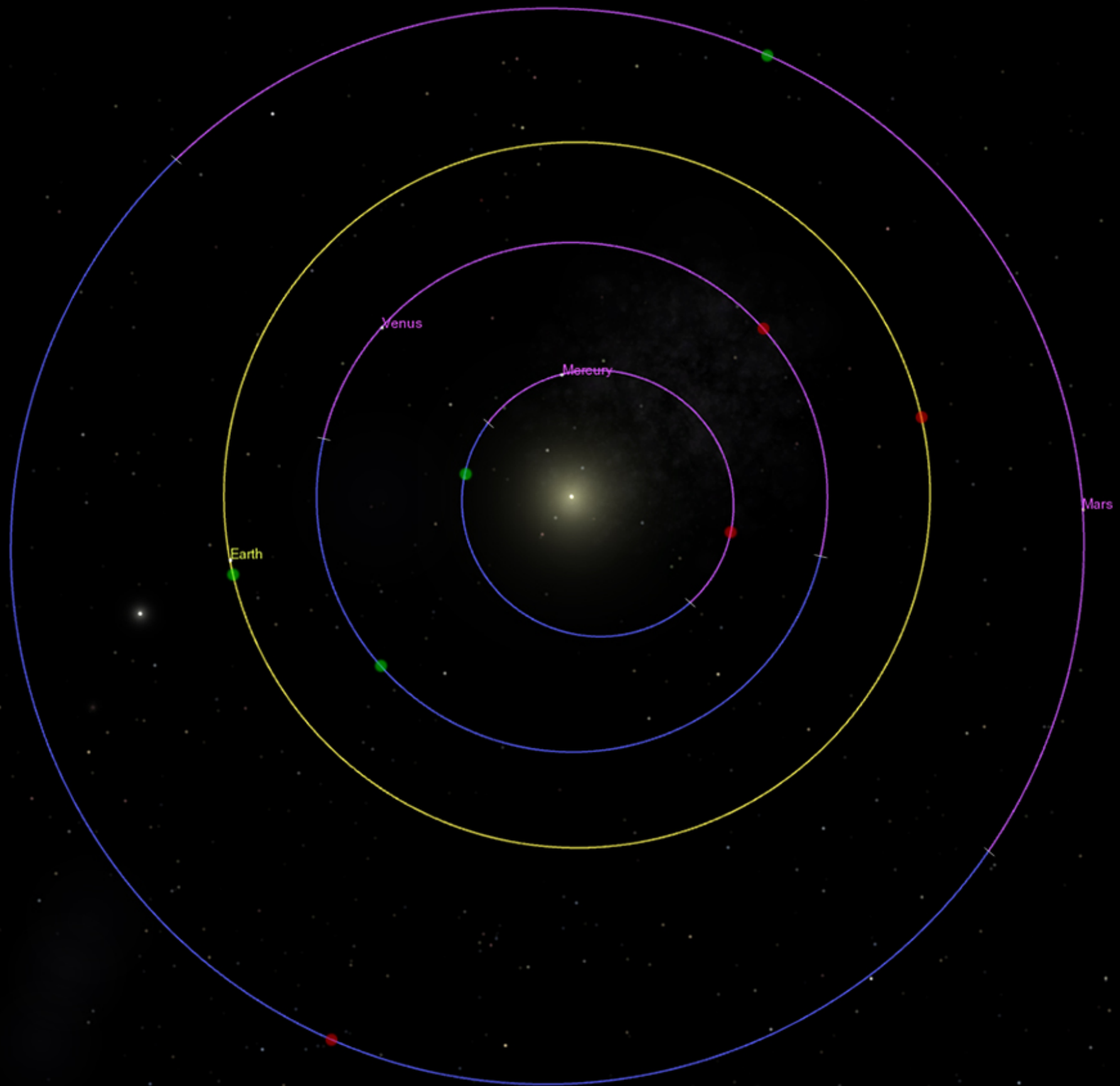


What time is it?

Simple orbit



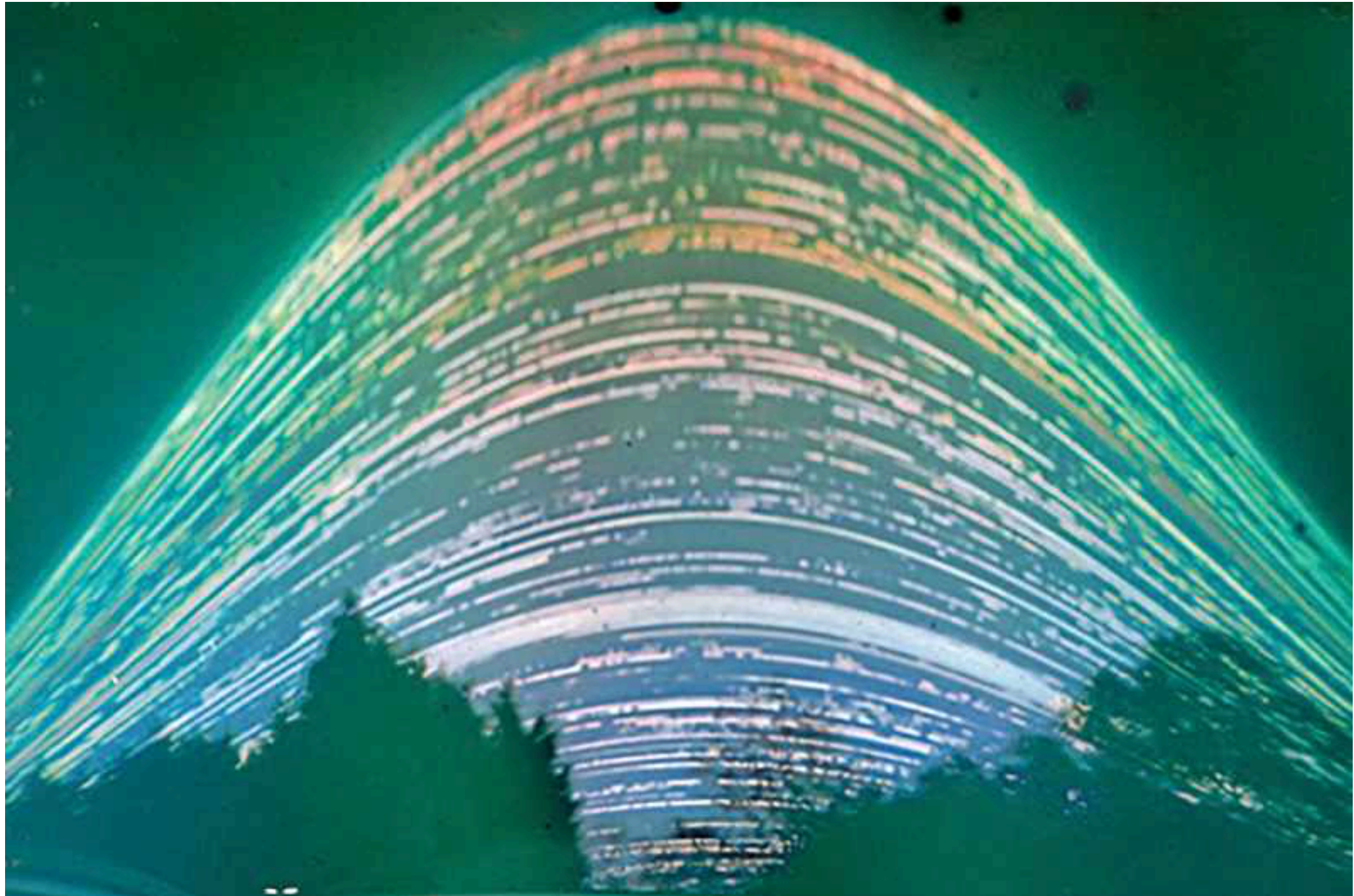
364 vs 365 vs 365.2425

- Sidereal day
- Mean solar day
- Leap years

Axial tilt



Pinhole camera, vertical solar motion

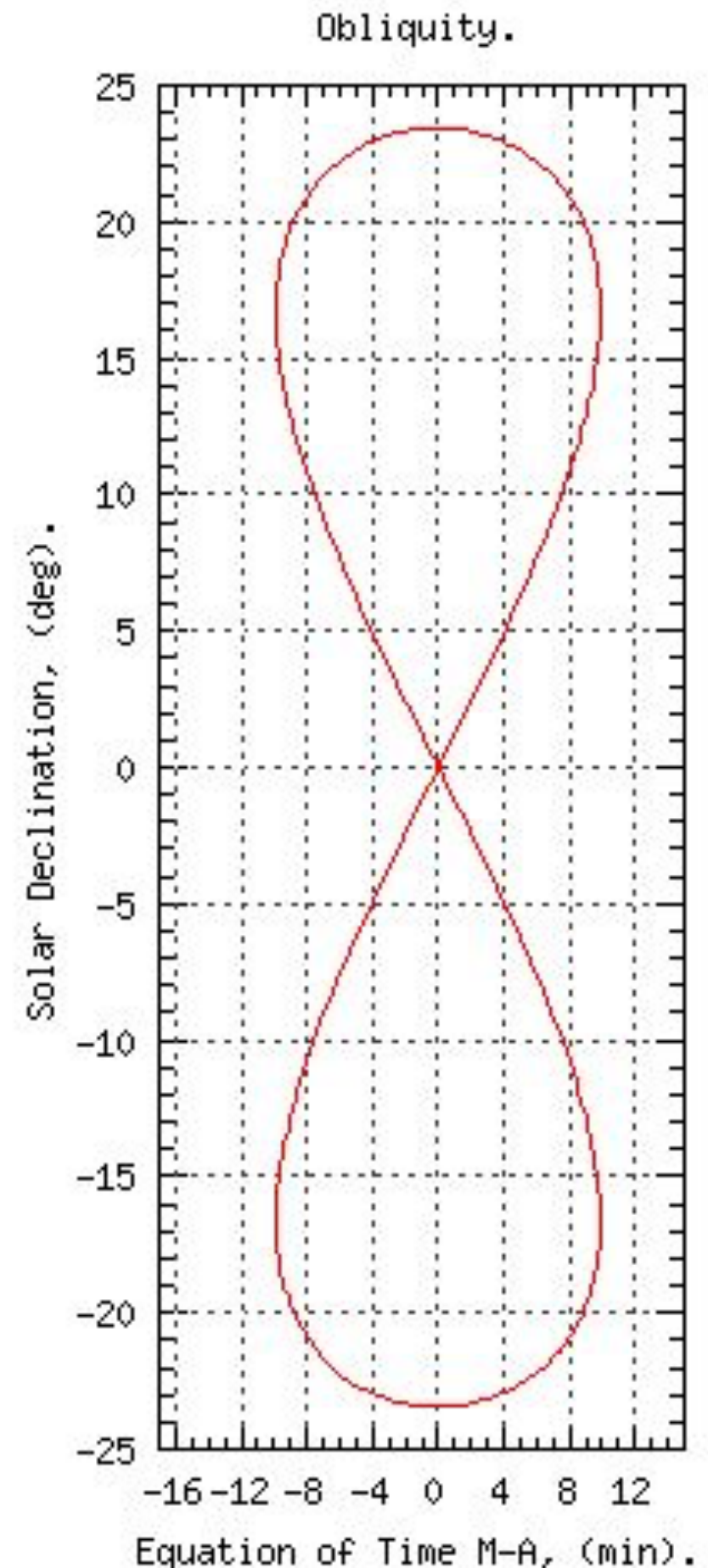


Seasons

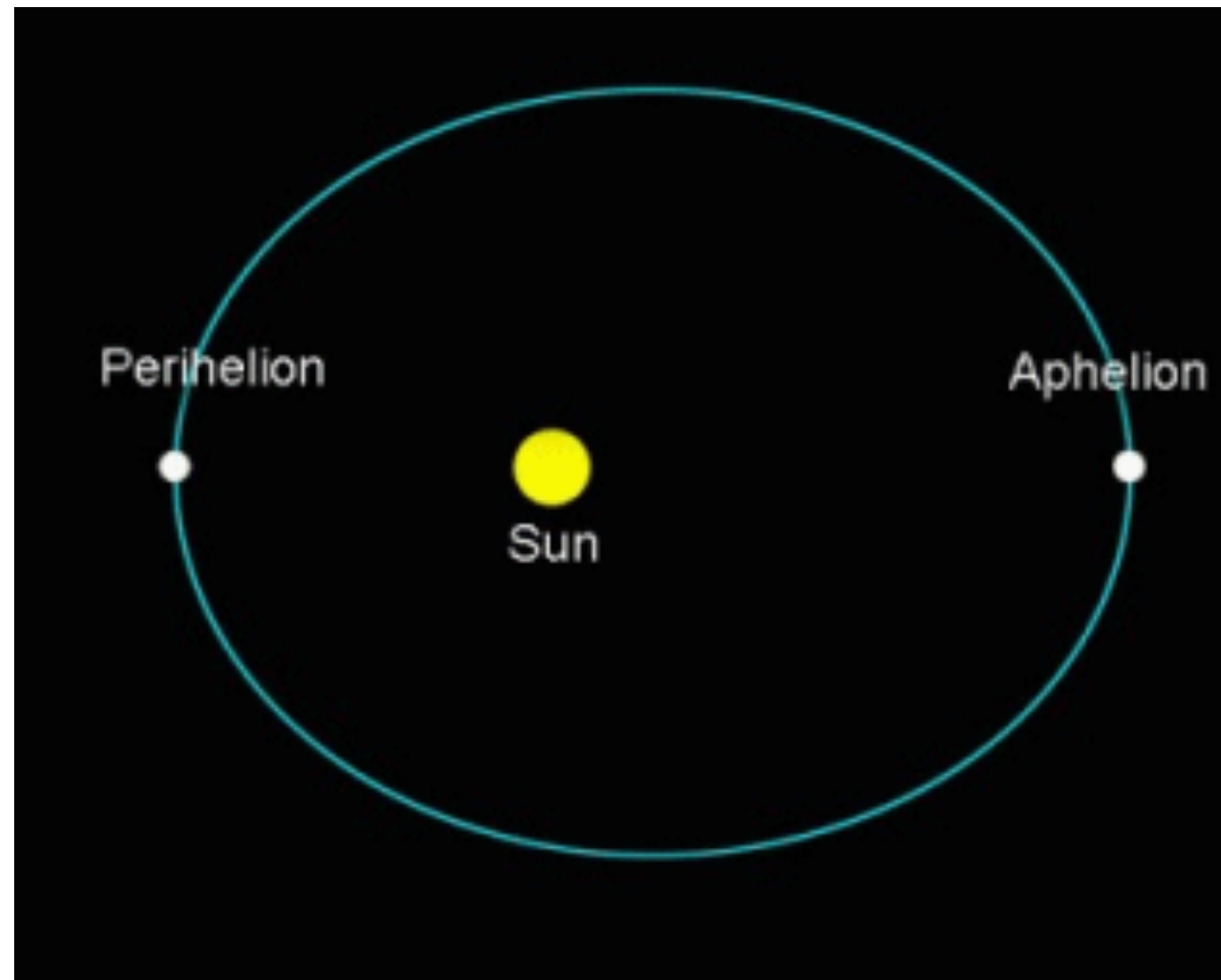
- More sunlight
 - Longer days
 - More direct sunlight
- **Not** how close to the sun (closest approach was last Sunday, January 5th)

Figure 8

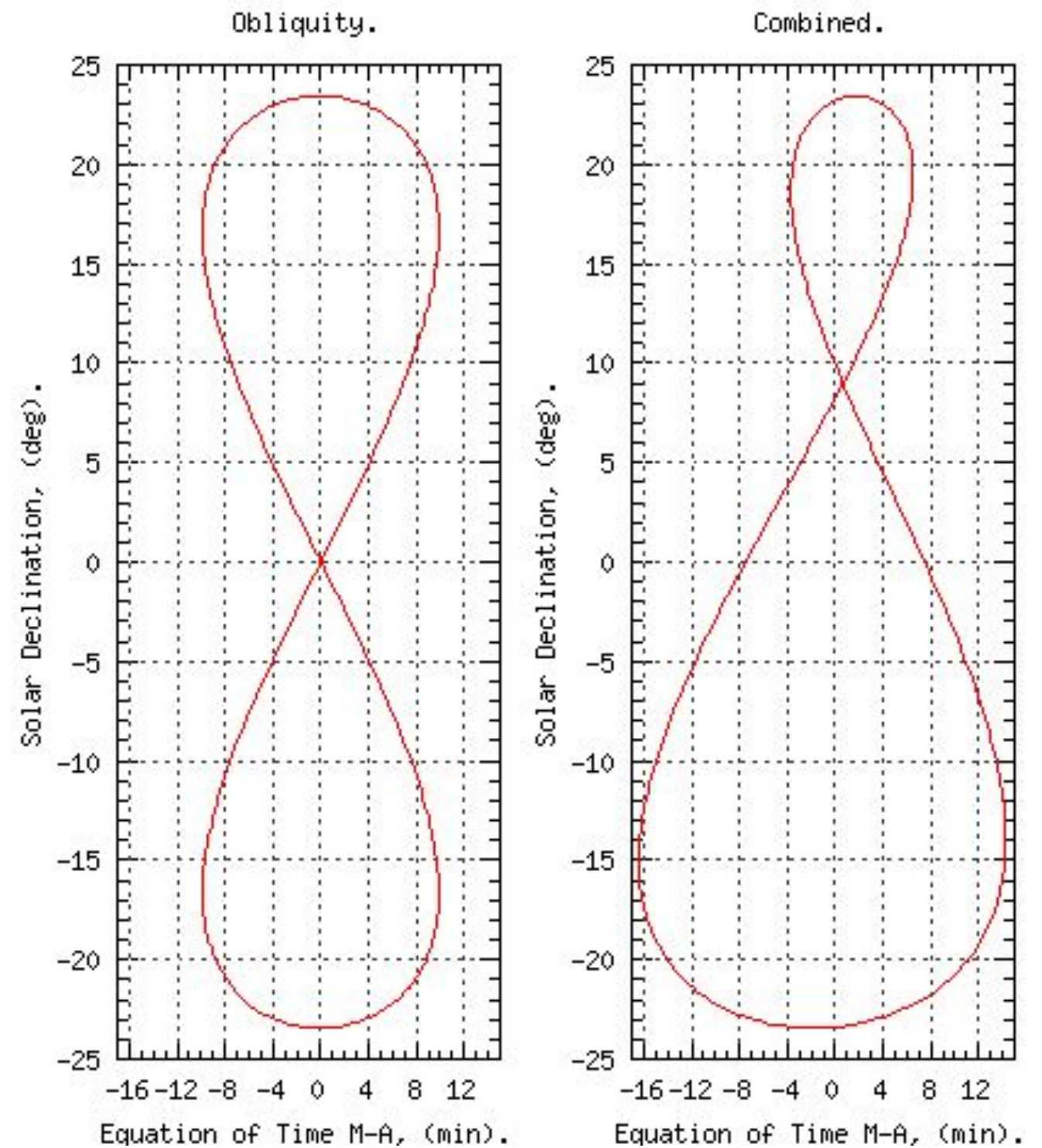
- Apparent motion of the sun at 'noon' *if* the earth's orbit was circular



Non-circular orbits

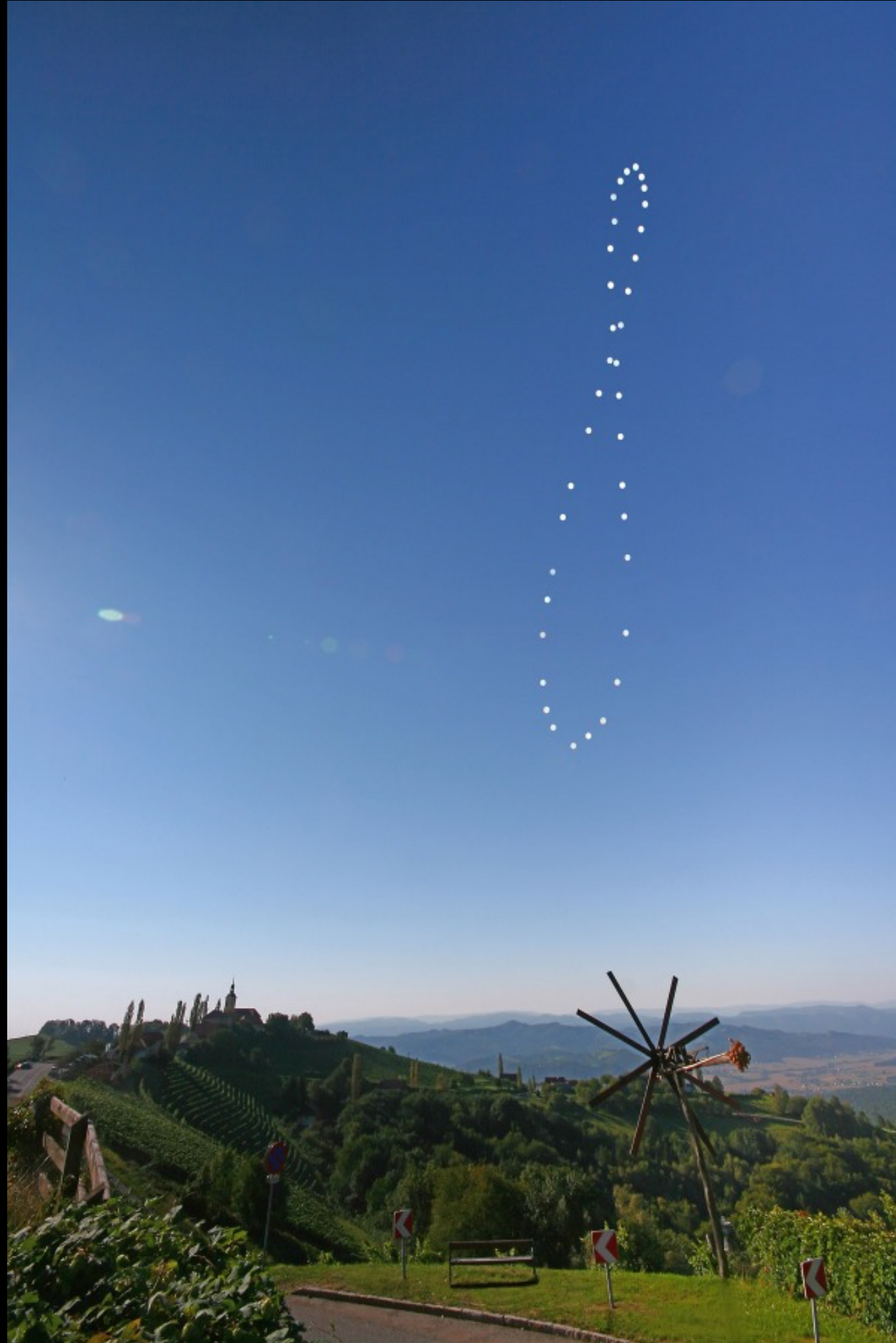


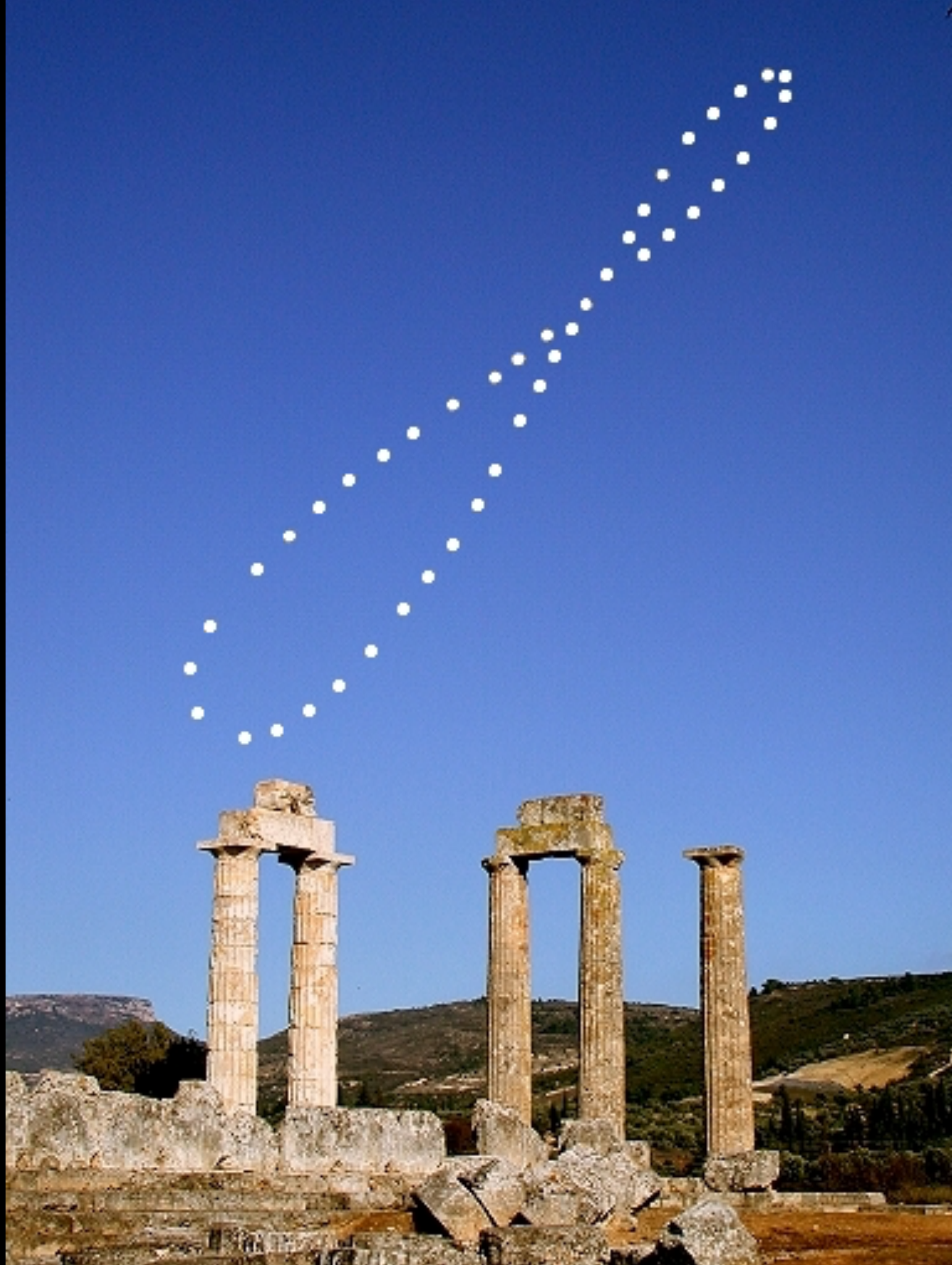
Earth's eccentricity

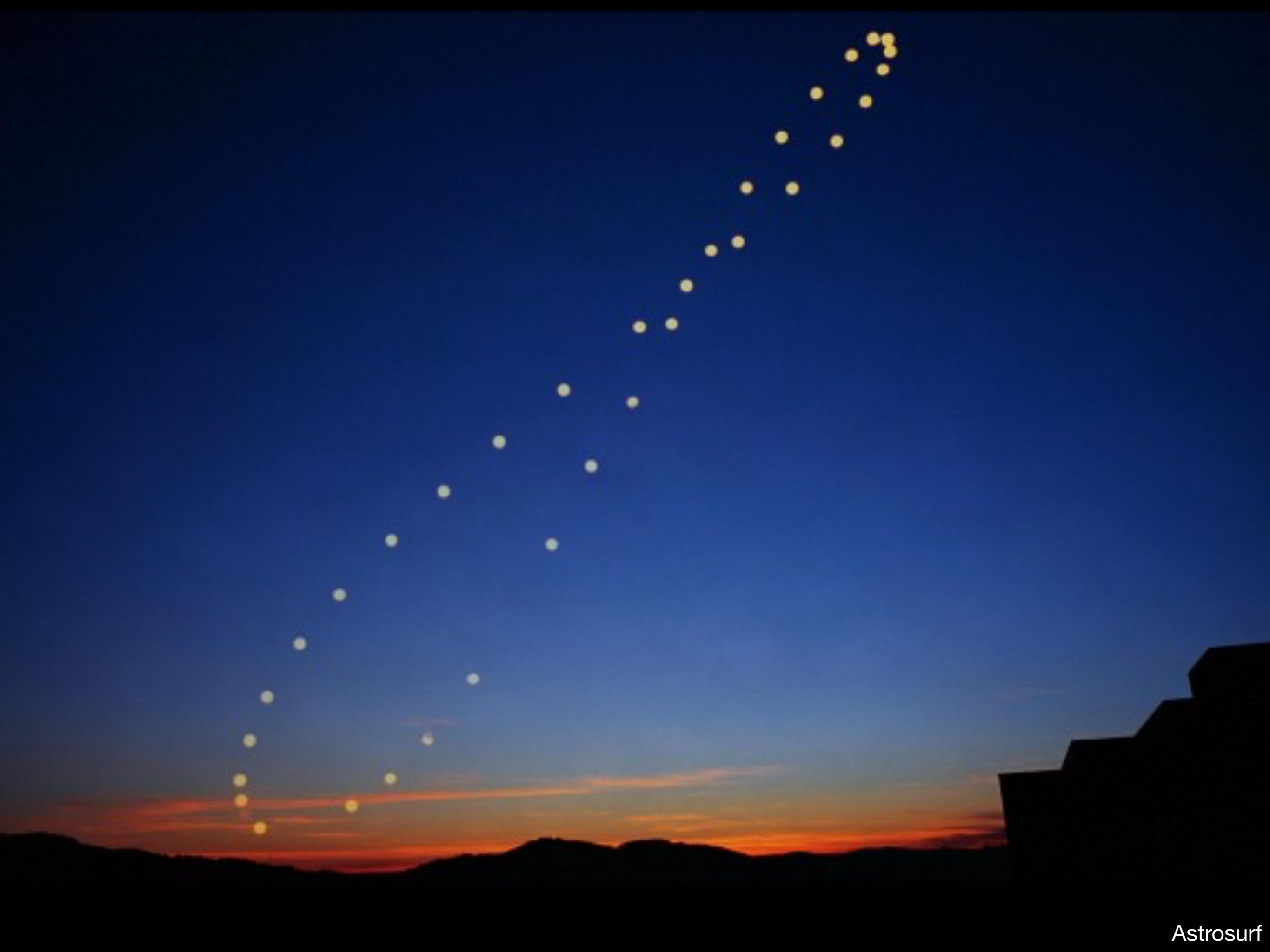


Analemmas





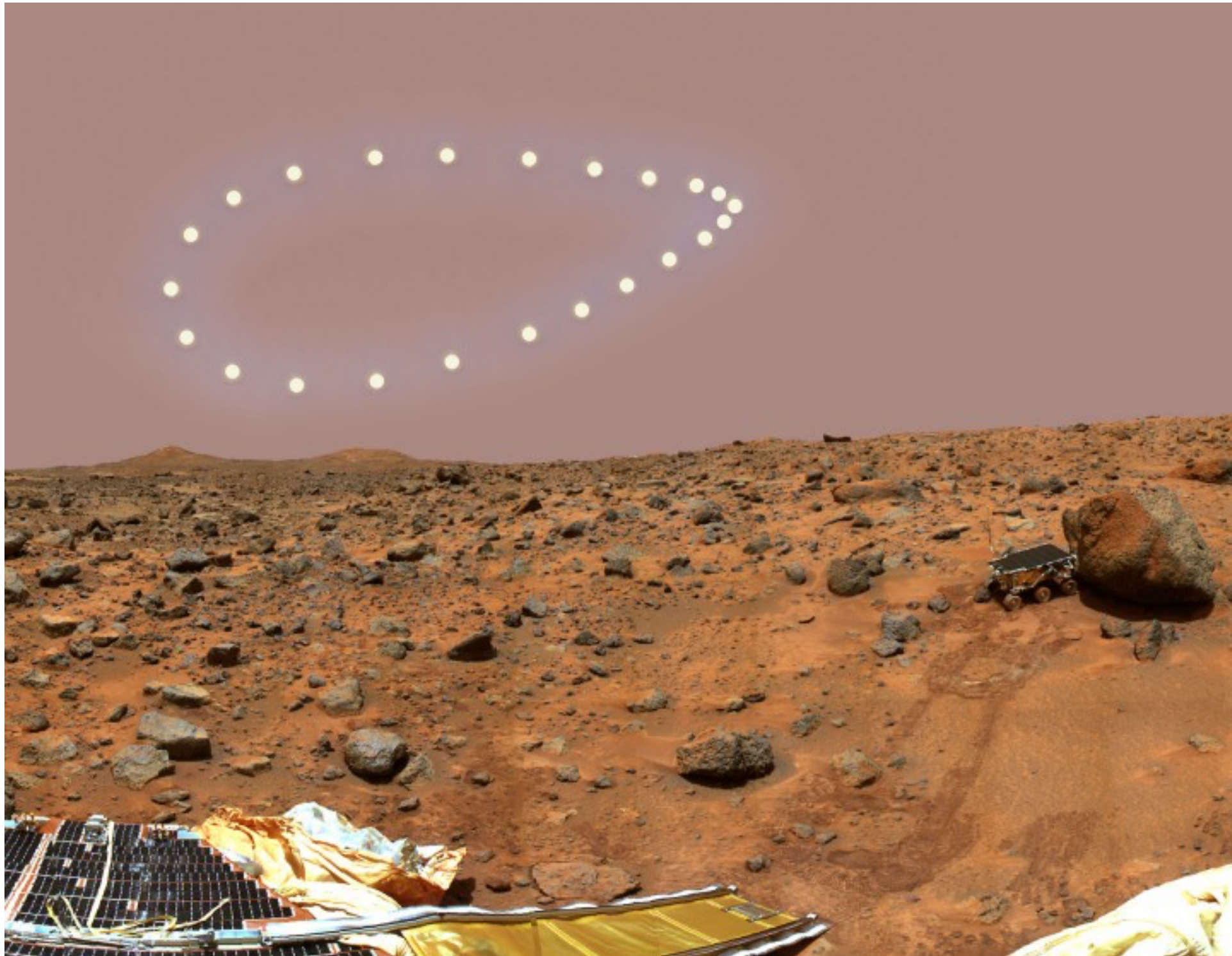




On almost all globes



Mars analemma



Fun questions

- At noon in Australia, what part of the sky is the sun in?
- Is local noon the same in Portland, Seattle, and Boise?
- If you wanted to accurately measure local time using the sky, how would you do it?

Transit telescope

Troughton 10-foot Transit Instrument (1816)





Sun dials, solar date, analemmas

- Take a selfie with a sun dial, solar date, or analemma
- Explain how it works
- E.C. for creativity!