

Data Release Note  
The SOHO/LASCO CME Catalog  
Correction to Angular Parameters (2019–2024)

Release Date: March 31, 2026

## 1. Overview

This data release documents the correction of a systematic orientation bias affecting angular parameters in the SOHO/LASCO CME Catalog for events occurring between 1 August 2019 and 18 January 2024.

The issue affected angular measurements derived from LASCO MVI files and derived quantities that depend on propagation direction. It does not impact CME detection, speed, angular width, or acceleration.

## 2. Background

The CME catalog is compiled using calibrated LASCO MVI files produced by the Naval Research Laboratory (NRL) for the Solar and Heliospheric Observatory (SOHO) mission.

The LASCO instrument was originally aligned to solar north. On 29 October 2010, the spacecraft alignment was changed to ecliptic north. To maintain a consistent historical format, NRL rotates ecliptic-north-up images to solar-north-up orientation during MVI file production.

Beginning 1 August 2019, the rotation was applied with an incorrect sign convention. The issue was naturally resolved starting 19 January 2024.

## 3. Description of the Issue

The transformation between ecliptic and solar north depends on the solar B0 angle (the tilt of the solar rotation axis relative to the ecliptic). Reversing the sign of the rotation introduced an effective angular offset approximately equal to twice the B0 angle.

Since the B0 angle varies seasonally between approximately  $\pm 7.25$  degrees, the resulting systematic error in angular measurements reached magnitudes up to approximately  $\pm 14$  degrees, depending on the date.

#### **4. Affected Parameters**

The following catalog parameters were affected during the interval 1 August 2019 – 18 January 2024:

- Central Position Angle (CPA)
- Measured Position Angle (MPA)
- CME Mass
- CME Kinetic Energy

Mass measurements were affected because CME masses are estimated using FITS files and by integrating excess brightness within a defined CME angular sector. The incorrect angle resulted in an incorrect CME span being selected in the FITS images, leading to systematic errors in mass estimates.

Because kinetic energy is derived from mass and speed, kinetic energy values were also affected through the mass term. CME speeds themselves were not affected.

The following parameters were not affected:

- CME detection status
- First appearance time
- Angular width
- Height-time measurements
- Radial distances
- Linear speeds
- Accelerations

All radial and kinematic measurements remain unchanged.

#### **5. Correction Method**

A post-processing analytical correction has been applied to all affected events. For each CME in the affected interval, the angular parameters were corrected using the corresponding solar B0 angle at the event time.

Corrected Angle = Catalog Angle – 2 × B0

All corrected values were normalized to the standard 0°–360° range.

Mass and kinetic energy values are being recalculated using the corrected angular information.

A full reprocessing of the image archive was not required because the error was geometric in nature.

## **6. Scientific Impact**

This correction does not affect:

- CME occurrence rates
- Width statistics
- Speed distributions
- Acceleration statistics
- Extreme-event identification

It may introduce minor adjustments to:

- Latitude distribution analyses
- Deflection studies
- Mass and energy statistical studies
- Directional space weather assessments

## **7. Data Availability**

The corrected catalog replaces the previously released version for the affected time interval. Users who downloaded angular, mass, or kinetic energy data for events between 1 August 2019 and 18 January 2024 are advised to update their records.

For questions regarding this correction, please contact:  
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