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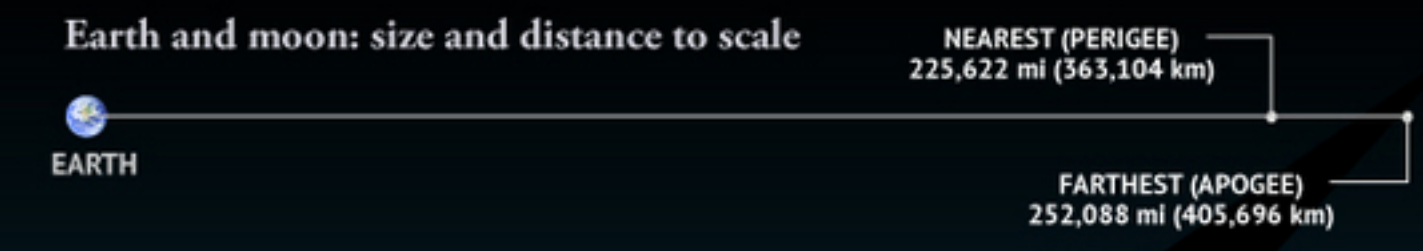
THE MECHANICS OF ECLIPSES OF THE SUN

A transit of the moon across the face of the sun – commonly called a solar eclipse – can be a dramatic event for viewers. In the case of a total eclipse, the sun's light is blocked completely, and is replaced midday by an eerie gloom. Even a partial eclipse – one where the sun is not fully covered – is an exciting and wondrous sight.

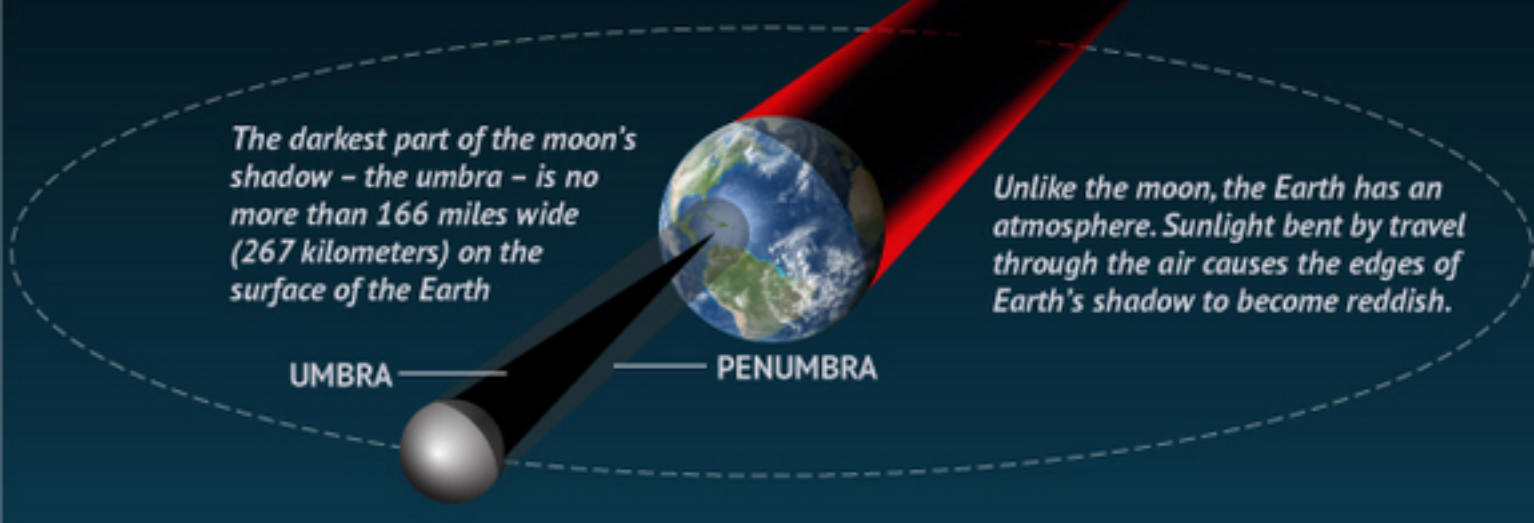
CREDIT: NASA/HINODE

Solar eclipses happen due to a cosmic coincidence. From Earth's surface, our moon's apparent diameter just about coincides with that of the sun. The moon appears just large enough to completely cover the sun under certain circumstances.



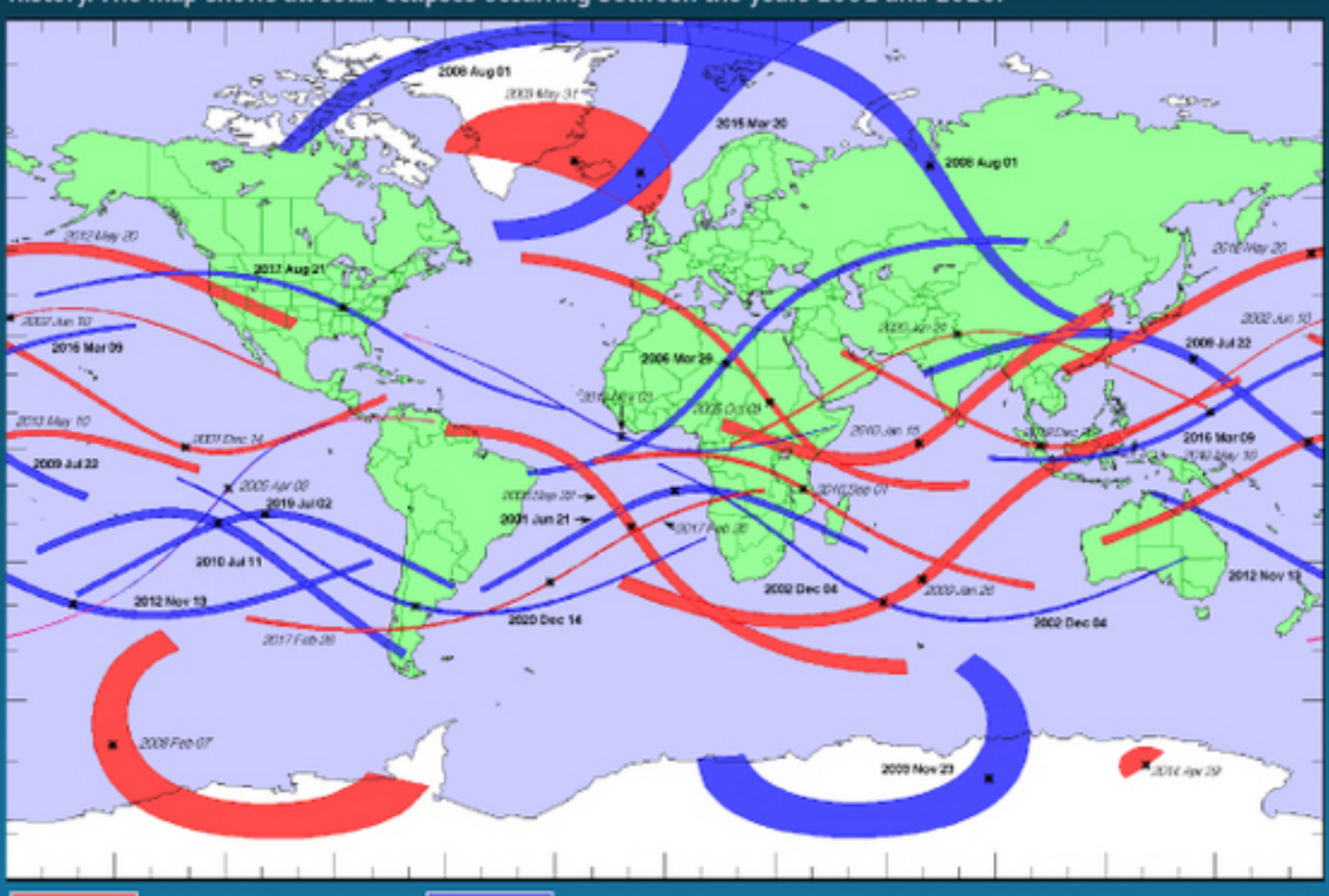
SHADOWS FALLING IN SPACE

The Earth, moon and other orbiting bodies of the solar system cast long shadows through space. When the moon's shadow falls onto the Earth, people on the ground see the sun obscured as the moon passes in front of it.



ECLIPSE PATHS

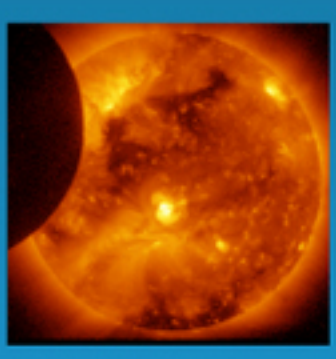
The geometry of the sun, moon and Earth changes with every eclipse. The narrow path of the moon's shadow will wander to different places each time, but every place on Earth will be exposed to a solar eclipse at some point in history. The map shows all solar eclipses occurring between the years 2001 and 2020.



TOTAL ECLIPSES PARTIAL ECLIPSES CREDIT: FRED ESPENAK, NASA/GSFC

TYPES OF SOLAR ECLIPSES

Due to variations in distance, not all eclipses are total. Every eclipse passes through a partial phase as the moon slowly moves across the sun. Even at the height of an eclipse, the moon may not completely cover the sun.



PARTIAL ECLIPSE

Only part of the sun is covered by the moon. The eclipse may continue to a total or annular phase. (CREDIT: NASA/HINODE)

TOTAL ECLIPSE

When the moon completely obscures the sun, unique effects occur. The solar corona becomes visible. Animals and birds think that night has fallen, and the air temperature may drop. (CREDITS: Williams College Eclipse Expedition – Jay M. Pasachoff, Muzhou Lu and Craig Malamut)

ANNULAR ECLIPSE

In this special kind of partial eclipse, the moon is slightly too far away from Earth to exactly cover the sun. The edge of the sun is still visible all around.

HYBRID ECLIPSE

A hybrid eclipse occurs when the tip of the moon's shadow lifts off the surface of the Earth at some point. This means that some observers along the path see a total eclipse, while others will see an annular eclipse.

SOURCES: NASA, GODDARD SPACE FLIGHT CENTER, ROYAL ASTRONOMICAL SOCIETY OF CANADA