U.S. NAVAL RESEARCH LABORATORY

LASCO on the Solar and Heliospheric Observatory

Large Angle and Spectrometric Coronagraph

AT A GLANCE

What is it?

Launched in 1995, the Large Angle and Spectrometric Coronagraph (LASCO) is a three-telescope instrument onboard the ESA/NASA Solar and Heliospheric Observatory (SOHO) satellite, which images the atmosphere around the Sun known as the solar corona to detect, monitor, and track solar eruptions and outflows.

How does it work?

LASCO images the solar corona over three nested fields of view from a half million miles to 14 million miles above the solar surface. The imaged light in the visible range is scattered off fast moving electrons that, with other charged particles, comprise the space environment. The Sun's dynamic corona is the source of space weather at Earth.

What will it accomplish?

LASCO real-time images are used by multiple research and operational groups to study the Sun's corona and provide forecasts of the near-Earth space environment. These forecasts provide warnings and arrival times for solar storms, which have the potential to disrupt satellite communications and other essential space-enabled technologies.

For more information

G.E. Brueckner, R.A. Howard, M.J. Koomen, et al., "The Large Angle Spectroscopic Coronagraph (LASCO)," *Solar Phys*. **162**, 357–402 (1995).

S.P. Plunkett, D.J. Michels, R.A. Howard, et al., "New Insights on the Onsets of Coronal Mass Ejections from SOHO," *Adv. Sp. Res.* **29**, 1473–1488 (2002).

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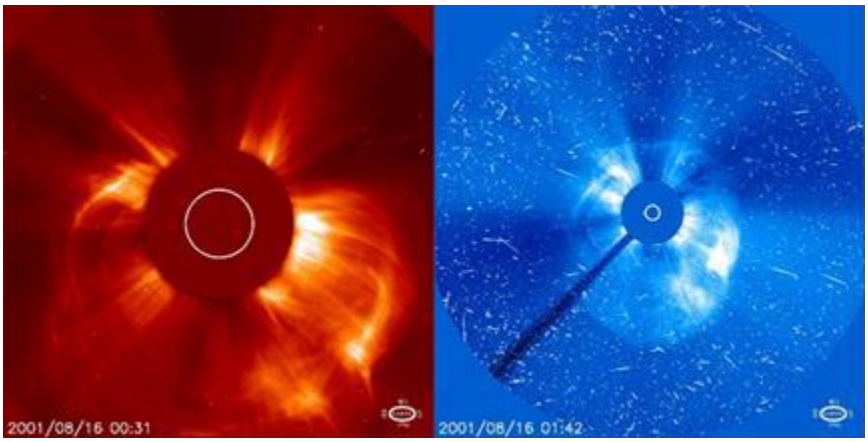

LASCO was launched Dec. 2, 1995; two of the three coronagraphs are currently operating. A coronagraph uses a set of solid disks to completely block direct sunlight, allowing us to see the relatively faint corona around the Sun. The solid circle in the center of the images is the occulter disk, and the white ring shows the size of the Sun. *Left-hand panel:* LASCO C2 image of a fast-moving coronal mass ejection (CME) headed toward Earth. *Right-hand panel:* The CME imaged an hour later with LASCO C3. CMEs can accelerate particles in the corona that appear as bright streaks or "snow" in the images. These highly energetic particles are a major hazard to spaceborne and ground systems.

Objectives

- Advance the understanding of the structure of the Sun's corona, the origin of coronal mass ejections (CMEs), and the dynamic coupling between CMEs and Earth.
- CMEs, the most energetic phenomena in the solar system, are major drivers of geomagnetic space weather storms that can adversely affect intelligence, surveillance, and reconnaissance; precision engagement, missile detection and intercept; communications on the move; spacecraft anomaly assessment; orbital tracking; polar flight; and the power grid.

Space Science Division Approach

- LASCO images the solar corona on a continuous duty cycle from the joint ESA/NASA Solar and Heliospheric Observatory (SOHO) satellite.
- Near real-time images and science data are made available online to other U.S. Government agencies and the general public for space weather forecasting and basic research of coronal processes and the solar plasma environment.

Payoffs

- The 25+ years of LASCO observations form the cornerstone of understanding the solar corona and its link with the near-Earth space environment
- LASCO real-time images have introduced the capability and demonstrated the need for space weather forecasting and solar storm warnings and arrival times.
- LASCO imaging has been used to validate the fundamental physical structures of the solar corona, contributing to physics-based modeling of this environment toward the goal of longer-term space weather forecasting.

LASCO was built by an international consortium of four institutions in four different countries with NRL SSD as the PI institution. It was integrated and tested at NRL's specialized coronagraph facility in NRL-DC Building A-13.