SOLAR ECLIPSE MERCURY TRANSIT 2016

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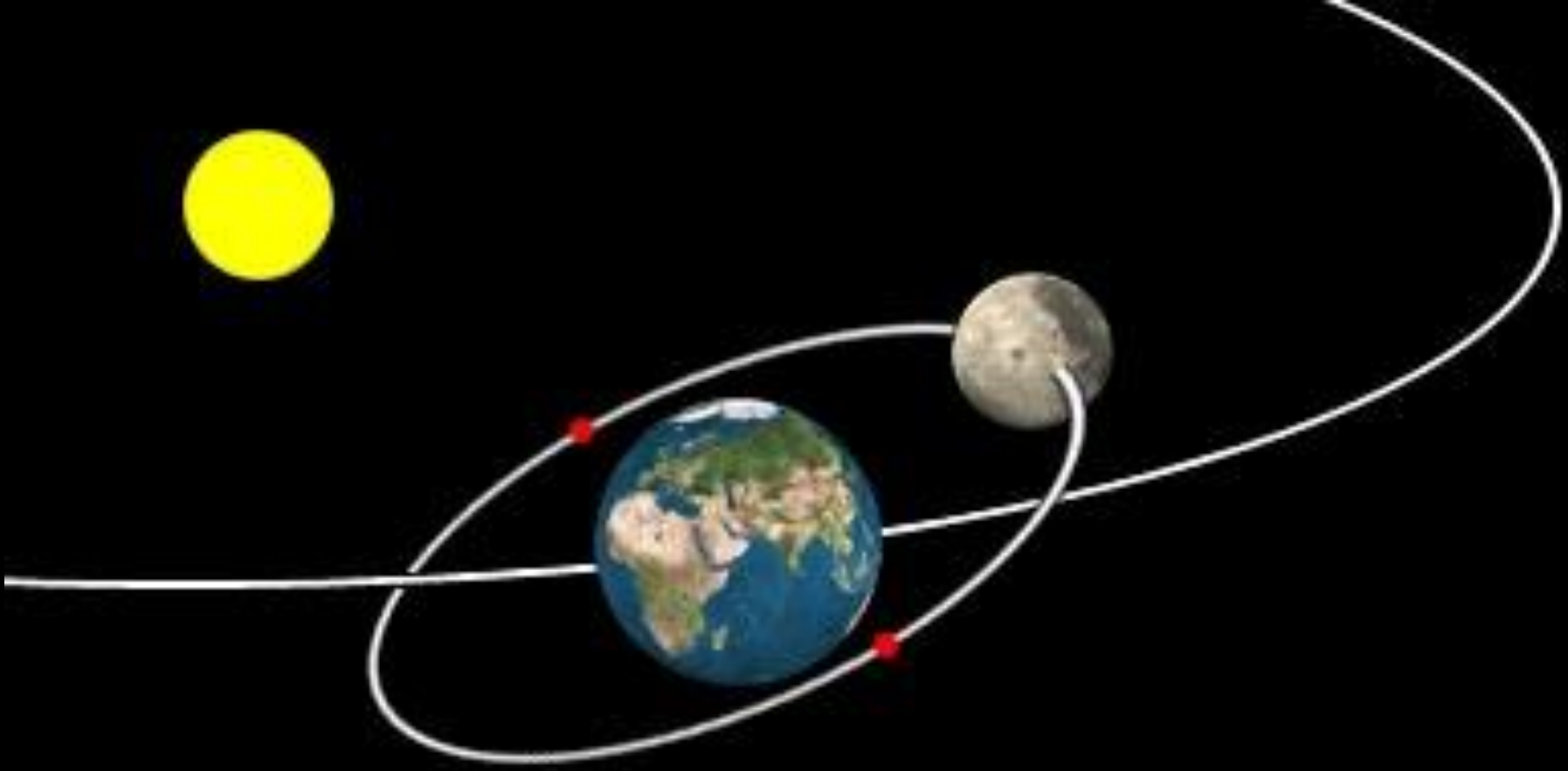
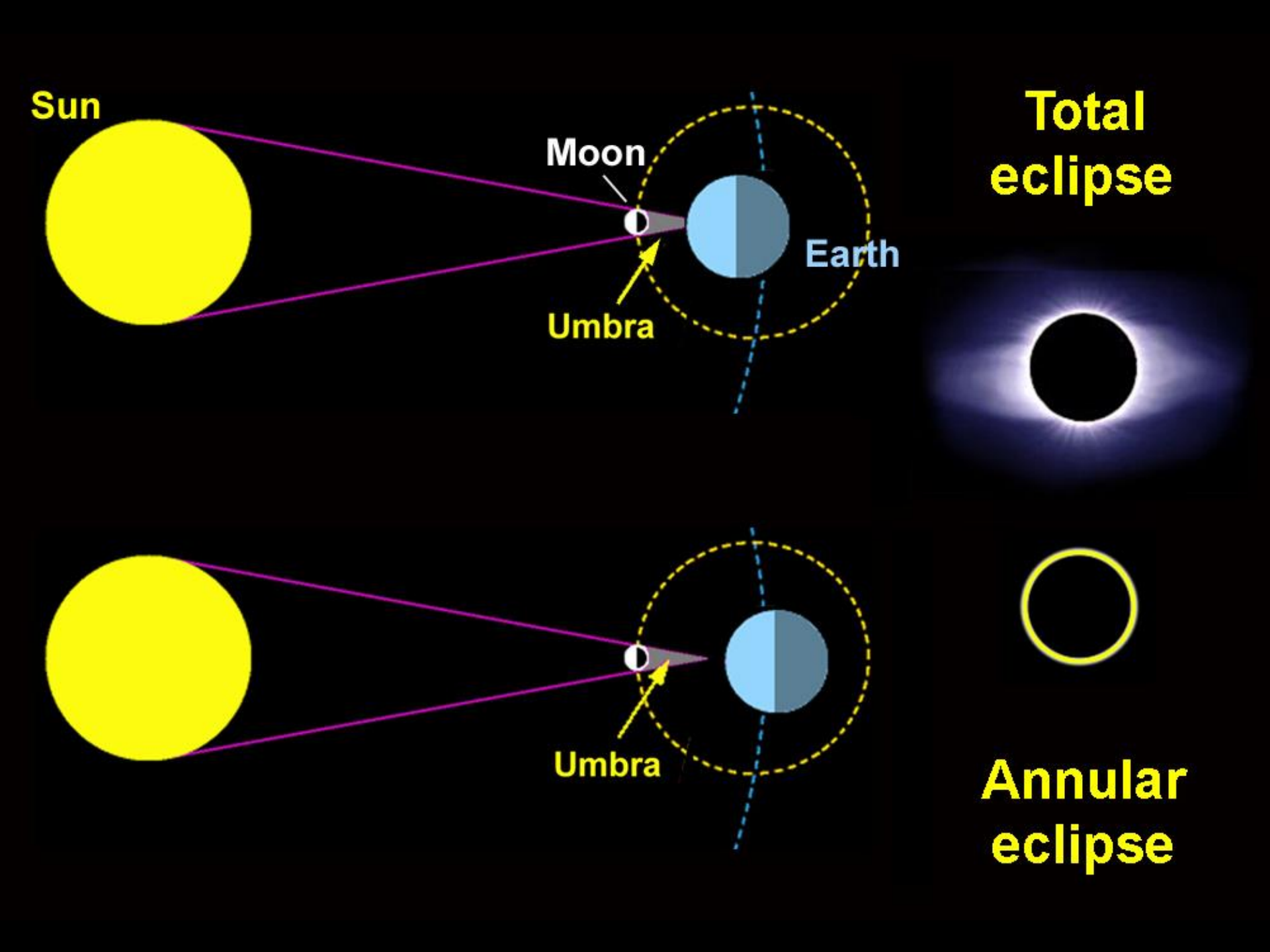
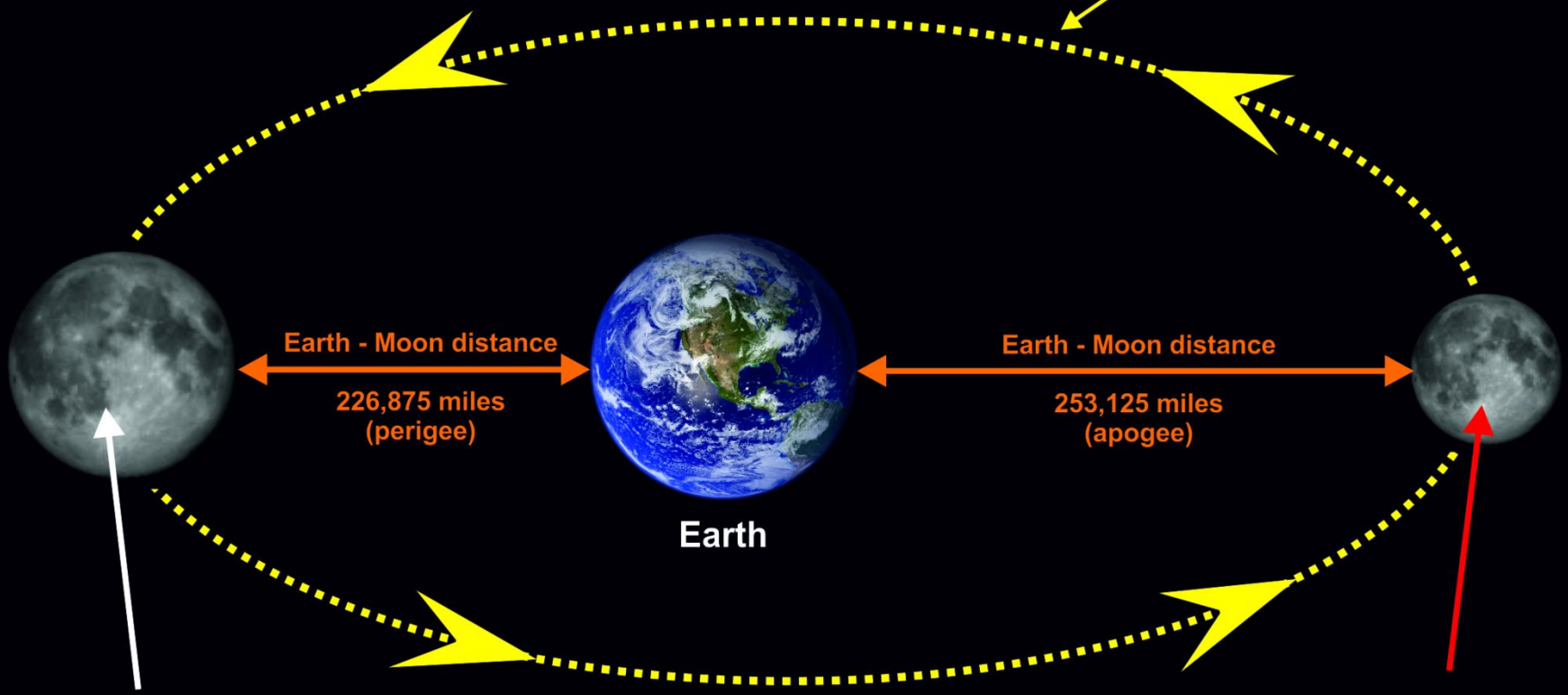
NASA/GSFC
February 22, 2016



The moon’s orbit is tilted 5 degrees to the Earth’s orbital plane. Lunar and solar eclipses can happen only when the moon is between the sun and the Earth at one of its orbital “nodes”.


Sun
Moon
Earth
Umbra
Total eclipse
Umbra
Annular eclipse

Perigee / Apogee



Sunday 10th August 2014 @ 18:43/6.43pm (BST)

Moon at perigee

(point of an orbit that is closer to Earth)

Thursday 16th January 2014 @ 04:54am

Moon at apogee

(point of an orbit that is further away from Earth)

**As the Moon crosses this elliptical path around the Earth each month,
its distance away from the Earth varies by more than 10%, between 226,875 miles and 253,125 miles.**

Perigee

2010-01-30
356,790 km
34.06 arc-mins
Altitude @ 68.82°

Apogee

2010-08-25
406,357 km
29.74 arc-mins
Altitude @ 44.87°

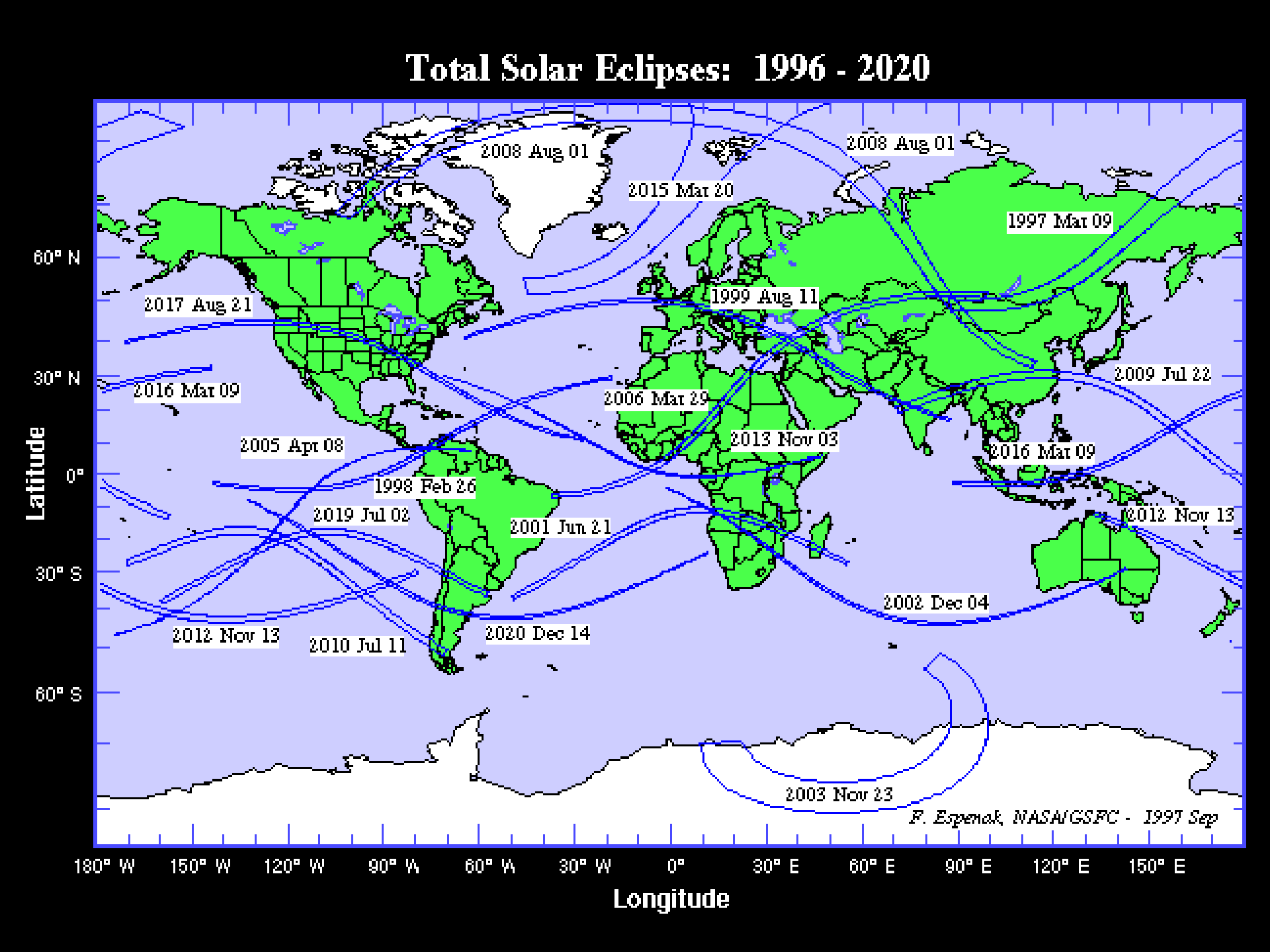
SAROS!

Synodic Month (New Moon to New Moon) = 29.530589 days = 29d 12h 44m 03s
Anomalistic Month (perigee to perigee) = 27.554550 days = 27d 13h 18m 33s
Draconic Month (node to node) = 27.212221 days = 27d 05h 05m 36s

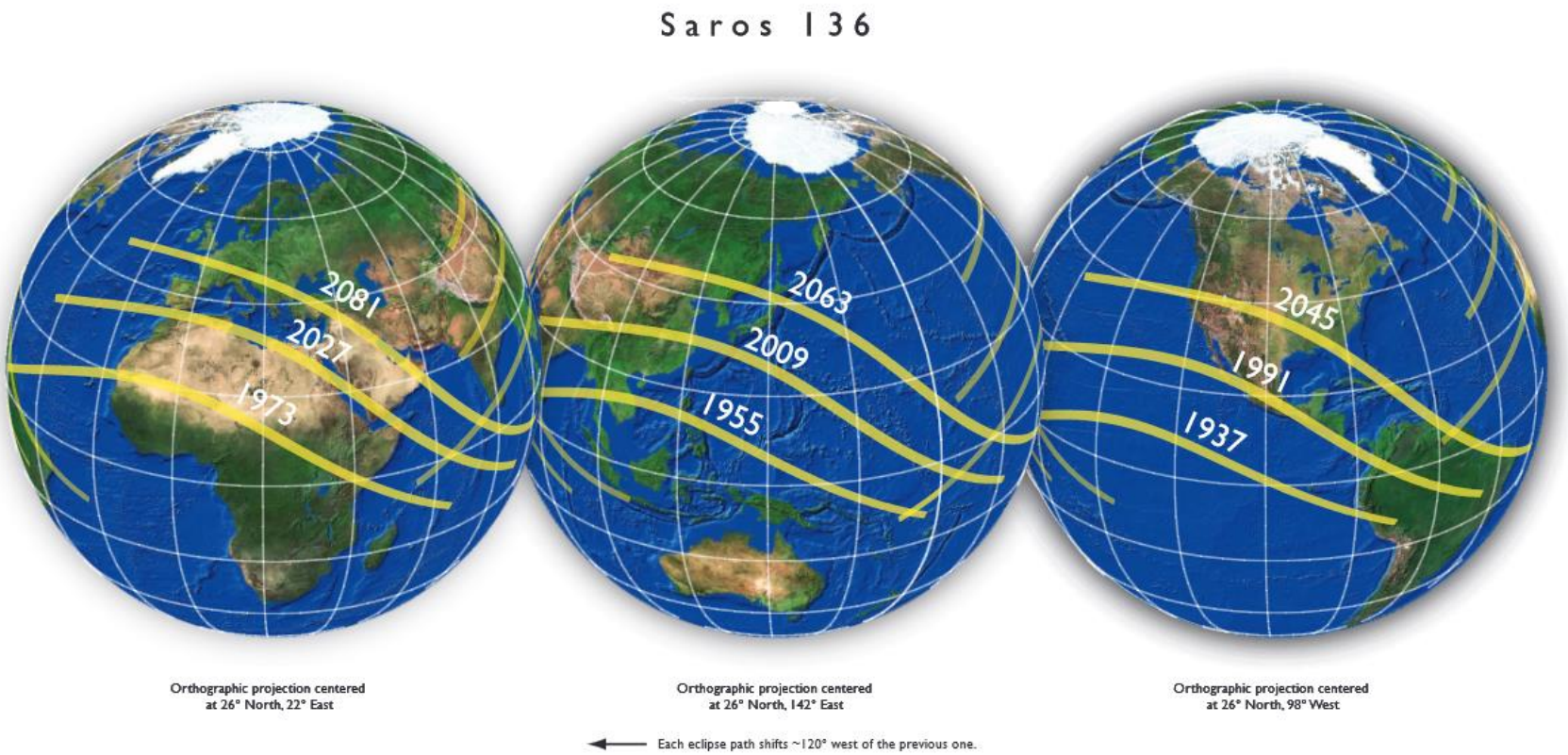
One Saros = 223 synodic months, 239 anomalistic months, and 242 draconic months.

223 Synodic Months = 6585.3223 days = 6585d 07h 43m
239 Anomalistic Months = 6585.5375 days = 6585d 12h 54m
242 Draconic Months = 6585.3575 days = 6585d 08h 35m

With a period of approximately 6,585.32 days (~18 years 11 days 8 hours), the Saros is valuable tool in investigating the periodicity and recurrence of eclipses. It was first known to the Chaldeans as an interval when lunar eclipses repeat, but the Saros is applicable to solar eclipses as well.


Total Solar Eclipses: 1996 - 2020
2008 Aug 01
2008 Aug 01
2015 Mar 20
1997 Mar 09
1999 Aug 11
2017 Aug 21
2009 Jul 22
2016 Mar 09
2006 Mar 29
2013 Nov 03
2005 Apr 08
2016 Mar 09
1998 Feb 26
2019 Jul 02
2001 Jun 21
2012 Nov 13
2002 Dec 04
2012 Nov 13
2010 Jul 11
2020 Dec 14
2003 Nov 23
F. Espenak, NASA/GSFC - 1997 Sep
60° N
30° N
0°
30° S
60° S
Latitude
180° W
150° W
120° W
90° W
60° W
30° W
0°
30° E
60° E
90° E
120° E
150° E
Longitude

SAROS CYCLE


Saros 136
2081
2027
1973
2063
2009
1955
2045
1991
1937
Orthographic projection centered at 26° North, 22° East
Orthographic projection centered at 26° North, 142° East
Orthographic projection centered at 26° North, 98° West
Each eclipse path shifts ~120° west of the previous one.

CALCULATE THE MASS OF THE EARTH!

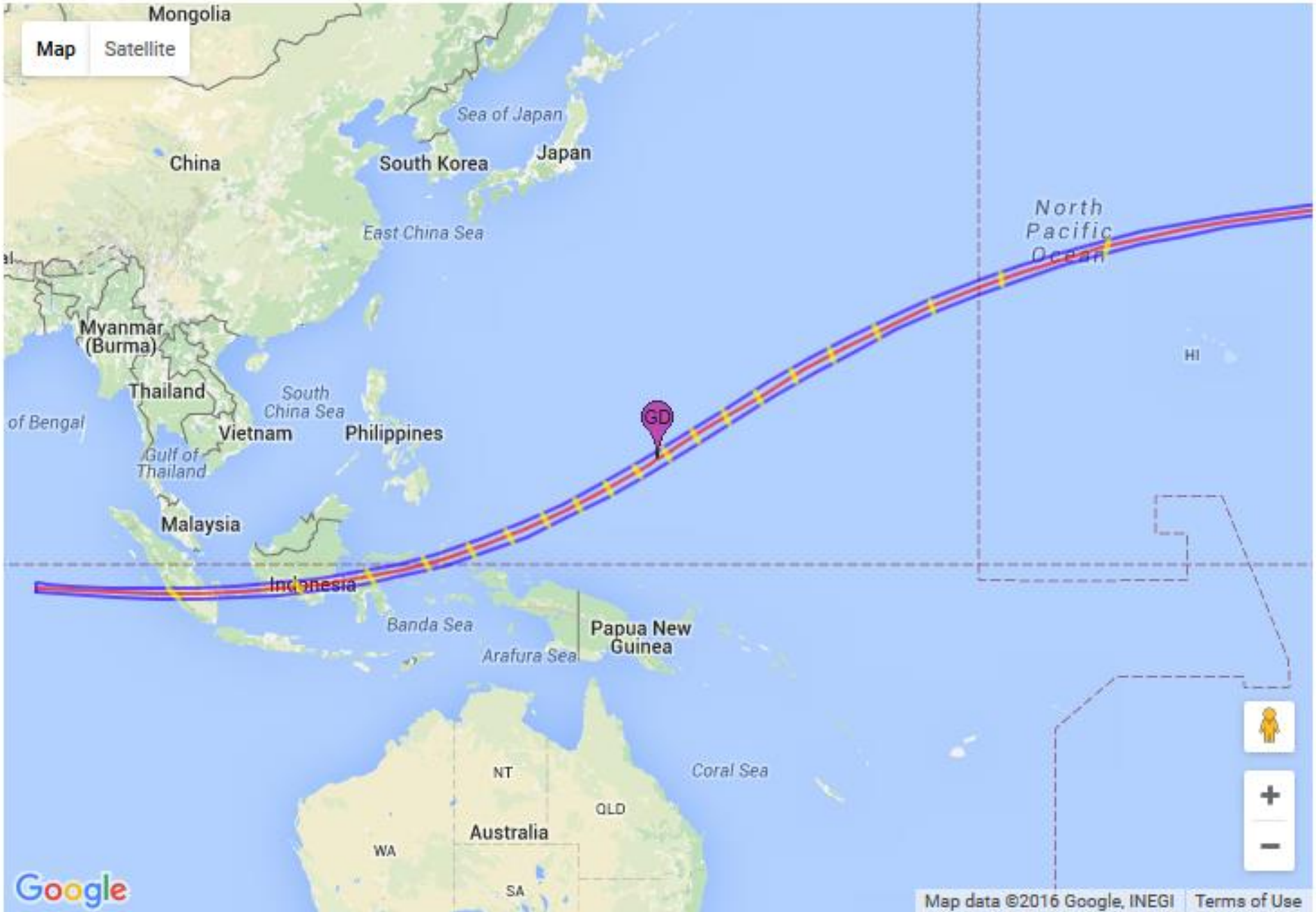
$$T^2 = \frac{4\pi^2}{GM} r^3$$

You will need to solve this equation for M, by putting it by itself on one side of the equation (hint: just interchange M and T^2).

Then, plug in the numbers and see how close you come…
M = the mass of the Earth in kg (this is what you are solving for)
r = distance between the centers of the Earth and moon (m) = 384,403,000m = 3.84 x 10^8 m
T is the time it takes the moon to go around the Earth = sidereal lunar month = 27.32 days
G is the Universal Gravitational Constant (6.672 x 10^{-11} Nm^2/kg^2) and p is 3.14.

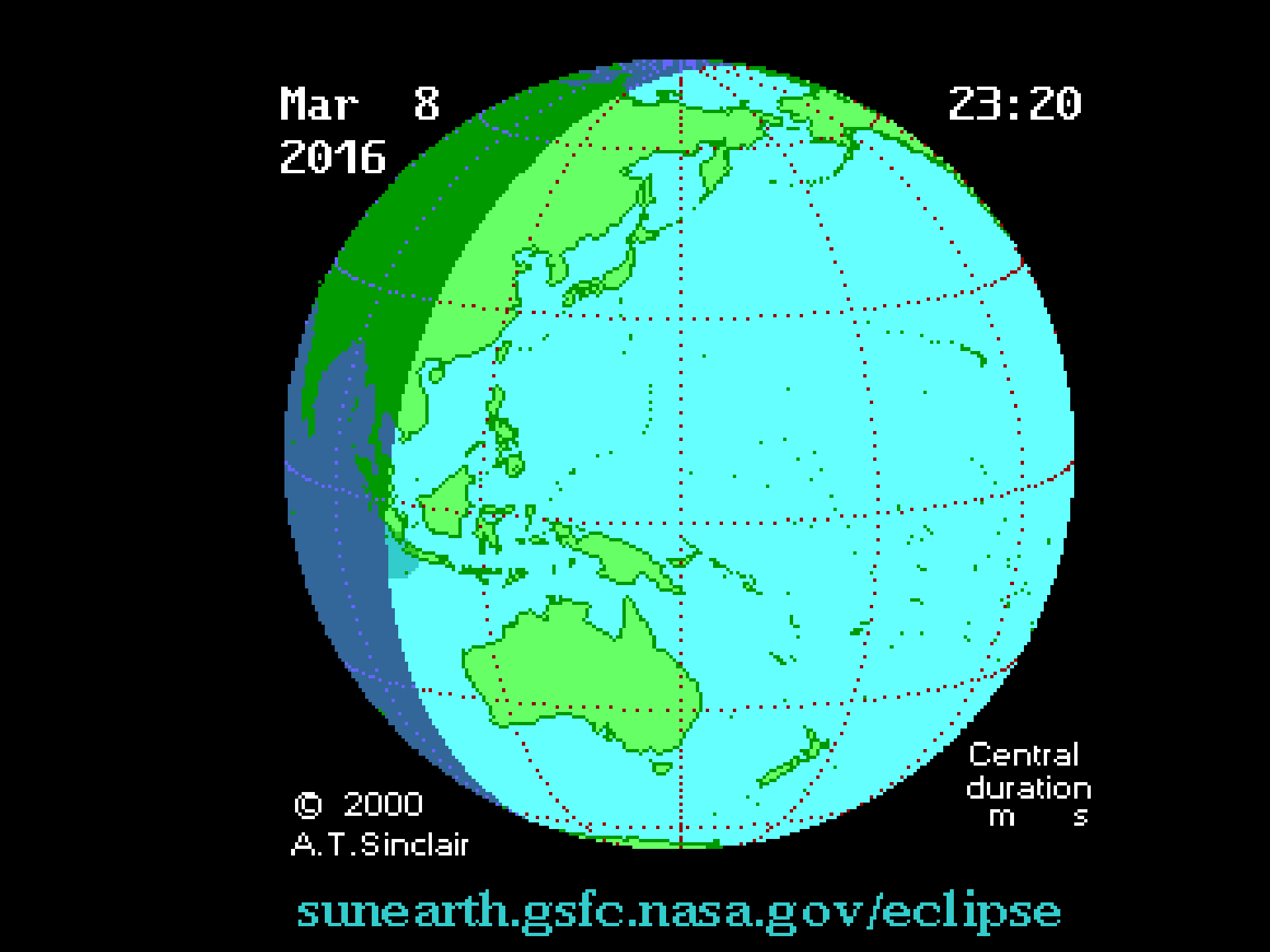
** Make sure to convert time into units of seconds!

TOTAL SOLAR ECLIPSE, MARCH 8th, 2016

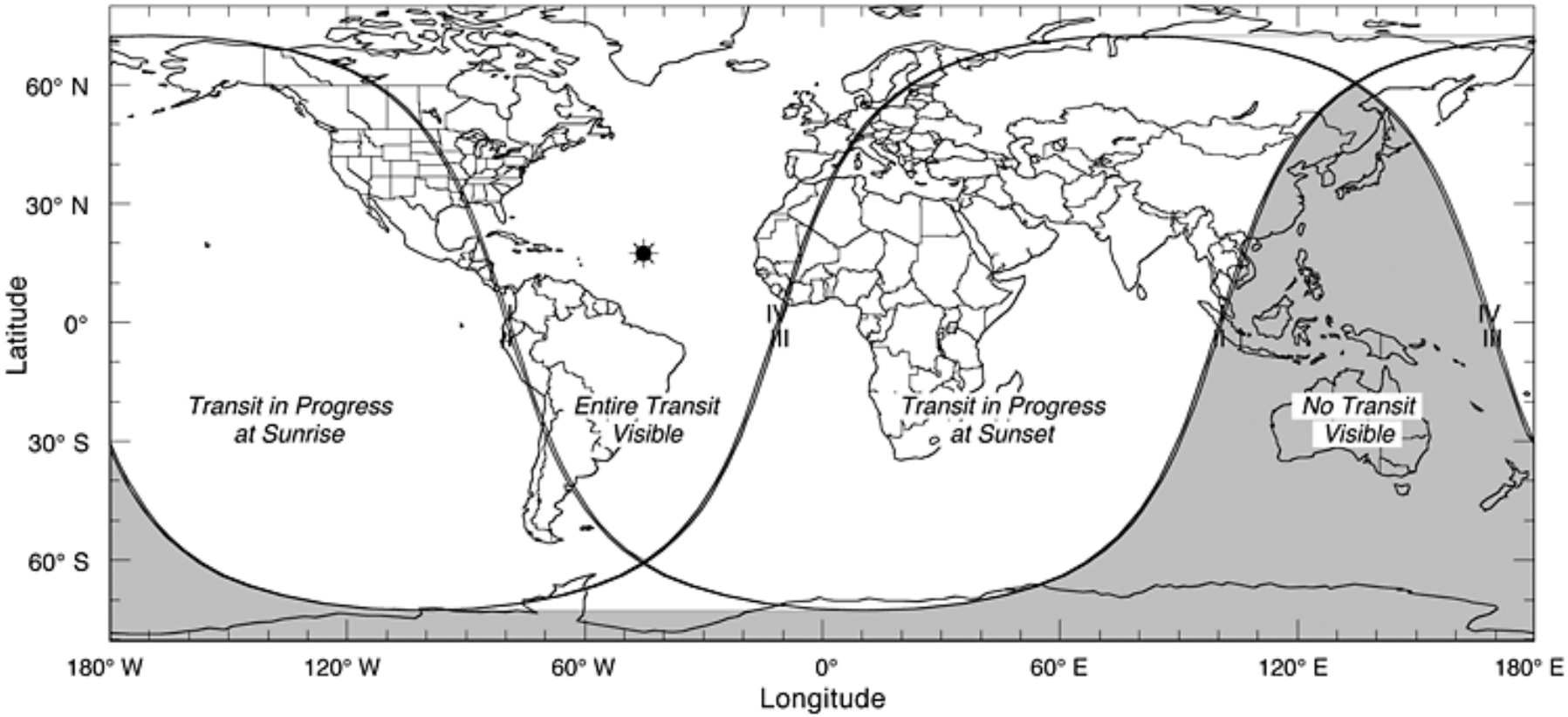


LOCAL CIRCUMSTANCES

Total Solar Eclipse 2016 in Indonesia				
No	Location	Duration	Remarks	Island
1	Muko - muko, Bengkulu	1m57.2s	West coast	Sumatra
2	Palembang	1m48,9s	inland	Sumatra
3	Bangka	2m09,6s	East coast	Bangka
3	Belitung	2m13,5s	East coast	Belitung
2	Sampit, Central Kalimantan	2m29,8s	Inland	Kalimantan
3	Tanahgrogot, East Kalimantan	2m37,4s	Inland	Kalimantan
4	Pasang Kayu, West Sulawesi	2m48,0s	West coast	Sulawesi
5	Kalora, Poso	2m52,2s	East coast	Sulawesi
6	Ampana Tete, Central Sulawesi	2m56,2s	North coast	Sulawesi
7	Pagimana, Central Sulawesi	2m59,3s	North coast	Sulawesi
8	Ternate	2m40,5s	East coast	Ternate
9	Maba, East Halmahera	3m19,8s	East coast	Halmahera


Mar 8
2016
23:20
© 2000
A.T.Sinclair
Central
duration
m s
sunearth.gsfc.nasa.gov/eclipse

TRANSIT OF MERCURY
May 9, 2016

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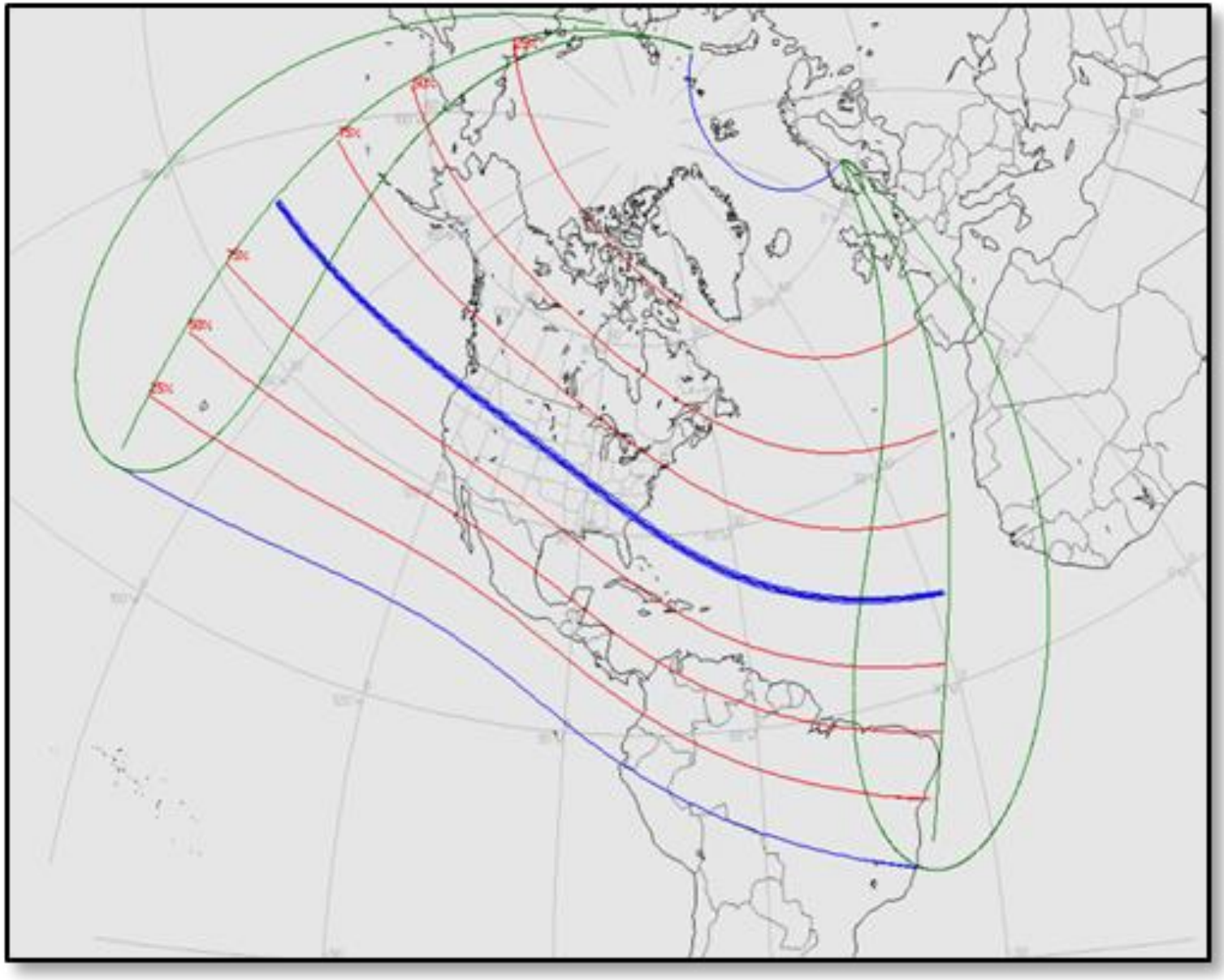
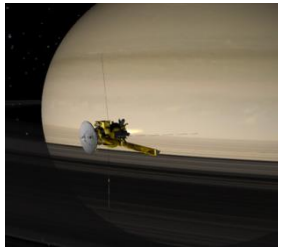
Eclipse 2017 Will Touch over 500 Million People



ECLIPSE RESOURCES

Stellarium **www.stellarium.org**



Eyes on the Solar System **eyes.nasa.gov**