India’s deepest solar eclipse

- India will witness its “deepest” annular solar eclipse of this century this Sunday (June 21), with the Sun appearing as a necklace of pearls for around 30 seconds during the maximum phase along a narrow corridor running through Rajasthan, Haryana and Uttarakhand.
- The eclipse will be partial in the rest of the country.
- An annular solar eclipse occurs when the apparent size of the Moon is slightly less than that of the Sun, which leaves the outer rim of the latter uncovered, giving the appearance of a “ring of fire”.
- During this eclipse, that ring is expected to be very thin as the Moon will cover up to 98.8% of the solar disc, making it the “deepest” annular eclipse of the century in India, according to experts.
- Instead of a wide fiery ring, the Sun may appear as a necklace of shiny beads (known as Baily’s beads) due to light filtering through Moon’s hills and valleys.
- There’s a possibility that the Sun’s corona, an ethereal white halo around the solar disc, will be visible during this eclipse.
- With the next eclipse (visible from the country) 11 years away in 2031, this is a big astronomical event for India. Many global eclipse chasers were expected to watch it from India but the Covid-19 pandemic dashed those plans.
- Domestic travel curbs have dampened the plans of many Indian enthusiasts as well.

The Moon Eclipses the Sun

- An eclipse of the Sun happens when the New Moon moves between the Sun and Earth, blocking out the Sun's rays and casting a shadow on parts of Earth.
- The Moon's shadow is not big enough to engulf the entire planet, so the shadow is always limited to a certain area.
- This area changes during the course of the eclipse because the Moon and Earth are in constant motion: Earth continuously rotates around its axis while it orbits the Sun, and the Moon orbits Earth.
- This is why solar eclipses seem to travel from one place to another.

Types of Solar Eclipses

There are 4 different types of solar eclipses. How much of the Sun’s disk is eclipsed, the eclipse magnitude, depends on which part of the Moon’s shadow falls on Earth.

1. Partial solar eclipses occur when the Moon only partially obscures the Sun's disk and casts only its penumbra on Earth.
2. Annular solar eclipses take place when the Moon's disk is not big enough to cover the entire disk of the Sun, and the Sun's outer edges remain visible to form a ring of fire in the sky. An annular eclipse of the Sun takes place when the Moon is near apogee, and the Moon's antumbra falls on Earth.
3. Total solar eclipses happen when the Moon completely covers the Sun, and it can only take place when the Moon is near perigee, the point of the Moon's orbit closest to Earth. You can only see a total solar eclipse if you’re in the path where the Moon's casts its darkest shadow, the umbra.
4. Hybrid Solar Eclipses, also known as annular-total eclipses, are the rarest type. They
occur when the same eclipse changes from an annular to a total solar eclipse, and/or vice versa, along the eclipse’s path.

Solar Eclipses Mainly Look Partial

- **Solar eclipses are only visible** from within the area on Earth where the Moon’s shadow falls, and the closer you are to the center of the shadow’s path, the bigger the eclipse looks.
- Solar eclipses are usually named for their darkest, or maximum, point. The exception is the hybrid eclipse.
- The darkest point of solar eclipses is only visible from a small area. In most places and for most of the duration, total, annular, and hybrid eclipses look like a partial solar eclipse.

Only around New Moon

- For a solar eclipse to take place, the Sun, the Moon, and Earth must be aligned in a perfect or near perfect straight line—an alignment astronomers call **syzygy**. This happens around New Moon every lunar month.
- The New Moon has to be near a lunar node. These nodes are the 2 points where the plane of the Moon’s orbital path around Earth meets Earth’s orbital plane around the Sun—the ecliptic. The paths meet because the plane of the Moon’s path around Earth is inclined at an angle of approximately 5° to the ecliptic.
- The Sun must also be close to a lunar node so it can form a perfect or near-perfect line with the Moon and Earth. This alignment occurs a little less than 6 months apart, and it lasts, on average, around 34.5 days. It is only during this time—the eclipse season—that eclipses can take place.
- When there is a Full Moon during the eclipse season, we see a **lunar eclipse**.