Aditya-L1's VELC finds a solar eruption (CME) expanding asymmetrically – IIA study

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News

Scientists of the Indian Institute of Astrophysics (IIA), Bengaluru, using data from Aditya-L1's Visible Emission Line Coronagraph (VELC), found that a coronal mass ejection (CME) launched on 5 Aug 2024 from an active region near the Sun's western limb did not expand evenly like a simple bubble but spread sideways asymmetrically. The spectra showed two branches at once – blueshifted (towards us) and redshifted (away); only a model with a tilted axis and uneven lateral expansion matched them. NASA's SDO images and 3-D models were also used. The study appeared in The Astrophysical Journal Letters; the findings were reported on 3 Nov 2026.

Key facts

Instrument	VELC – the primary of Aditya-L1's 7 payloads; an internally occulted coronagraph
Event	5 Aug 2024 – CME near the Sun's western limb; observed in the low corona (about 1.05–1.5 solar radii)
Method	Spectroscopy of the 530.3 nm green line (highly ionised iron; plasma about 1.8 million K)

Authors	Saurabh Tripathi (lead), Tanmoy Samanta, Jayant Joshi – IIA (autonomous body under DST)
Journal	The Astrophysical Journal Letters (2026); reported 3 Nov 2026
Significance	A CME's shape affects solar-wind drag and its arrival time at Earth – aids space-weather forecasting

Background

- What is a CME? A huge burst of magnetised plasma (billions of tonnes) hurled from the Sun's corona into space. If Earth-directed it can trigger geomagnetic storms that disturb satellites, GPS, radio links and power grids, and produce auroras near the poles.
- Aditya-L1: India's first space-based solar observatory; launched Sep 2023, it is in a halo orbit around the Sun–Earth L1 (Lagrange) point. From L1 the Sun is seen continuously, without eclipses or occultation. 7 payloads – 4 remote-sensing (VELC, SUIT, SoLEXS, HEL1OS) and 3 in-situ (ASPEX, PAPA, MAG). ASPEX – Physical Research Laboratory (PRL), Ahmedabad; PAPA – Space Physics Laboratory (SPL), VSSC, Thiruvananthapuram.
- Coronagraph principle: it blocks the Sun's bright disc with an occulter, creating an 'artificial eclipse', to study the faint corona. VELC is internally occulted; its spectra give plasma speed and temperature. Until now a CME's 3-D shape needed several spacecraft imaging from different angles; this method may do it from a single vantage point.

Tamil Nadu link: IIA, which built VELC, also runs the Kodaikanal Solar Observatory in Dindigul district. The liquid engines of the PSLV rocket that launched Aditya-L1 are tested at the ISRO Propulsion Complex (IPRC), Mahendragiri, Tirunelveli district. ISRO's second spaceport is being built at Kulasekarapattinam, Thoothukudi district.

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