

Fall equinox means 12 hours of sunlight for everyone, everywhere

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Sunset over the southern part of the Atlantic Ocean. Photo taken from the International Space Station. Photo by: Johnson Space Center/NASA

September 22 marks the fall equinox, ushering in the year's best season on a day where the sun is out almost exactly 12 hours no matter where you are on the globe.

Many people who live in the Northern Hemisphere start noticing the days get shorter right about now. In truth this has been happening for months — ever since June 21, the summer solstice, or, the year's longest day.

But for most of us, the speed at which daylight is dying is faster now than at any other time of the year.

Plotted over a year, from March to March, and represented on a graph, a number of daylight hours per day behave like a wave or a sine curve. The curve peaks on June 21 — when daylight hours are longest — and bottoms out on December 21, the shortest day of the year.

Location From Equator Dictates Daylight Hours

The amount of daylight in a given location depends on its latitude, or how far north or south it is from the equator. The equator has a latitude of zero. Locations closer to the equator have lower latitudes and experience less of a difference in daylight hours throughout the year. Their seasonal change is also less noticeable. Places with a high latitude are further away from the equator experience. The farther away from the equator, the greater highs and lows and greater change in the seasons.

In places close to the equator, such as Quito, Ecuador, the graph barely curves because there are 12 hours of sun there most days of the year. Farther north in places such as Juneau, Alaska, the curve gets very steep. It peaks in the summer and valleys in the winter. This extreme curve in daylight hours means the days are extremely long in the summer and extremely short in the winter.

Even further north — above the Arctic Circle, in towns such as Barrow, Alaska — the curve goes off the charts, literally. The sun never sets for part of the summer, and it never rises in the middle of winter.

One cool thing about these graphs is that the lines all converge, or match up, around the fall equinox on September 22 and on the spring equinox on March 20. On those days, every place on earth gets the exact same amount of sunlight. NASA explains, "At an equinox, the Earth's terminator — the dividing line between day and night — becomes vertical and connects the north and south poles." To better imagine it, picture one-half of the earth in shadow (night) and one-half in light (daytime). On the equinox, that dividing line is perfectly straight, whereas in between the equinoxes, the line tilts.

The Reason For The Seasons

This shift happens because the earth orbits the sun on a natural 23.5-degree tilt. This means that for half the year the Northern Hemisphere tilts away from the sun causing colder seasons. When the Earth tilts toward the sun the seasons become warmer.

During the fall equinox, the daily change in the amount of daylight differs dramatically by latitude. On the equator, the rate of change is essentially zero — the day will be about 12 hours long today, and 12 hours long tomorrow, too. But as you trek north up the globe, that rate changes.

Miami, for instance, is losing about 1 1/2 minutes of daylight now, every single day; Washington's losing 2 1/2 minutes; where I live in Red Lake Falls, Minnesota, we're losing nearly 3 1/2 minutes of light each day.

Extreme Daylight Loss In Arctic Circle

As you get to the Arctic Circle, the loss in daylight becomes extreme. Barrow, Alaska, is losing nearly 10 minutes a day. In the now-abandoned settlement of Etah, Greenland, the daylight is dying at a rate of more than 15 minutes a day. In other words, winter is coming.

For the Southern Hemisphere, this trend is reversed — the further south you go from the equator, the longer the days are getting.

Again, this all goes back to the Earth's axial tilt — without that 23.5-degree offset, we'd have no seasons. The weird thing about this tilt is that it changes slightly over 40,000-year periods, varying between 22.1 and 24.5 degrees. Our current tilt is somewhere in the middle of that range and headed toward the low end of it. Scientists believe this difference will result in less extreme differences in seasons. Hopefully, if we're still around to notice it.

Quiz

- 1 According to the article, the equinox can be viewed from space.

Which piece of evidence BEST supports the idea outlined above?

- (A) Many people who live in the Northern Hemisphere start noticing the days get shorter right about now. In truth this has been happening for months — ever since June 21, the summer solstice, or, the year's longest day.
- (B) Locations closer to the equator have lower latitudes and experience less of a difference in daylight hours throughout the year. Their seasonal change is also less noticeable.
- (C) To better imagine it, picture one-half of the earth in shadow (night) and one-half in light (daytime). On the equinox, that dividing line is perfectly straight, whereas in between the equinoxes, the line tilts.
- (D) As you get to the Arctic Circle, the loss in daylight becomes extreme. Barrow, Alaska, is losing nearly 10 minutes a day. In the now-abandoned settlement of Etah, Greenland, the daylight is dying at a rate of more than 15 minutes a day.

- 2 Read the paragraph from the section "Location From Equator Dictates Daylight Hours."

The amount of daylight in a given location depends on its latitude, or how far north or south it is from the equator. The equator has a latitude of zero. Locations closer to the equator have lower latitudes and experience less of a difference in daylight hours throughout the year. Their seasonal change is also less noticeable. Places with a high latitude are further away from the equator experience. The farther away from the equator, the greater highs and lows and greater change in the seasons.

What conclusion is BEST supported by this paragraph?

- (A) If you live in a place that is located on a high latitude, there will be greater seasonal variation.
- (B) If you live in a place that is located on a lower latitude, there will be no change in the seasons.
- (C) If you live in a place that is located on a higher latitude, temperatures will always be cold.
- (D) If you live in a place that is located on the equator, temperatures will always be warm.

- 3 Read the paragraph from the introduction [paragraphs 1-4].

Plotted over a year, from March to March, and represented on a graph, a number of daylight hours per day behave like a wave or a sine curve. The curve peaks on June 21 — when daylight hours are longest — and bottoms out on December 21, the shortest day of the year.

HOW does the author frame this comparison to help you understand the change in seasons?

- (A) by providing a model of a curve that is shaped like a horizontal 'S'
- (B) by showing what the calendar looks like on a graph
- (C) by providing a model of a curve shaped like a 'U'
- (D) by creating a graphic illustration of a wave

- 4 The phrase "axial tilt" is essential to understanding WHY the seasons change.

Which of the following words or phrases from the article provides context clues to the meaning of the phrase "axial tilt"?

- 1. *high latitude*
- 2. *orbits*
- 3. *12 hours*
- 4. *23.5-degree offset*

- (A) 1 and 3
- (B) 2 and 4
- (C) 1 and 2
- (D) 3 and 4