

Statistical study of CMEs, lateral overexpansion and SEP events

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Introduction

We present a statistical study on the early evolution of coronal mass ejections (CMEs), to better understand the effect of CME (over)-expansion and how it relates to the production of Solar Energetic Particle (SEP) events.

We study the kinematic CME characteristics in terms of their radial and lateral expansion, from their early evolution in the Sun's atmosphere



Credit: NASA/TM2006-214137, NASA/SOHO

Dataset and Methodology



Dataset and Methodology



Results: Kinematics

Every panel includes the raw measurements and their respective smoothed curves.

Radial and Lateral expansion

Radial and Lateral Velocities

Radial and Lateral Accelerations

Aspect Ratio and Angular Width

Expansion rate of CME width

From here, we extract many key-variables to use for our final computations

Results: Kinematics

Few Samples of the kinematics curves:

Histograms:

Histograms:

Scatter Correlation Plots:

Conclusions

SEP events tend to have higher values in terms of velocity, acceleration and angular width. Widespread SEP events tend to have higher characteristic values among the total SEP events.

We find high correlations between the radial and lateral CME velocities and accelerations. CMEs which are associated tend to be located at the high value end of the distributions of velocities, widths and expansion rates compared to non-SEP associated events.

THANKYOU