

The Vernal Equinox, more commonly referred to as the Spring Equinox, occurs March 20 this year. On this day, the noontime sun is shining directly on the equator of the earth, while at the North Pole the sun peaks above the horizon for the first time in 6 months¹. As the name “equinox” implies, every place on the planet *should* observe 12 hours of daylight and 12 hours of night, but as the table below shows, this isn’t exactly the case (Table 1).

Location	Sunrise	Sunset	Difference
Fort Dodge	7:20 AM	7:29 PM	+9 minutes
Mason City	7:17 AM	7:25 PM	+8 minutes
Waterloo	7:13 AM	7:21 PM	+8 minutes
Des Moines	7:18 AM	7:26 PM	+8 minutes
Creston	7:21 AM	7:29 PM	+8 minutes
Ottumwa	7:14 AM	7:22 PM	+8 minutes

Table 1: The table above shows the sunrise and sunset times (CDT) for various sites across Iowa². The yellow column on the end shows the difference between sunset and sunrise, with positive values indicating more daylight.

Why isn’t here exactly a 12 hour difference between sunset and sunrise? There are two reasons that explain the discrepancy. The first is a result of how “sunrise” and “sunset” are defined. According to the American Meteorological Society, sunrise occurs with the first appearance of the sun on the eastern horizon, and sunset occurs with the last disappearance below the western horizon. However, the equinox uses the *center point of the sun*. Therefore, the 3 or 4 minutes difference between the first sliver of sun and the center point at sunrise, and the last sliver of sun and the center point at sunset is one part of the reason why there is a few minutes more of sunlight during the Spring Equinox (Figure 1).

The second reason is because as sunlight enters the atmosphere, it *refracts*, or bends slightly. Therefore even though the sun is actually below a person’s line of site, the rays bend and the observer can actually see the sun on the horizon before it rises, or after it sets (Figure 2).

¹ Ahrens, Donald C. *Meteorology Today*, West Publishing Company, St Paul, 1982

² U.S Naval Observatory Astronomical Applications Department

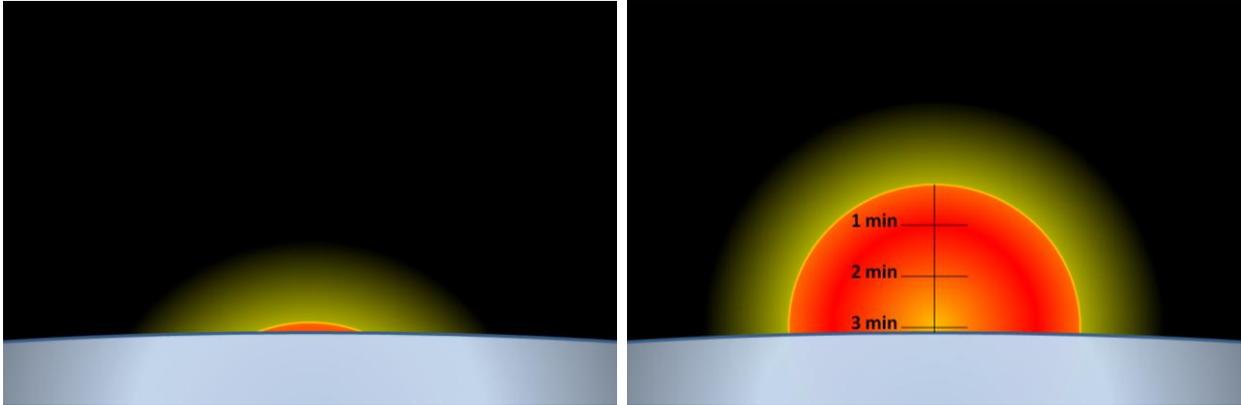


Figure 1: The two images above illustrate the three or so minute difference between the American Meteorological Society's definition of sun rise (left), and the time until the center point of the sun rises above the horizon (right). Together these few minutes from both the morning and evening help explain why there is more than 12 hours difference between sunset and sunrise during the Spring Equinox.

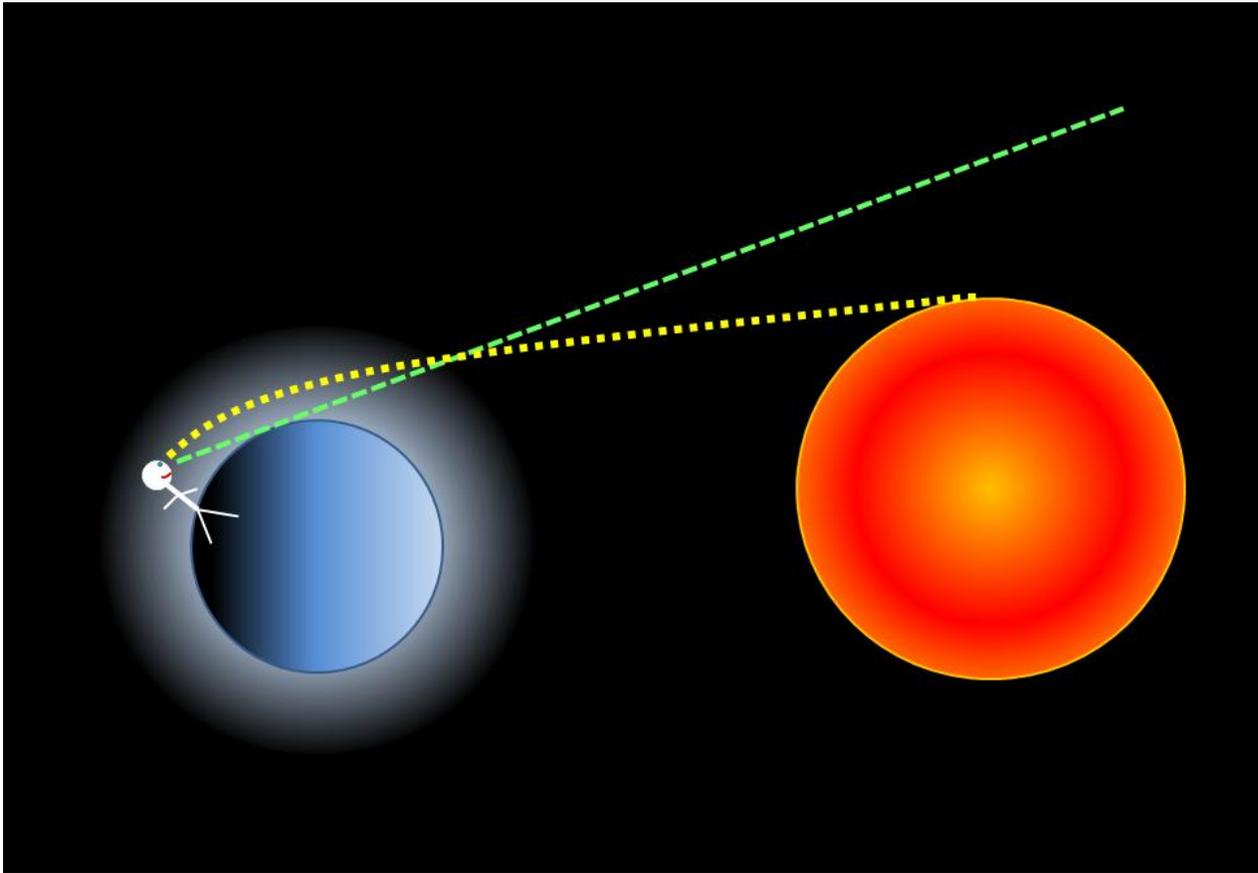


Figure 2: The image above shows the sun to the right, and earth along with its atmosphere to the left. The straight line-of-sight along the horizon of the earth is indicated by the green dashed line. A ray of sunlight is indicated by the yellow dashed line. The person standing on earth is able to see the sun even though it is slightly below the horizon because the sunlight "refracts" or bends when it enters the earth's atmosphere.

** not to scale*