Cosmic Rays Impacting Earth's Climate

According to a study published in the **Scientific Reports** journal,the cosmic rays are impacting earth climate by adding low-cloud cover.

- Besides atmospheric temperature and the amount of water vapour in the air, cosmic rays beaming down through space also contribute towards cloud formation.
- According to scientists: Cosmic rays can affect the earth's climate by increasing cloud cover and cause an "umbrella effect".

Cosmic Rays

- Cosmic rays are atom fragments that rain down on the Earth from outside of the solar system. Most cosmic rays are atomic nuclei: most are hydrogen nuclei, some are helium nuclei, and the rest are heavier elements.
- Though cosmic rays were discovered in 1912 but still the origins of the highest energy cosmic rays remains unknown and a topic of much research, most scientists suspect their origins are related to supernovas (star explosions)
- Cosmic rays travels at the speed of light and have been blamed for electronics problems in satellites and other machinery.

Umbrella Effect

In this case Umbrella effect refers to the cooling of earth, as cosmic rays increases low level clouds which blocks the sunlight thereby acting as an Umbrella.

- Previous studies using data from the meteorological observation showed that there are only minute changes in the amounts of cosmic rays and cloud cover.

- However, the researchers from the Kobe University in Japan, analysed Earth's last geomagnetic reversal (a phenomenon where the planet's overall magnetic field flips) transition 780,000 years ago and figured out that :
    - During the period, the Earth's magnetic strength fell to less than one-fourth and cosmic rays increased by over 50 per cent.
    - This spiked the global cloud cover and enabled detection of the impact of cosmic rays on climate.
    - The Cosmic rays can enhance the formation of low-lying clouds or increase the global cloud cover ultimately leading to the cooling of Earth's atmosphere.
    - Combined effect of rays and cloud cover, led to a high atmospheric pressure in Siberia. The effect caused the East Asian winter monsoon to become stronger.
    - Focusing on the phenomenon, the researchers also investigated changes in particle size and accumulation speed of loess layer dust (sediment created by the accumulation of wind-blown silt) in two locations of China's Loess Plateau.
        - The particles became coarser and silt was accumulated up to three times faster in both locations. due to this during the last geomagnetic reversal, the researchers found evidence of stronger winter monsoons.
- So this study provides an opportunity to rethink the impact of clouds on climate. When galactic cosmic rays increase, so do low clouds, and when cosmic rays decrease clouds do as well, so climate warming may be caused by an opposite-umbrella effect
- Earlier the **Intergovernmental Panel on Climate Change** has discussed the impact of cloud cover on climate but this phenomenon has never been considered in climate predictions due to the insufficient physical understanding of it.
- Thus with the increase in climate change events, understanding the cosmic rays' role in global warming may be important.