



Chandrayaan's ChaSTE

[Source: TH](#)

India's [Chandrayaan-3 mission's](#) ChaSTE (Chandra's Surface Thermophysical Experiment) became the first-ever instrument to successfully measure **subsurface temperature near the Moon's south pole**.

- ChaSTE was deployed by the **Vikram lander** after Chandrayaan-3's successful lunar landing in **August 2023**.
 - The **ChaSTE probe features 10 temperature sensors spaced 1 cm apart** along its needle, with a **rotation-based deployment mechanism**, rather than a hammering one.
 - The probe successfully **descended up to 10 cm** into the lunar surface and **collected thermal data until September, 2023**.
 - The **data suggested the presence of more water ice** near the south pole than previously estimated, a crucial discovery for future lunar missions.
 - **ChaSTE's success was attributed to its rotating probe mechanism**, which proved more effective than the hammering technique used by earlier missions.
- **Previous Missions: ESA's Philae lander (2014)** couldn't deploy the MUPUS (Multi-Purpose Sensors for Surface and Subsurface Science) thermal probe due to an awkward landing on comet 67P.
 - **NASA's InSight (2018) on Mars** also failed to gather subsurface data due to mechanical issues with the Heat Flow and Physical Properties Package (HP3) instrument.

CHANDRAYAAN 3

India's 3rd lunar mission; a successful attempt at achieving a soft landing on lunar south

BRIEF HISTORY

Lunar Mission	Aim	Launch Vehicle	Success
Chandrayaan 1 (2008)	Create a 3D atlas of moon & Mineralogical mapping	PSLV – C11	Detection of water and hydroxyl on lunar surface
Chandrayaan 2 (2019)	Exploring lunar south pole	GSLV MkIII-M1	Lander and rover crashed but orbiter successfully collected data

COMPONENTS

- Lander - **Vikram**; Rover - **Pragyan** (same as Chandrayaan 2)
 - ▶ Both designed to last for 14 days; not supposed to come back to the earth
- Spectro-polarimetry of Habitable Planet Earth (**SHAPE**)
 - ▶ An experimental payload in propulsion module
 - ▶ Study spectro-polarimetric signatures of Earth (near-infrared wavelength range)

ASPECTS TO STUDY

- Lunar quakes
- Thermal properties of lunar surface
- Changes in plasma near the surface
- Accurately measuring distance b/w Earth and the moon

MISSION LIFE

- 1 lunar day (~14 Earth days)

LAUNCH VEHICLE

- LVM3 - M4

India became the 1st country to successfully land on Lunar south pole and 4th to achieve soft-landing on Lunar surface (after US, Russia and China)

Why Chandrayaan 3 Succeeded?

- A "failure-based design", unlike the "success-based design" of Chandrayaan-2
 - ▶ Even if all the sensors failed and engines stopped, **Vikram was sure to make the landing**
 - ▶ Provision of **multiple attempts** for landing if attempt 1 failed
- Developed accordingly to **rule out the scenario of crash landing**
 - ▶ Expanded landing area for more flexibility to land safely
 - ▶ Equipped with more fuel to enable longer-distance travel

Importance of Lunar South Pole

- Vastly different, more **challenging terrain** compared to lunar equatorial region
- Potential repositories of valuable **information about early Solar System**
- Impact **future deep space exploration** significantly
- **Water may be concentrated** in the moon's southern hemisphere



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Read more: [Chandrayaan-3 Successfully Lands on Moon's South Pole](https://www.drishtiias.com/printpdf/chandrayaan-3-successfully-lands-on-moon-s-south-pole)