With closer view, Aditya can unravel sun's surface

Solar eruption study to give clue on averting earth-bound matter

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The primary payload on India's first space-based mission to study the sun could help track the origins of solar eruptions in greater detail and provide insights on averting the expelled matter when they are headed towards the earth. The Visible Emission Line Coronagraph (VELC) on board the Aditya-L1 mission is equipped to study regions in the sun's corona, its outermost layer, where Coronal Mass Ejections (CME) are initiated.

CMEs are expulsions of magnetic fields and charged particles from the corona; the larger ejections carry billions of tonnes of coronal matter. R Ramesh, professor at the Indian Institute of Astrophysics (IIA), Bengaluru, which developed the payload, and principal investigator of the project, said it was imperative to monitor the sun continuously to understand CMEs better.

The Indian Space Research Organisation (Isro) will launch Aditya-L1, with seven payloads, on September 2. The spacecraft will take about four months to travel from launch to L1, the first Lagrange point in the sun-earth system from where it will watch the sun.

At their fastest speed of about 3,000 km per second, CMEs can reach near-earth space in about 15 hours. "Once the expulsions reach the earth's atmosphere, these clouds of charged particles can engulf satellites on the sun-earth line, causing them to malfunction and impact communication networks. These particles can also disrupt the geomagnetic field, leading to massive power grid failures," Prof Ramesh told *DH*.

In March, 1989, a solar plasma expulsion hit the earth's magnetic field causing a 12-hour power blackout in the province of Quebec in Canada.

The 1995 ESA-NASA mission SOHO (Solar and Heliospheric Observatory) has also orbited around L1 to study the sun.

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Set for Saturday launch

Isro said on Wednesday that preparations for the launch of the PSLV-C57/Aditya-L1 mission were progressing. The launch rehearsal and vehicle internal checks have been completed, the space agency said. The mission is set to take off from the Satish Dhawan Space Centre in Sriharikota on September 2, at 11.50 am.

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Prof Ramesh noted that VELC will be an improvement on the observation, considering that it can image the corona as close as 1.05 times the solar radius.

The extremely bright light from the photosphere (sun's surface) makes observation of the lower corona region – where CMEs take shape – difficult. VELC has an internal occulter that separates this bright light out and sends the remaining light, from the corona, for processing.

"From the earth, observations can be made only in dawn-to-dusk cycles. With earth-based facilities, you cannot artificially block this bright light; you cannot be waiting for eclipses either (to observe the faint emission from the corona). You also need to be at a place where the light is not scattered as it travels through the intervening atmosphere," he said.

These factors were considered while finalising L1 to place the observatory. L1 is one of the five points in the sun-earth system where the gravitational forces between these two bodies are balanced, providing stability to spacecraft that remain locked on the sun-earth line.