Determination of the 3D Trajectory of Coronal Mass Ejections using Stereoscopy

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What is a CME?

- Coronal Mass Ejections
- Corona: Sun’s Atmosphere
- CME: Portion of Corona Blasted into the Solar Wind
- Velocity: 300~2000 km/s
- Consists of Electrons, Ions, Magnetic Field
Why Studying CMEs?

- Communications Systems Disruption
  Satellite, GPS, Cell phones etc
- Astronauts’ Radiation Exposure
- Electric Power Outage
Solution: SOHO?
Solution: STEREO
STEREO Field of View
Simulated STEREO Data

C2

H1

H2

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Approach

1. Automatic Tiepointing
2. Loop Tracing
3. 3D Reconstruction
4. CME Representative Point
5. Trajectory + Velocity Determination
Approach

- Automatic Tiepointing
- Loop Tracing
- 3D Reconstruction
- CME Representative Point
- Trajectory + Velocity Determination
Automatic Tiepointing

- Masking
- Skeletonizer
- Closing
- Slope Analyzer
Masking
Masking
Skeletonizer

Skeletonizer
Closing Algorithm
Closing Algorithm
Closing Algorithm
Closing Algorithm
Closing Algorithm
Closing Algorithm
Closing Algorithm
Horizontal Line
Slope Analyzer
Slope Analyzer
CME Representative Point

![Image of CME data analysis interface]

<table>
<thead>
<tr>
<th>Time (UT)</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Speed (km/s)</th>
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Plot: 3D Trajectory + Velocity

CME Linear Trajectory (C2, H1, H2)

CME Linear Velocity (C2, H1, H2)
Plot: Longitude vs. Latitude
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