

# ESA supports Indian lunar and solar missions

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The Ariane 5 V188 launcher carrying Herschel and Planck rises above ESA's 15 m-diameter tracking dish at Kourou, French Guiana, on 14 May 2009. Credit: ESA/A. Chance

In June 2021, ESA and the Indian Space Research Organization (ISRO) signed an agreement to provide technical support to each other, including tracking and communication services to upcoming Indian space missions via ESA's ground stations.

The first missions to benefit from this new support agreement will enable India look to the sun and the moon with the Aditya-L1 solar observatory and Chandrayaan-3 [lunar lander](#) and rover, both due to launch in 2022 from the Satish Dhawan Space Center in Sriharikota Range (SDSC SHAR), India.

"Deep space communication is an essential part of any space mission," says Ramesh Chellathurai, ESA Service Manager and ESA Liaison Officer for ISRO. "Ground stations keep spacecraft safely connected to Earth as they venture into the unknowns and risks of space. Without ground station support, it's impossible to get any data from a spacecraft, to know how it's doing, to know if it is safe or even to know where it is."

## **A place in the sun**

The Aditya-L1 solar observatory is named for the Hindu sun god, Aditya, and the spacecraft's future home, L1—the first Lagrange point of the Earth-sun system. It will study a number of properties of the sun, such as the dynamics and origins of coronal mass ejections.

Its home at L1 will allow Aditya to orbit the sun at an almost constant distance from Earth, but without the planet ever eclipsing its view of our star.

"The spacecraft will always be in the same direction from Earth as the sun," says Ramesh. "So, as Earth rotates, no single ground station will always be in view of Aditya-L1. Using a global station network like ESA's is the best way to exchange data and commands with this

spacecraft as often as possible."

ESA is one of the only agencies in the world with a network of deep space ground stations located across the planet. The Estrack network lets it track and communicate with spacecraft anytime and in any direction, up to two billion kilometers from Earth.

The "big iron" 35-meter deep space Estrack antennas, located in New Norcia, Australia, Malargüe, Argentina, and Cebreros, Spain, will all support Aditya-L1. Additional support will be provided by ESA's 15-meter antenna at Europe's spaceport in Kourou, French Guiana, and the commercial 32-meter deep space antenna at Goonhilly station in the UK.

The combined ESA and Goonhilly antennas will provide tracking, telemetry and command (TT&C) support for Aditya-L1, with ISRO's deep space antennas in India providing additional communication time.

Data and telemetry sent back by Aditya-L1 arriving via any of the ground stations will be forwarded to ESA's ESOC mission control center in Darmstadt, Germany. From there, they will be sent to ISRO's ISTRAC facility for analysis.

ESA's involvement in the mission has already begun. ISRO's flight dynamics team tested the software they will use to precisely determine the location and orbit of Aditya-L1 on ESA's Gaia observatory. ESA's flight dynamics experts then used their decades of experience flying spacecraft across the Solar System to validate this software by comparing ISRO's results to their own measurements.

Meanwhile, radio frequency compatibility tests important to ensure the hardware used by both agencies can work together took place in December 2021.

## **Guide me to the moon**

The support to Aditya-L1 was soon extended to ISRO's upcoming Chandrayaan-3—"moon craft"—mission to study the lunar surface at the moon's south pole.

The mission comprises a lander and rover, which will spend two weeks conducting scientific and technical operations on the surface.

Chandrayaan-3 would be India's first successful soft landing on another celestial body—a major milestone for any space program.

ESA's Kourou antenna and the Goonhilly station will be added to the NASA deep space stations supporting the mission and provide similar support to Chandrayaan-3 as they will to Aditya-L1.

The ESA station support for both Aditya L1 and Chandrayaan-3 begins with the critical launch and early orbit phase and continues to the end of both missions, if required by ISRO.

## **India and space**

ISRO was formed in 1969 and is headquartered in the city of Bengaluru. It operates a launch site and a deep space ground station located within India.

The Organization was among ESA's first international partners in the 1970's, with initial cooperation culminating in the provision of ESA instruments for ISRO's Chandrayaan-1 lunar orbiter [mission](#), launched in 2008.

Provided by European Space Agency

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