



NASA's Parker Solar Probe

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Why in News?

[NASA's Parker Solar Probe](#) recently set a historic record by flying closer to the Sun than any other man-made object, reaching speeds of 430,000 mph and withstanding temperatures up to 982°C.

What are the Key Facts Related to Parker Solar Probe?

- **About:**
 - Launched in 2018, a car-sized robotic spacecraft, is named after American solar **astrophysicist Eugene Newman Parker**.
 - This is the **first NASA mission named for a living researcher** and it's humanity's first mission to explore within 3.8 million miles of the Sun's corona.
 - The Probe uses an **advanced carbon-composite heat shield** to withstand extreme temperatures.
- **Objectives:**
 - The Parker Solar Probe aims to approach within **6.5 million kilometers of the Sun** to **study energy flow**, solar corona heating.
 - It also investigates the source of **solar winds**, **high-speed streams of charged particles** that affect space weather.
 - To investigate the **Sun's corona**, and understand why it is hotter than the Sun's surface, a long-standing mystery in astrophysics.
 - To determine the **structure and dynamics of the plasma and magnetic fields** at the sources of the solar wind.
 - To explore mechanisms that accelerate and transport energetic particles.

Aditya-L1 Mission

- The [Aditya-L1 mission](#) is India's solar observatory at [Lagrange Point L1](#), enabling continuous observation of the **Sun's chromospheric and coronal dynamics**.
- The spacecraft will be positioned in a halo orbit around **Lagrange Point 1 (L1)** of the **Sun-Earth system**, approximately **1.5 million km from Earth**.
- The spacecraft will carry **seven payloads** to observe the **photosphere, chromosphere**, and the outermost layers of the **Sun (the corona)** using electromagnetic and particle detectors.

Lagrange Points

- **About:**
 - Lagrange Points are positions in space within a two-body gravitational system where a small object can remain stable.
 - It enables spacecraft to **maintain stable positions with minimal fuel** consumption by **balancing the gravitational forces of two large bodies** with the **centripetal force** required for the smaller object to move in sync with them.
- **Types:**

- The **Lagrange point L1** lies **between the Sun-Earth line**. The distance of L1 from Earth is approximately **1% of the Earth-Sun distance**.
- **L2**, located **behind Earth from the Sun**, offers ideal conditions for observing the universe without Earth's shadow interference.
- **L3**, located **behind the Sun, opposite Earth**, offers potential observations of the Sun's far side.
- Objects at **L4** and **L5** maintain stable positions, forming an equilateral triangle with the two larger bodies.

ADITYA-L1 MISSION



ABOUT

- India's 1st scientific expedition to study the Sun
- To be placed at halo orbit around **L1 Lagrange point**
- Launch date - 02 Sept, 2023
- Time to reach - **4 months**; Mission Life - **5 years**

FIELDS OF STUDY:

- **Sun's corona** (Visible and Near-infrared rays), **photosphere** (soft and hard X-ray) and **chromosphere** (UV)
- Solar emissions, solar winds and flares and **Coronal Mass Ejections** (CMEs)
- Carry out round-the-clock imaging of Sun

SIGNIFICANCE

- Solar weather/environment affects the weather of entire solar system
- Solar events help **understand space weather**
- **Tracking Earth-directed storms** can help predict their impact

LAUNCH VEHICLE

- PSLV-C57

PAYLOADS:

- Visible Line Emission Coronagraph (VLEC) (**primary payload**)
- Solar Ultraviolet Imaging Telescope (SUIT)
- Solar Low Energy X-ray Spectrometer (SoLEXS)
- Aditya Solar wind Particle Experiment (ASPEX)
- High Energy L1 Orbiting X-ray Spectrometer (HEL1OS)
- Plasma Analyser Package for Aditya (PAPA)
- Advanced Tri-axial High Resolution Digital Magnetometers

What are Lagrange Points?

- ▮ Named after Italian-French mathematician Joseph-Louis Lagrange
- ▮ Positions in space where gravitational forces of a two-body system (e.g. Sun & Earth) produce enhanced regions of attraction and repulsion
- ▮ Spacecrafts placed at L points consume lower fuel to remain in position
- ▮ L1 will provide ISRO continuous view of Sun without any occultation/ eclipses

ANATOMY OF THE SUN

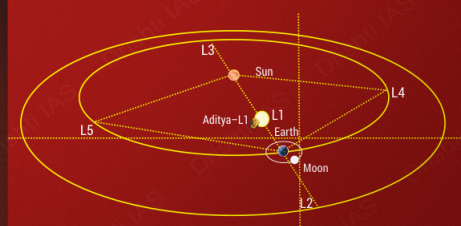
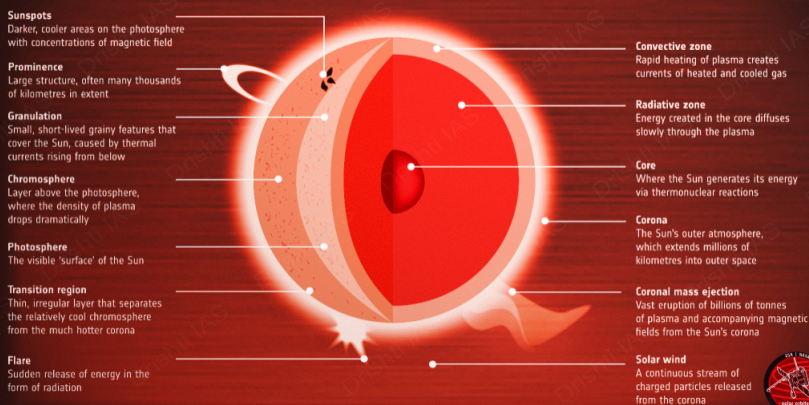


Illustration of all five Lagrange points of Sun-Earth System. Aditya-L1 will be placed around Lagrange point 1



UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims:

Q1. In the context of space technology, what is “Bhuvan”, recently in the news? (2010)

- (a) A mini satellite launched by ISRO for promoting the distance education in India
- (b) The name given to the next Moon Impact Probe, for Chandrayaan-II
- (c) A geoportal of ISRO with 3D imaging capabilities of India
- (d) A space telescope developed by India

Ans: (c)

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