

# Where to Go for the Best Views, and How to Watch Safely

**OCTOBER 14, 2023**  
ANNULAR SOLAR ECLIPSE

**APRIL 8, 2024**  
TOTAL SOLAR ECLIPSE

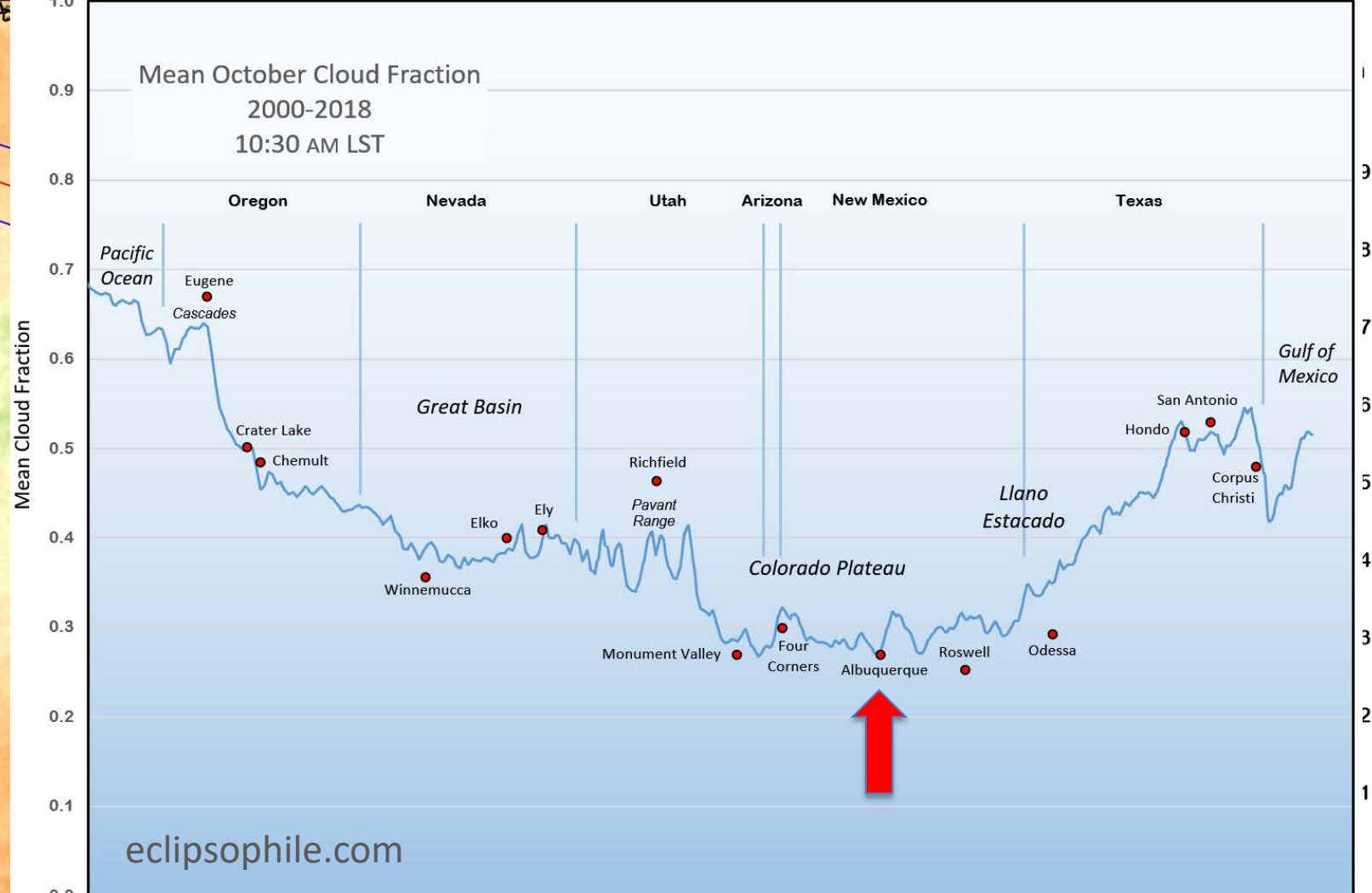
**Rick Fienberg**

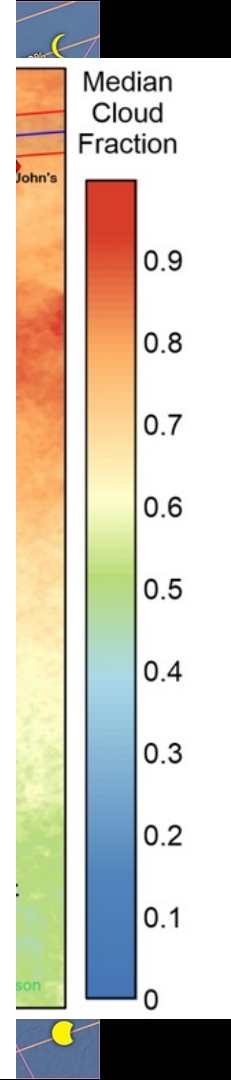
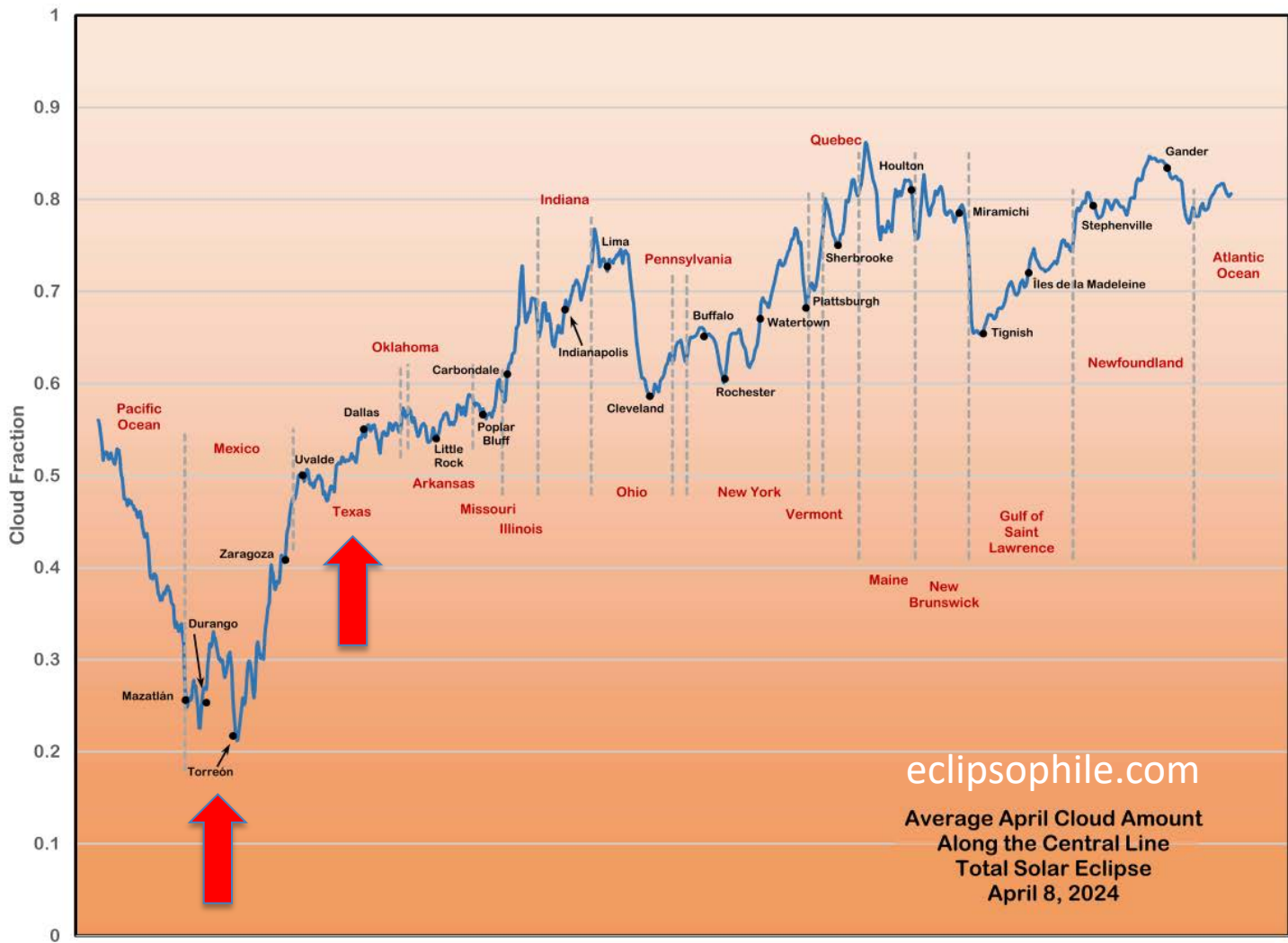
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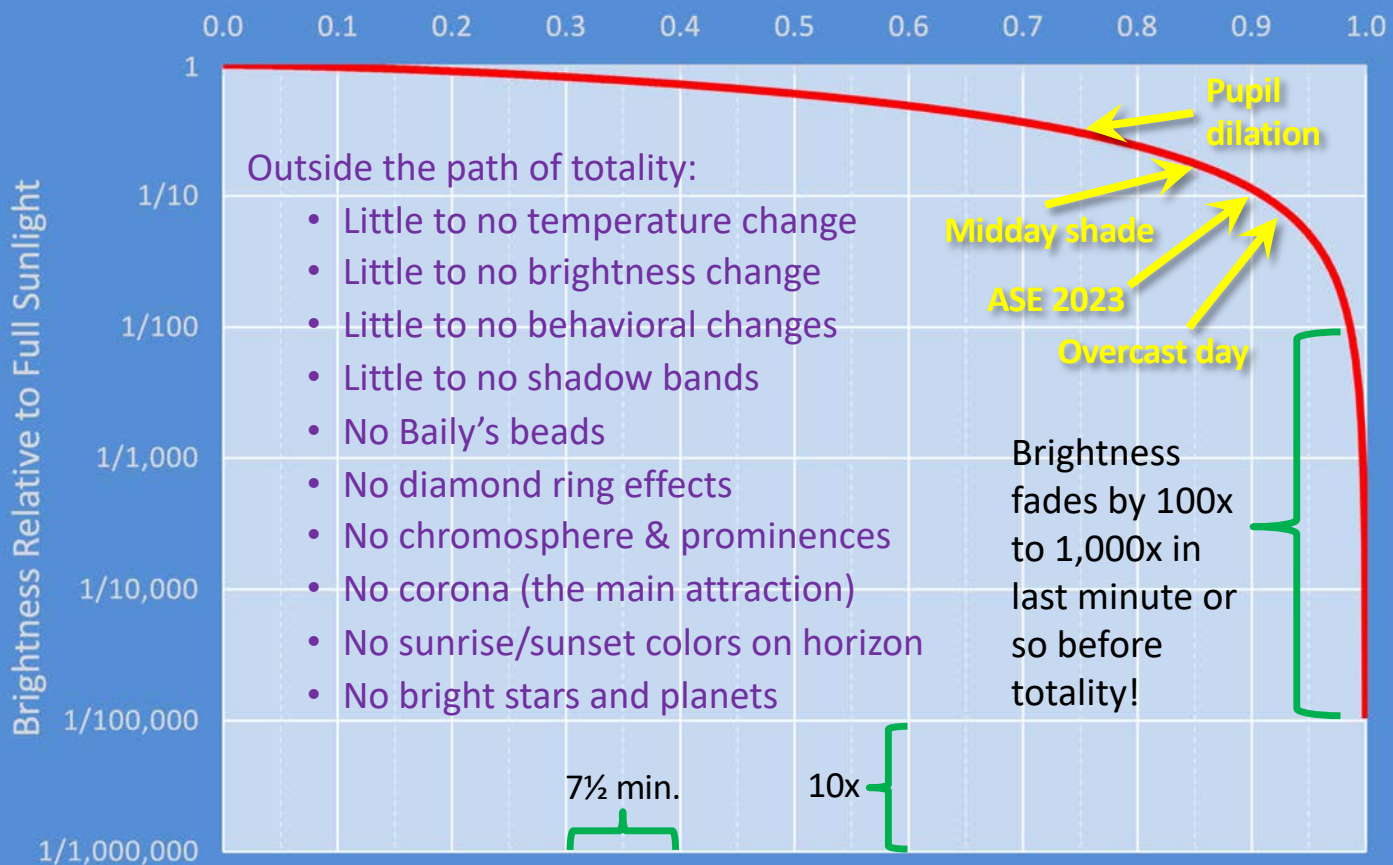
# Mean October Cloud Fraction 2000-2018 10:30 AM LST







# Eclipse Magnitude



## Change in Apparent Brightness During a Solar Eclipse

# The Essentials of Solar Eclipse Safety



This is  
Mom  
saying...



...“Never  
look at  
the Sun!”

*Exception:* The totally eclipsed Sun is only about as bright as the full Moon — and just as safe to look at.\*



\*Even with binoculars or a telescope!



But the Sun at any other time, such as...

- when no solar eclipse is occurring,
  - during a partial or annular (ring) solar eclipse, and
  - during the partial phases of a total or annular eclipse
- ...is dangerously bright. There is a serious risk of retinal injury.







To observe the Sun outside of a total solar eclipse, view it...

- *directly* only through special-purpose safe solar filters
- *or indirectly* only by using pinhole or optical projection.



Are very dark sunglasses safe  
for direct viewing of the Sun?



They transmit thousands of times too much light!

# Safe Solar Filters Are Very Dark

Maximum visible-light transmission:

<0.001% (that's 1 part in 100,000)

Attenuate UV & IR to safe levels too.

Comply with the ISO 12312-2 international standard, as confirmed by an independent, properly accredited laboratory.

**Note:** The main danger comes from intense *short-wavelength (blue) visible light*, not from UV or IR.



# SOLAR ECLIPSE ACROSS AMERICA

Monday, April 8, 2024: Sun... Moon... You!



AMERICAN ASTRONOMICAL SOCIETY



ECLIPSE AMERICA

EYE SAFETY

IMAGING & VIDEO

RESOURCES

SOLAR ECLIPSE TASK FORCE

WORKSHOPS

INFO FOR...

HOW TO VIEW A SOLAR ECLIPSE SAFELY

SUPPLIERS OF SAFE SOLAR VIEWERS

ABOUT THE ISO 12312-2 STANDARD

PROJECTION: PINHOLE & OPTICAL

SOLAR FILTERS FOR OPTICS



## PATH OF THE TOTAL SOLAR ECLIPSE

### APRIL 8, 2024

# Get 'em ASAP; they'll be hard to find by October!

Michael Zeiler / GreatAmericanEclipse.com

# 129

Days to the Next U.S. Solar Eclipse

Two major solar eclipses are coming to North America! On Saturday, October 14, 2023, an annular ("ring of fire") eclipse sweeps from Oregon to Texas in a 125-mile-wide path that continues to the Yucatán peninsula and northern South America. Six months later, on Monday, April 8, 2024, a total solar eclipse darkens a 115-mile-wide swath from Mexico to Eastern Canada, traversing the U.S. from Texas to Maine in the process. In both cases virtually all of North America will have at least a partial solar eclipse.



Never look through optics  
(camera lenses, binoculars,  
or telescopes) while  
wearing solar viewers!



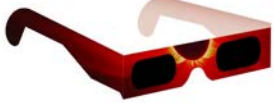
# How to Safely View the October 14, 2023, Annular Eclipse

A solar eclipse occurs when the Moon blocks any part of the Sun. On Saturday, October 14, 2023, a solar eclipse will be visible (weather permitting) in North, Central, and South America. All 49 continental U.S. states will experience at least a partial eclipse, as will most of Canada and all countries in Central and South America.

During a partial or annular (ring) solar eclipse, such as the one on October 14, 2023, there is no time when it is safe to look directly at the Sun without using a special-purpose solar filter that complies with the transmission requirements of the ISO 12312-2 international standard.



During a partial or annular (ring) solar eclipse, there is no time when it is safe to look directly at the Sun without proper eye protection. View it only through special-purpose solar filters that comply with the transmission requirements of the ISO 12312-2 international standard for filters for direct solar viewing.



The only safe way to look directly at the un eclipsed, partially eclipsed, or annularly eclipsed Sun is through special-purpose solar filters, such as "eclipse glasses" (example shown at left) or handheld solar viewers. Ordinary sunglasses, even very dark ones, are not safe for looking at the Sun; they transmit far more sunlight than is safe for our eyes.

## Instructions for the Safe Use of Solar Filters and Viewers

- Always inspect your solar filter before use; if scratched, punctured, torn, or otherwise damaged, discard it. Read and follow any instructions printed on or packaged with the filter.
- Always supervise children using solar filters.
- If you normally wear eyeglasses, keep them on. Put your eclipse glasses on over them or hold your handheld viewer in front of them.
- Stand still and cover your eyes with your eclipse glasses or solar viewer before looking up at the bright Sun. After looking at the Sun, turn away and remove your filter – do not remove it while looking at the Sun.
- Do not look at the un eclipsed, partially eclipsed, or annularly eclipsed Sun through an unfiltered camera, telescope, binoculars, or other optical device.
- Similarly, do not look at the Sun through an unfiltered camera, telescope, binoculars, or any other optical device while wearing your eclipse glasses or using a handheld solar viewer in front of your eyes — the concentrated solar rays could damage the filter and enter your eyes, causing serious injury.
- Seek expert advice from an astronomer before using a solar filter with a camera, telescope, binoculars, or any other optical device; note that solar filters must be securely attached to the front of any telescope, binoculars, camera lens, or other optics.

## What If You Don't Have a Safe Solar Filter or Viewer?

An alternative method for safe viewing of the partially or annularly eclipsed Sun is indirectly via pinhole projection. For example, cross the outstretched, slightly open fingers of one hand over the outstretched, slightly open fingers of the other, creating a waffle pattern. With your back to the Sun, look at your hands' shadow on the ground. The little spaces between your fingers will project a grid of small images on the ground, showing the Sun as a crescent during the partial phases of any solar eclipse or as a ring during the annular phase of an annular eclipse. Or look at the shadow of a leafy tree during a partial or annular eclipse; you'll see the ground dappled with crescent or ring-shaped Suns projected by the tiny spaces between the leaves.

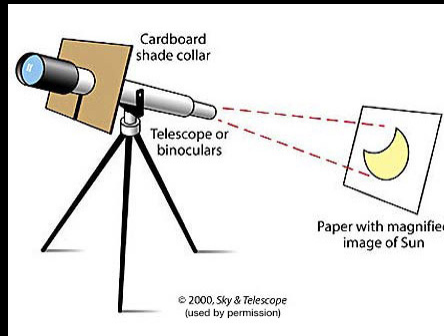


A solar eclipse is one of nature's grandest spectacles. By following these simple rules, you can safely enjoy the view and be rewarded with memories to last a lifetime. For more information about eye safety and the eclipse, visit <https://eclipse.aas.org/safety>.

This safety information has been endorsed by the American Astronomical Society, the American Academy of Ophthalmology, the National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration, the American Optometric Association, and the U.S. National Science Foundation.



- Consistent messaging
- Endorsed by eye-care academies



# SOLAR ECLIPSE ACROSS AMERICA

Sat., October 14, 2023: Sun... Moon... You!



- ECLIPSE AMERICA ▾
- EYE SAFETY ▲
- IMAGING & VIDEO ▾
- RESOURCES ▾
- SOLAR ECLIPSE TASK FORCE ▾
- WORKSHOPS ▾
- INFO FOR... ▾



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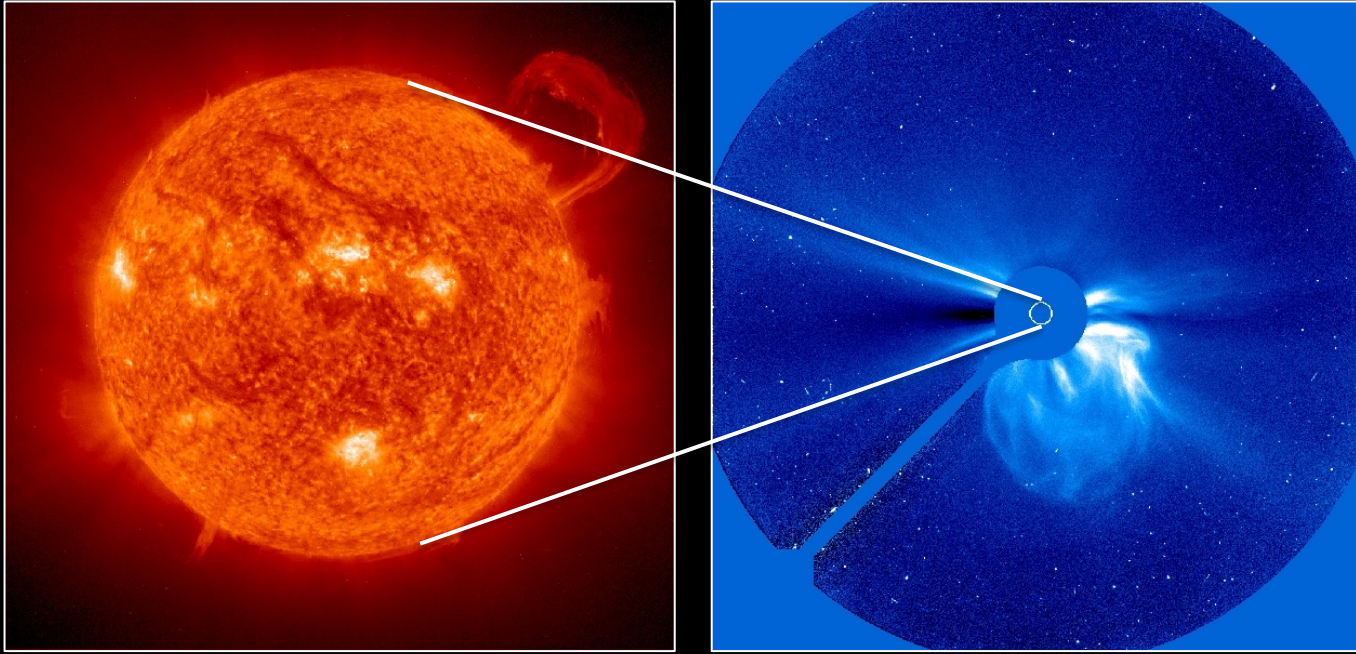
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Extra Slides

Doesn't the Sun emit dangerous rays during a solar eclipse?



No more so than at any other time. The Moon has no “focusing” or other effect. Earth’s atmosphere shields us from most harmful solar radiation across the spectrum.



# Some of My Pet Peeves








**Don't say, "Outside the path you'll have an X% annular or total eclipse."**




**Do say, "Outside the path you'll have an X% *partial* eclipse."**






**Don't say, "Outside the path, you'll have a partial solar eclipse. Inside the path you'll have an annular or total solar eclipse."**



**Do say, "Outside the path, you'll have a partial eclipse. Inside the path, you'll have an annular or total eclipse with partial phases before and after."**





**Don't say, "An annular or total solar eclipse is a rare event."**



**Do say, "It is rare for an annular or total solar eclipse to occur where you live."**





**Don't say, "A total solar eclipse is a once-in-a-lifetime experience!"**



**Do say, "You need to see a total solar eclipse at least once in your lifetime!"**

