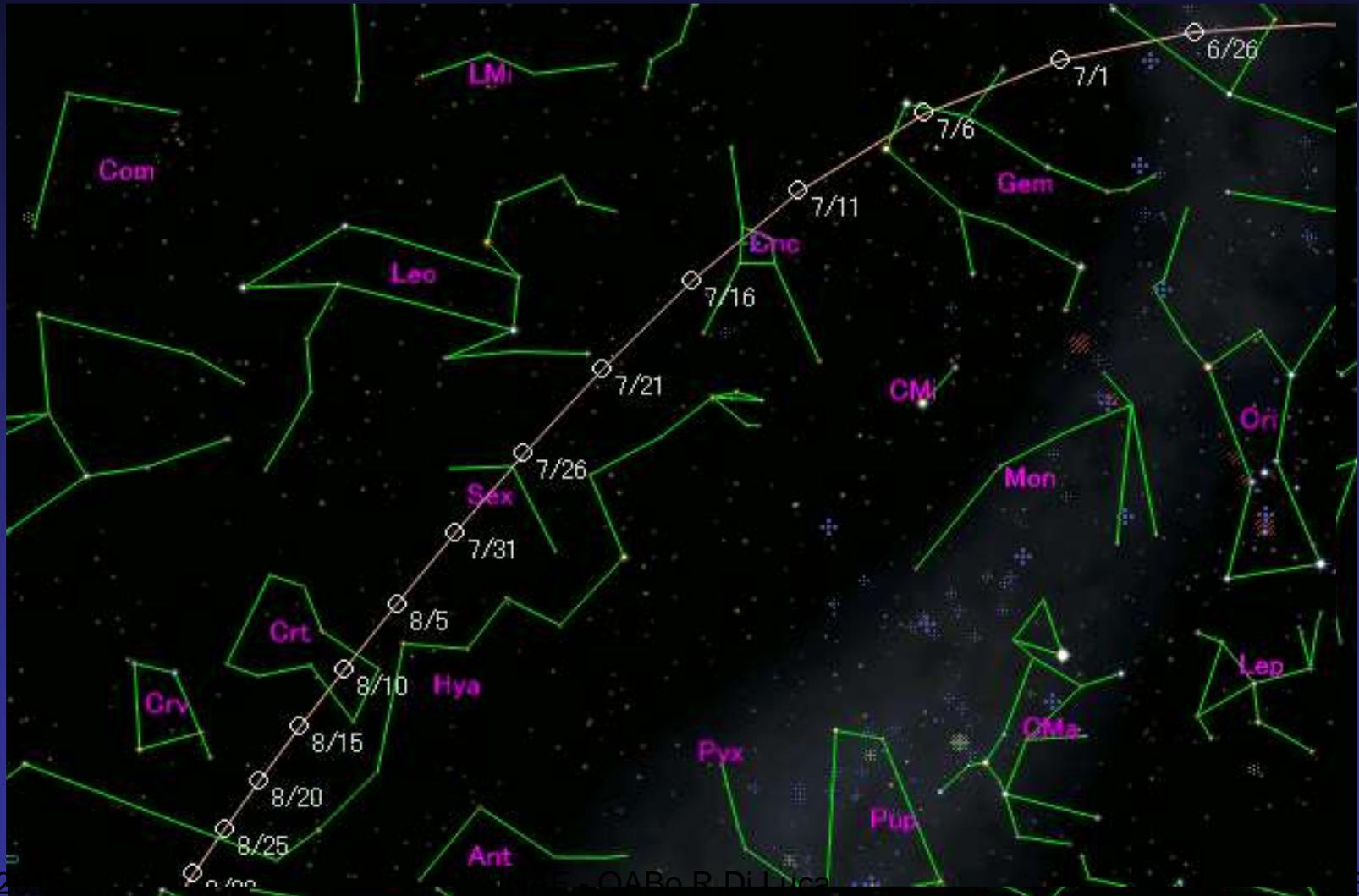
C/2014 Q2 (Lovejoy)

Ad inizio 2015 al limite della visibilita' ad occhi nudo.. (?)



C/2014 Q1 (PanSTARRS)

in primavera



C/2013 US10 (Catalina)

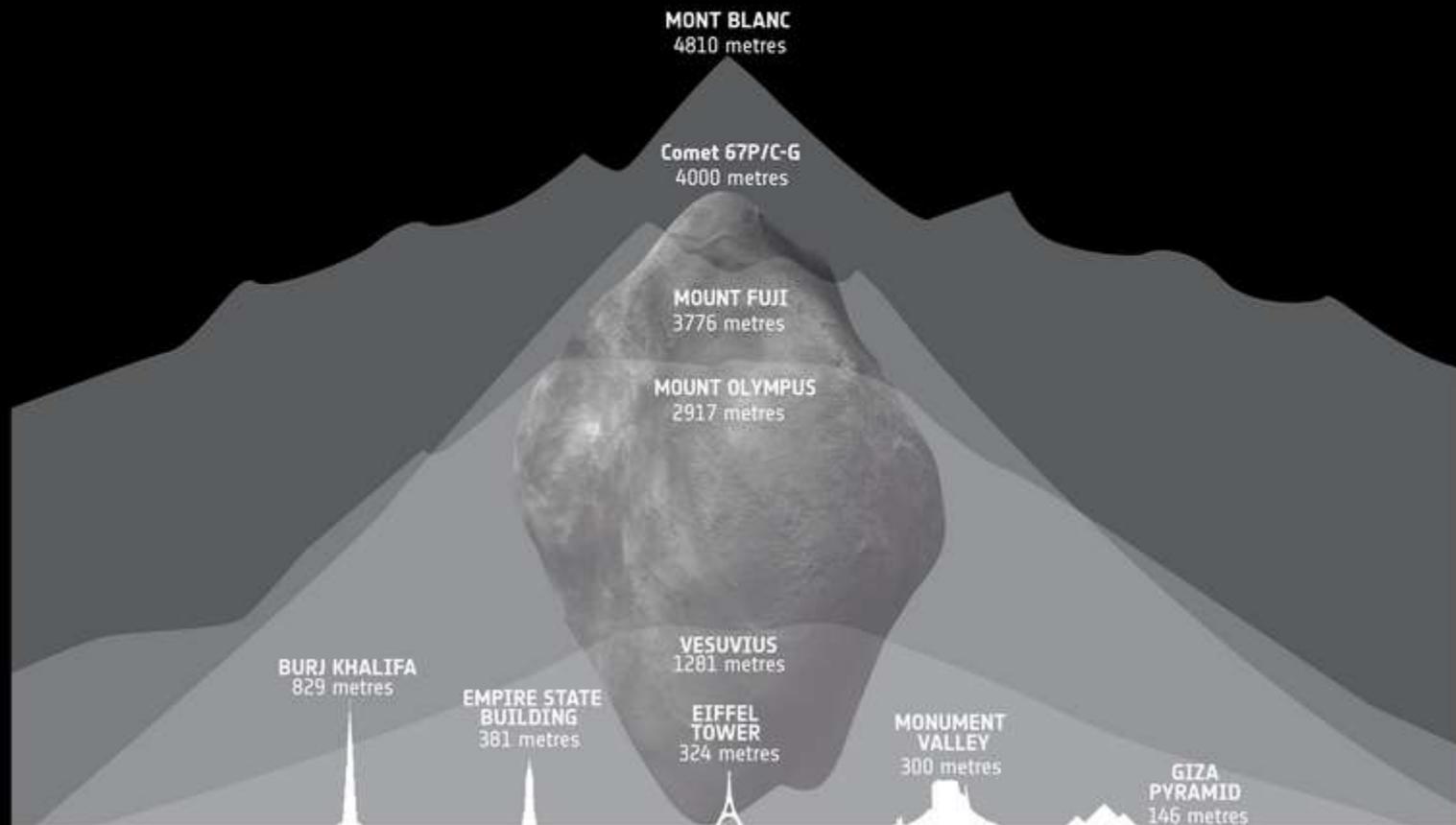
Verso fine 2015

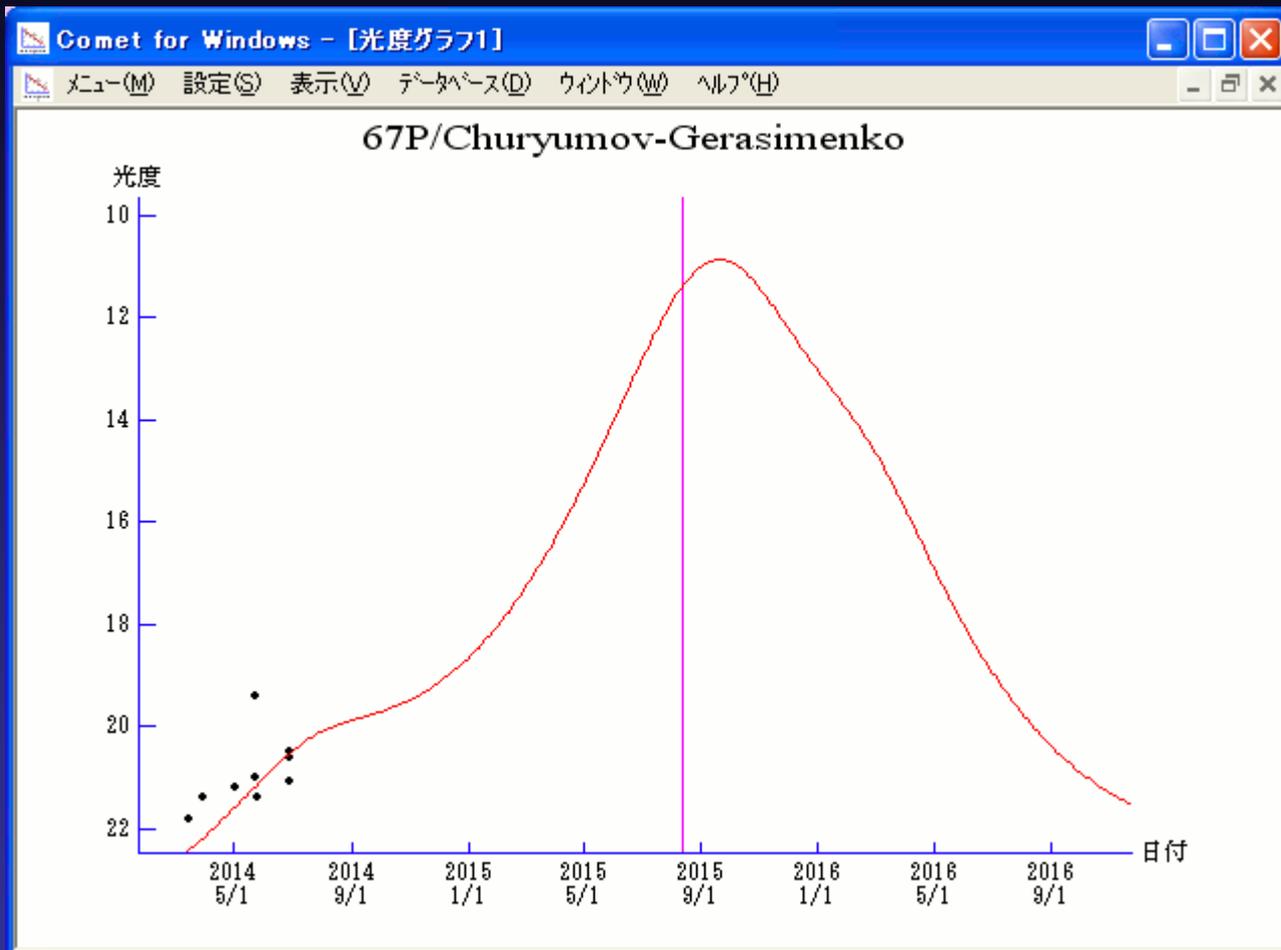


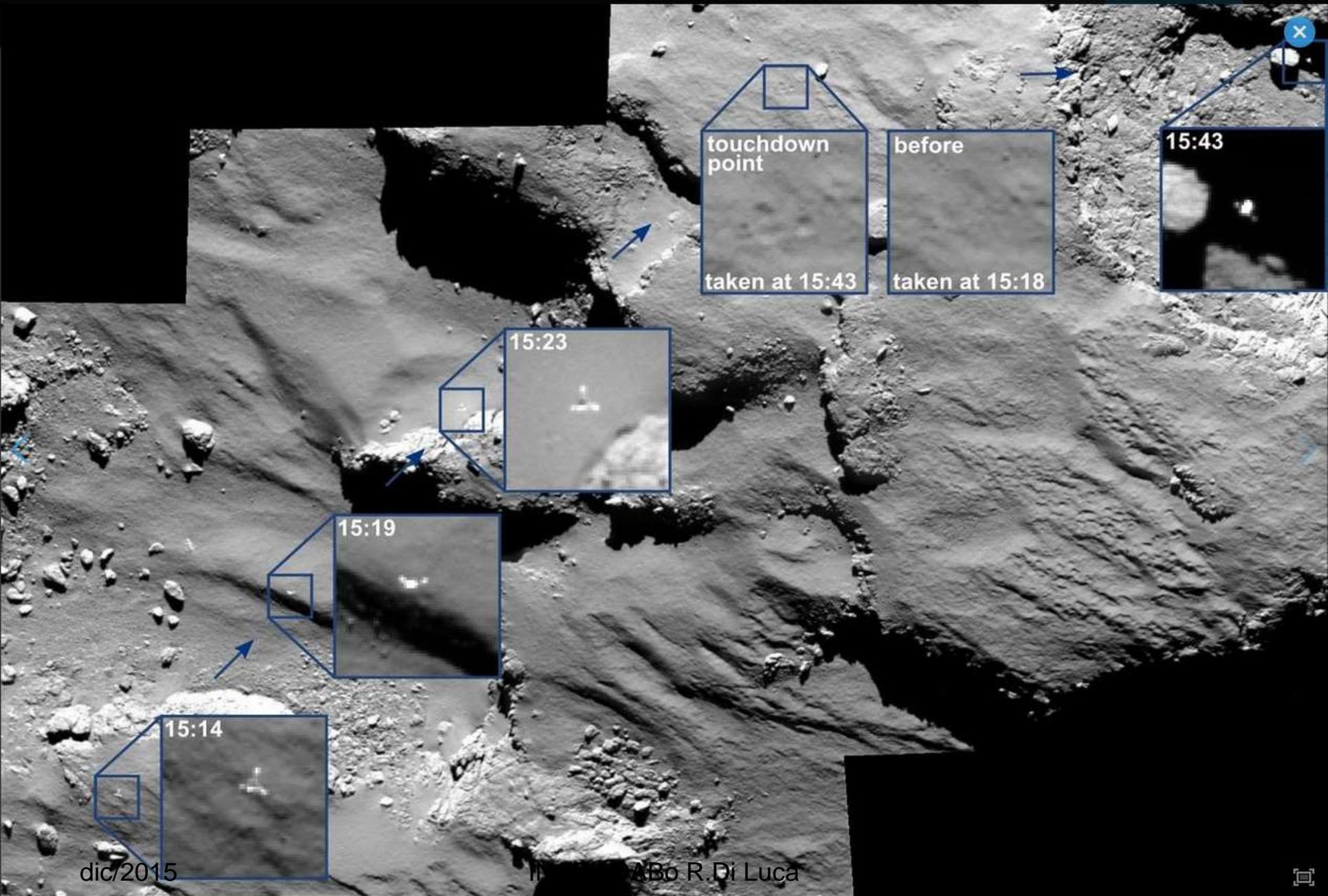
67P/Churyumov-Gerasimenko - Missione Rosetta



→ HOW BIG IS COMET 67P/CHURYUMOV-GERASIMENKO?







touchdown
point

before

15:43

taken at 15:43

taken at 15:18

15:23

15:19

15:14

dic/2015

ABo R. Di Luca



Gli star party ed eventi nel 2015

- **Ostellato** - maggio
- **Occhi su Saturno** - giugno
- **Notte della Luna** - 6 settembre
- **San Barthelemy (AO)** - settembre

**GRAZIE
PER L'ATTENZIONE !!**

Piero Tempesti

IL CALENDARIO E L'OROLOGIO

In collaborazione con l'IAI - Istituto Nazionale di Astrofisica



GEMESI EDITORE

Piero Tempesti

Il calendario e l'orologio