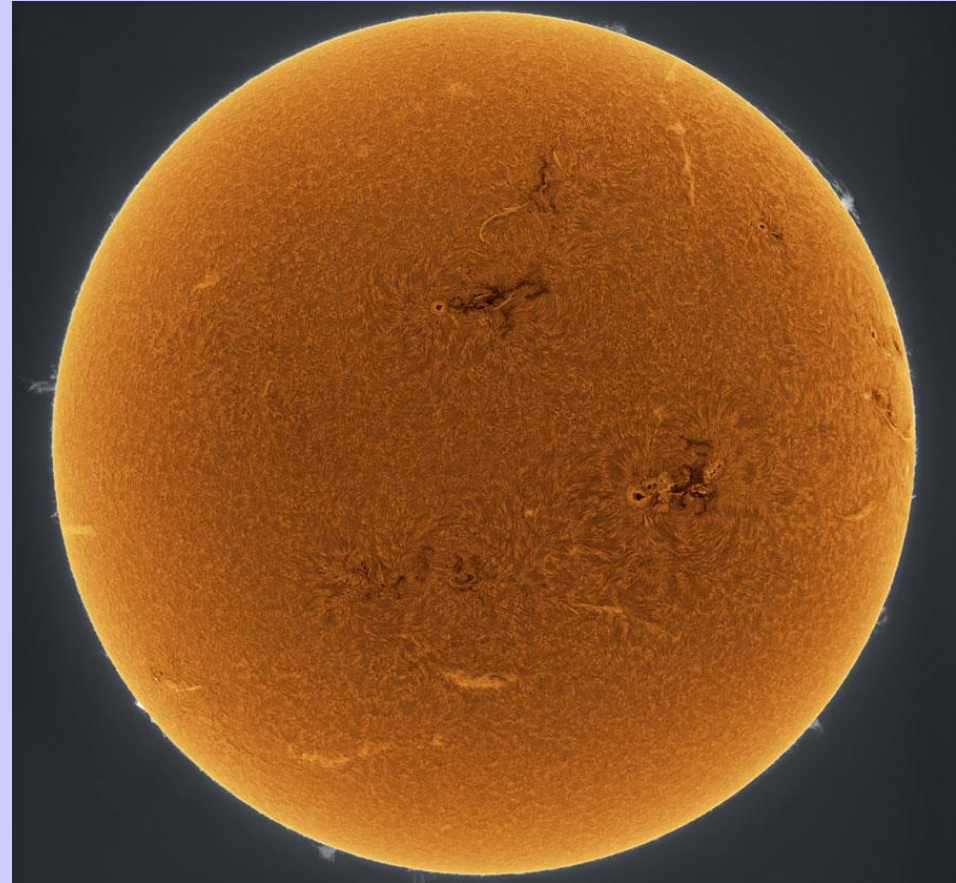


Solar Eclipses

The Sun

- **1.4 million km wide**
- **Distance = 150 million km \pm 1.5%**
- **30' – 31' wide in sky**

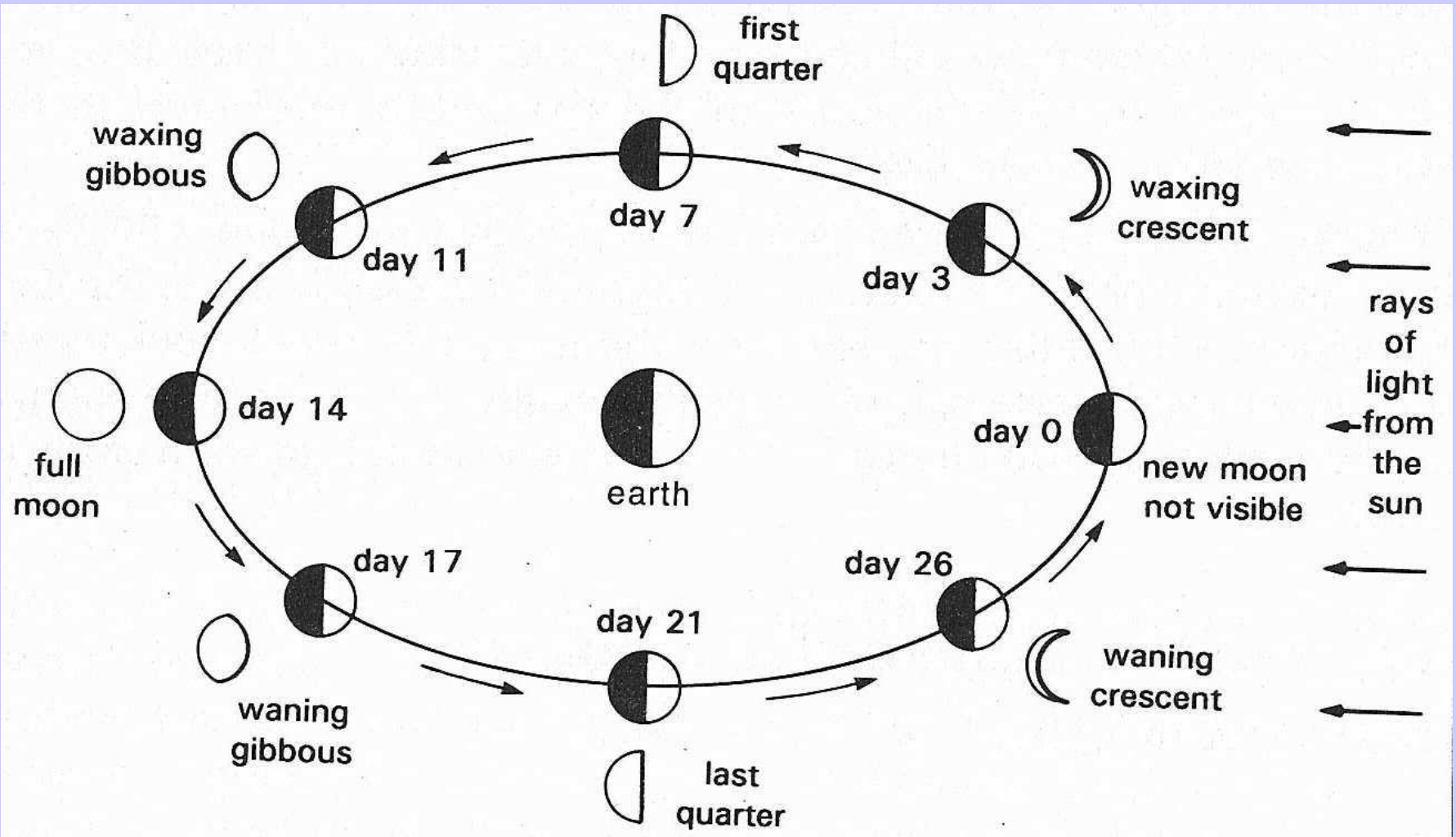


Moon Facts

- $\sim \frac{1}{4}$ diameter of Earth
- Perigee: 356,000 km
- Apogee: 407,000 km
- 33.5'–29.5' wide
- Sidereal month = 27.3 d
- Synodic month = 29.5 d



Why does the Moon have phases?

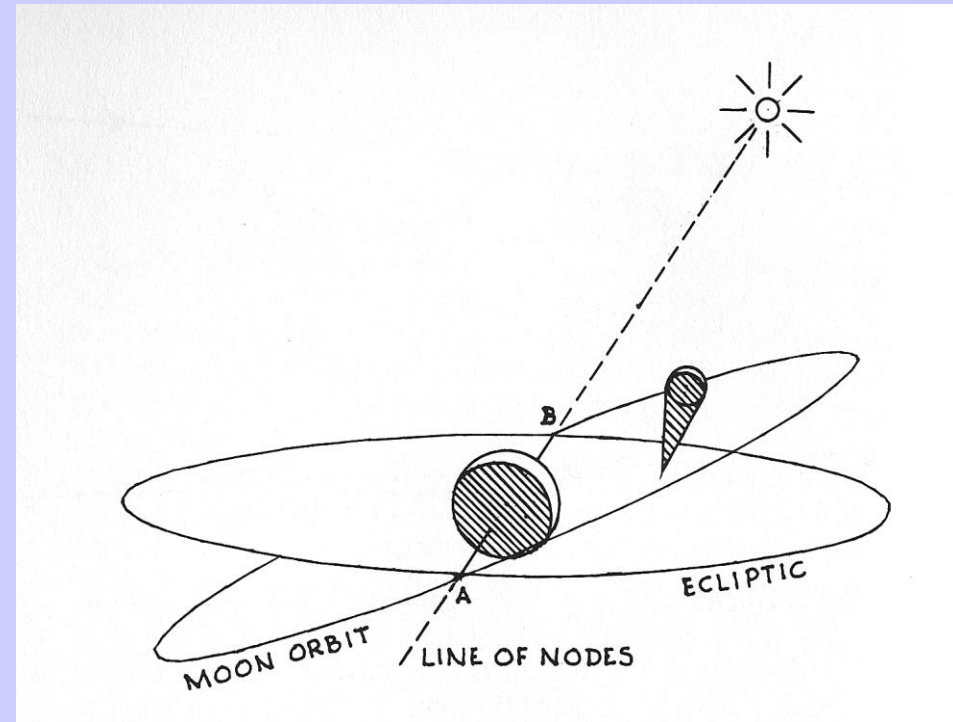


Moon at Perigee and Apogee



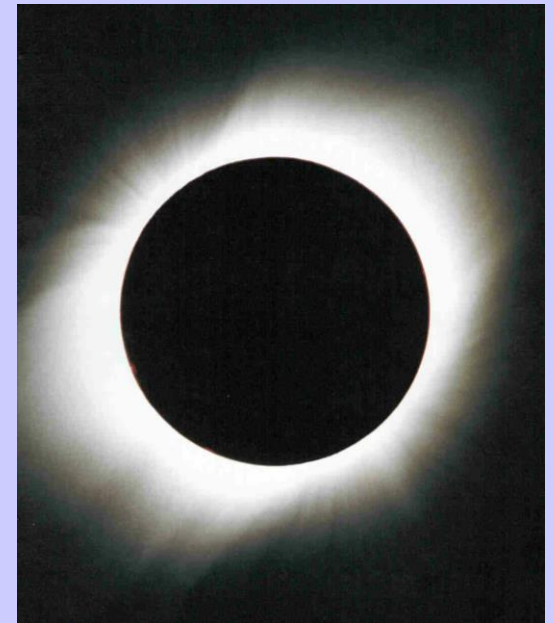
Eclipses – Moon & Sun

- Sun & Moon about same size in the sky
- Moon's inclination 5°
- Orbit wobbles with 18.6 year period; eclipse period few weeks earlier each year
- Eclipses occur if Moon near ecliptic when Full (lunar) or New (solar)



Solar Eclipses

- **Types: partial, annular, total, hybrid**
- **Only a narrow path (100-200 km) along Earth**
- **Next partial eclipse here: August 21, 2017 (~50%)**
- **Next total eclipse here: April 8, 2024**



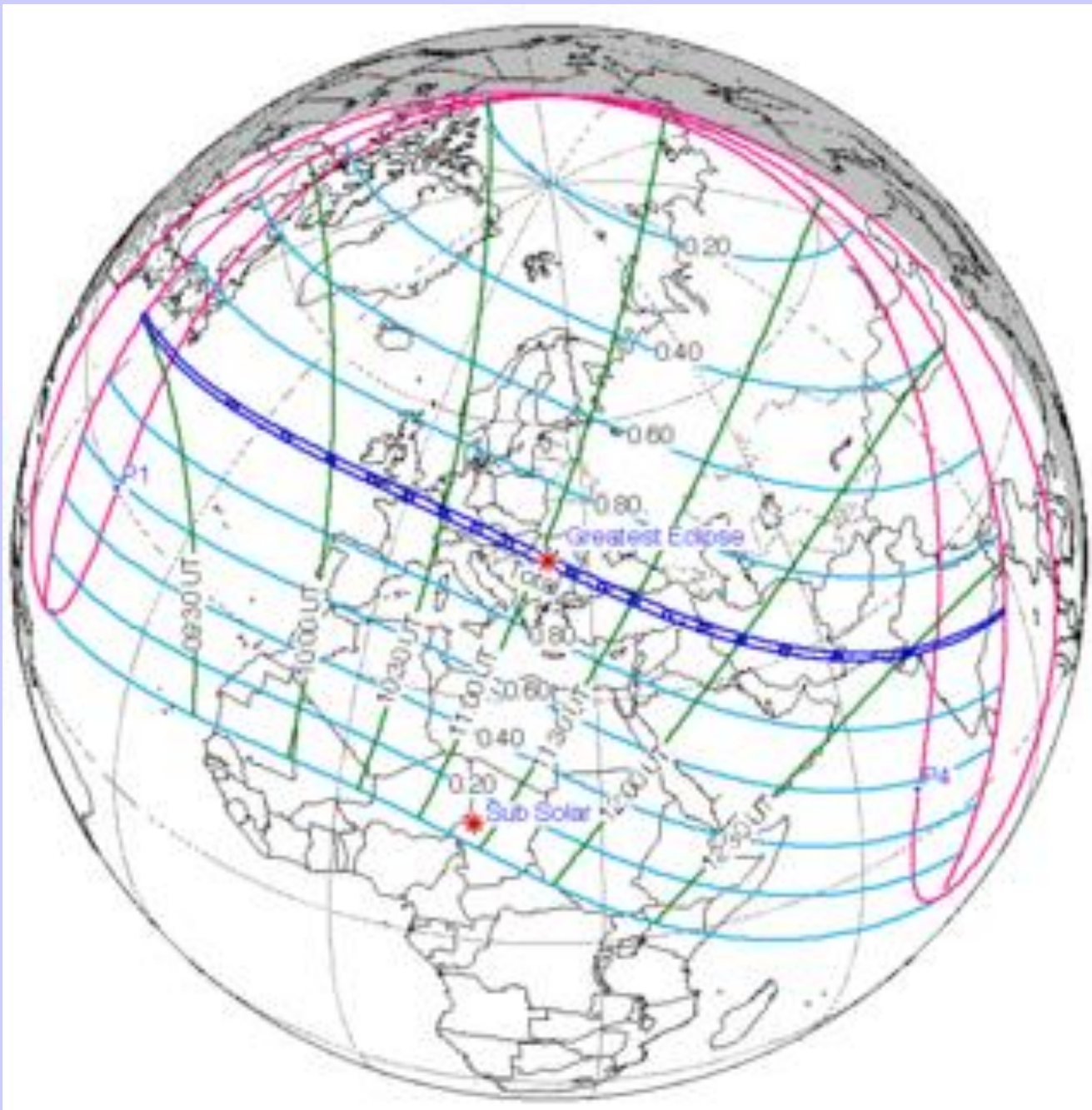
Lunar Months – Eclipse Patterns

- **Synodic (S) (new-new): 29.530589 d**
 - **Draconic (N) (node-node): 27.212221 d**
 - **Anomalistic (P) (perigee-perigee): 27.554550 d**
 - **223 S = 6585.3213 d**
 - **242 N = 6585.3575 d**
 - **239 P = 6585.5375 d**

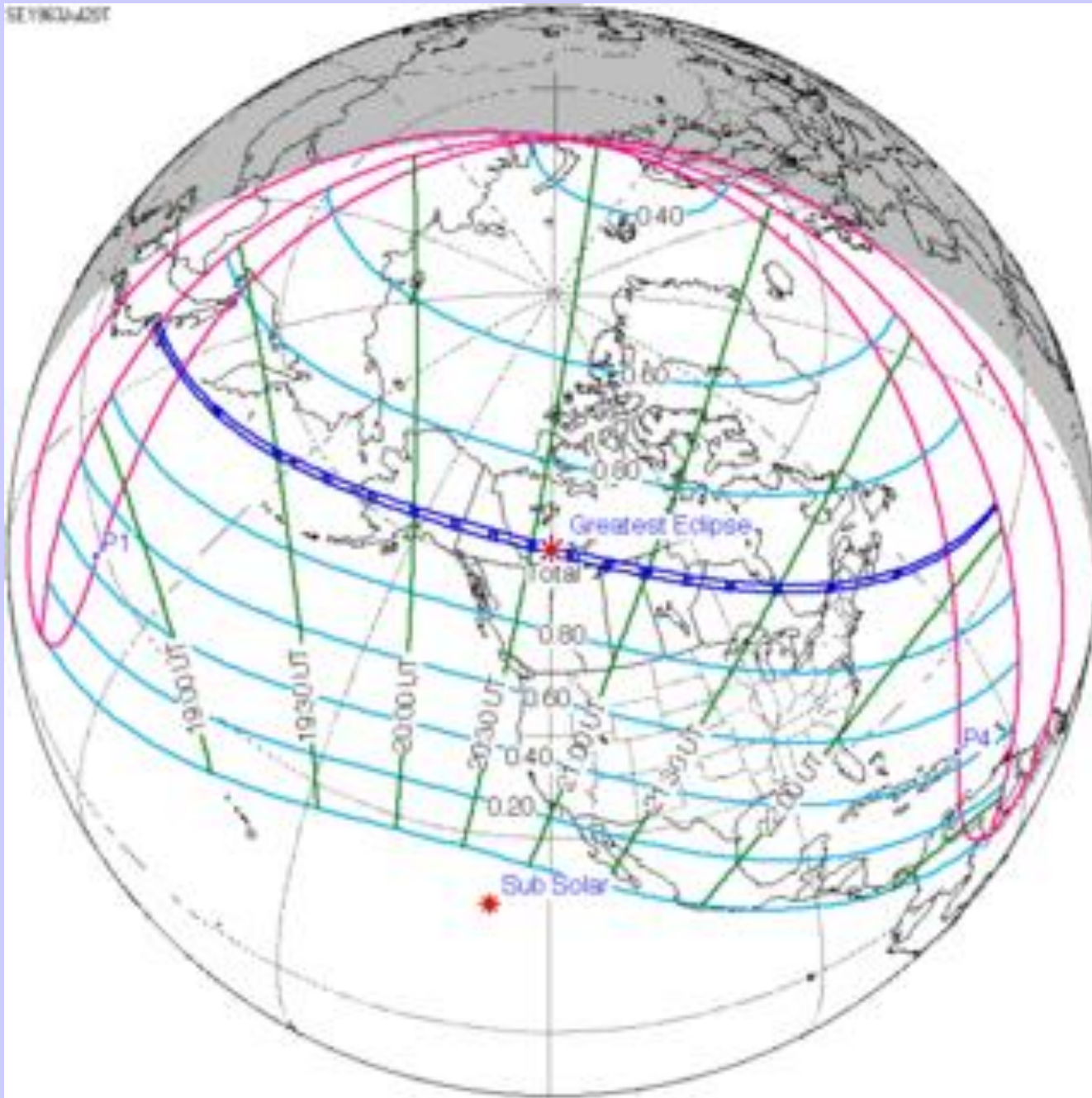
 - **Saros: 18 years, 10.3213 or 11.3213 days**
 - **Exeligmos: 3 Saros periods (54 years, 32-33 d)**
- (Ref: RASC Observer's Handbook, R. Bishop)**

**Aug 21
2017**





**Aug 11
1999**



**July 20
1963**

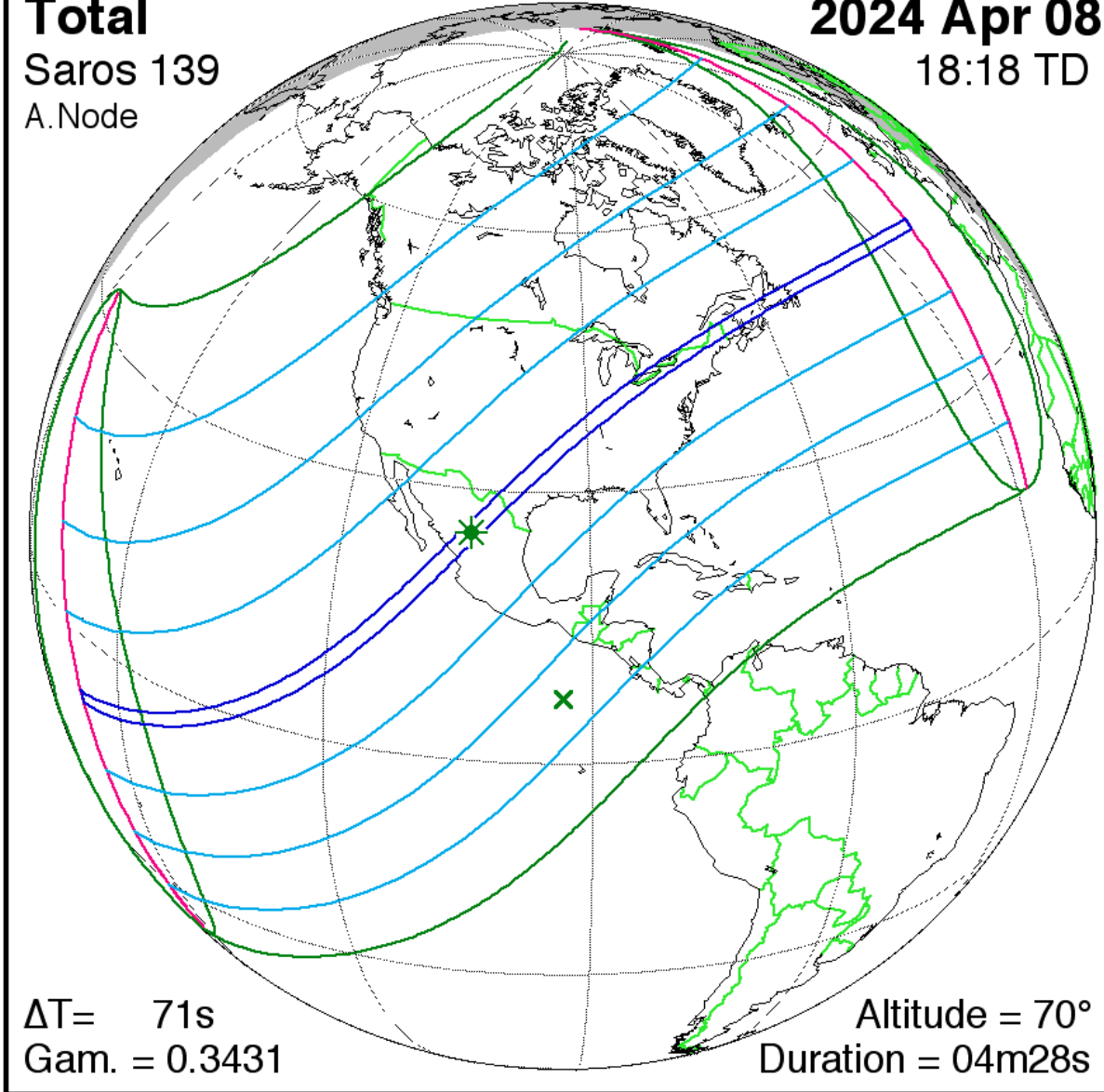
Total

Saros 139

A.Node

2024 Apr 08

18:18 TD



**April 8
2024**

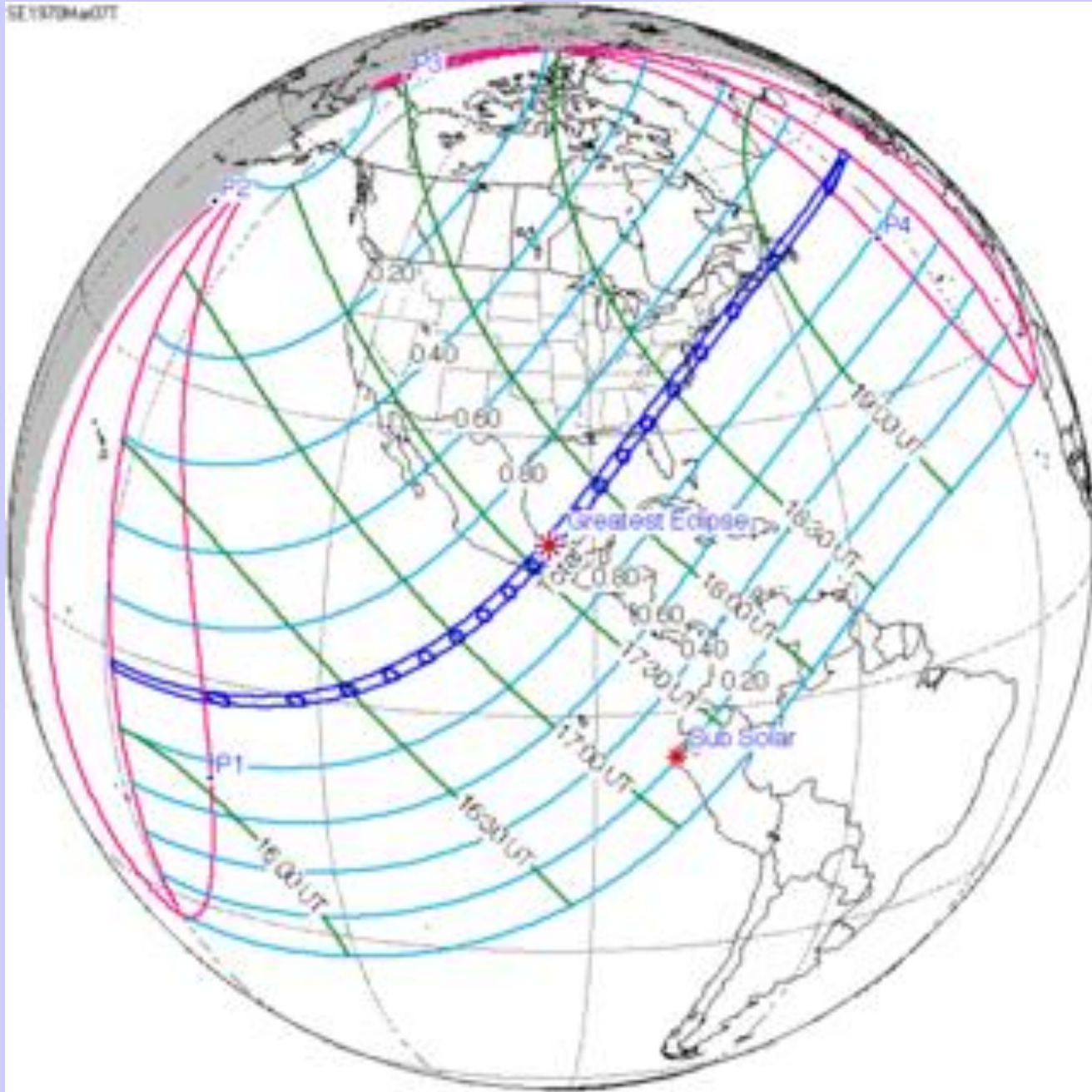
$\Delta T = 71s$
Gam. = 0.3431

Altitude = 70°
Duration = 04m28s

Thousand Year Canon of Solar Eclipses

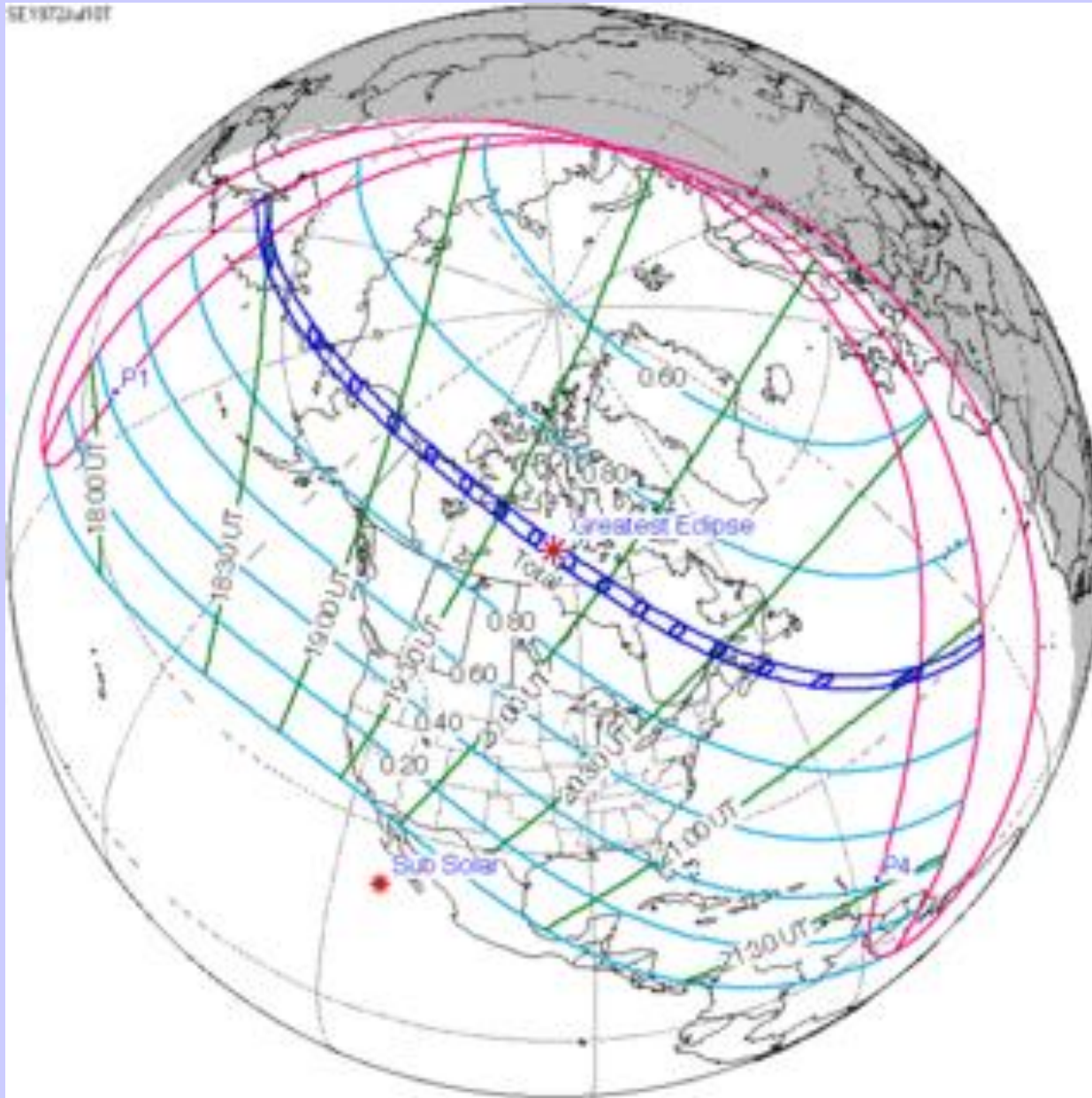
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SEYDRA/07T



**March 7
1970**

SE1872410T



**Last
totality
in NB
(east
coast)**

**July 10
1972**