

Space Weather

Madam Chair and Distinguished delegates,

The Indian scientific community working in the domains of solar physics, heliophysics, ionosphere-thermosphere-magnetosphere integrate their wisdom to understand the science of Sun-Earth connection from the perspective of the space weather. Spread across the lower magnetic latitudes, space weather effects on the Indian region is characterized by several interesting ionospheric phenomena like equatorial plasma bubbles, plasma fountain, posing major concern in Space Weather research due to their substantial disruption of long-distance communication across various radio frequencies, including over-the-horizon and ground-to-satellite links. These, along with the motivation of understanding the physics of solar eruptions and events have motivated the inception of the Aditya-L1 solar observatory, which operates from the first Sun-earth Lagrange point.

Madam Chair,

Today, Aditya-L1 has been India's first dedicated space-based solar observatory that covers the studies of solar corona, photosphere and chromosphere, X-Ray flares both in soft and hard X-Ray, as well as the solar wind particles and the magnetic field associated. The observatory was inserted to the halo orbit around the first Sun-Earth Lagrange point on January 6, 2024. Since then, the spacecraft has completed more than two orbits.

On the first anniversary of the successful injection of the Aditya-L1 spacecraft to its designated halo orbit, on January 6, 2025, the maiden set of the scientific data from Aditya-L1 has been released by ISRO to the Indian Space Science Data Centre portal for the global scientific community.

Aditya-L1, building upon India's rich history in solar science, provides continuous solar observation, advancing research in heliophysics and the Sun-Earth connection. This mission is crucial milestone for developing India's own space weather prediction program in future.

Madam Chair,

Indian researchers, utilizing the Visible Emission Line Coronagraph (VELC) instrument aboard the Aditya-L1 mission, have observed a Coronal Mass Ejection (CME) accompanied by a solar flare on July 16, 2024. By analyzing the emission of "green light" (5303 Å) from highly ionized iron in the solar corona, the VELC provided crucial insights into the dynamics of this significant space weather event. The observatory has also captured the signatures of the solar eruptions during the severe geomagnetic storm during May 2024.

Madam Chair,

India's ground-based networks monitor crucial parameters like ionospheric conditions, magnetic fields, and radiation levels at various locations, complementing the Aditya-L1 mission. Real-time integration and analysis of this multi-sensor data have potential to enable a space weather forecasting programme in future. This collaborative approach invites participation from diverse fields, including AI/ML, engineering, and industry.

Madam Chair,

In the spirit of International Cooperation, on December 5, 2024, India has also launched the Proba-3 of ESA, comprising two spacecrafts viz. the Coronagraph Spacecraft (CSC) and the Occulter Spacecraft (OSC), enabling unprecedented observations of the Sun's faint corona near the solar limb.

India's endeavors for space and ground-based studies of the Sun, as well as the solar forcing on the Earth's Ionosphere-Thermosphere-magnetosphere region have significant importance to understand the space weather impacts in the lower and middle magnetic latitudes.

Thank you, Madam Chair and distinguished delegates.