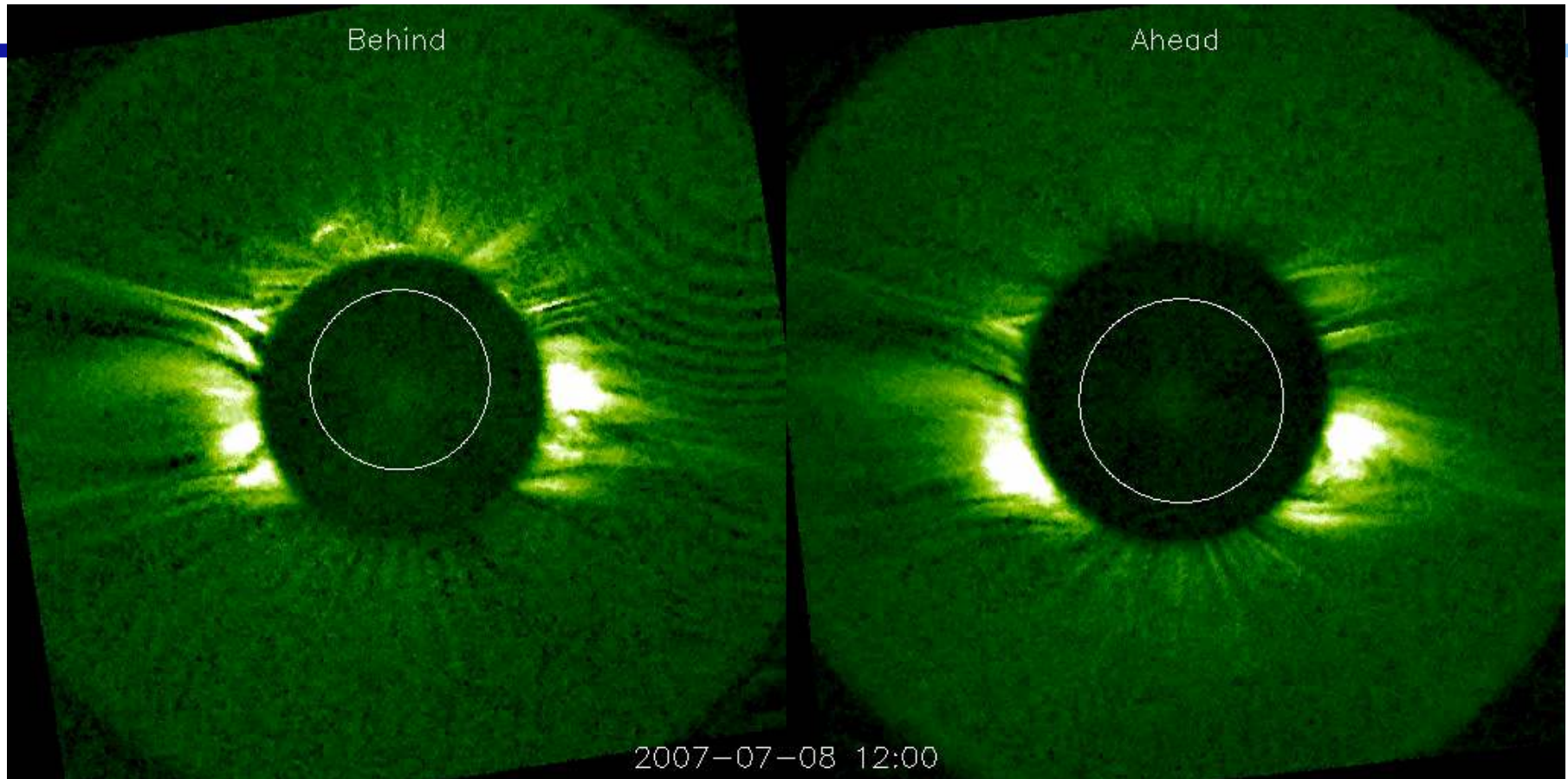


CME Accelerations in the Low Corona



O. C. St. Cyr
NASA-GSFC

J. T. Burkepile
HAO/NCAR

08-July-2007
Separation=17.4°

CME Accelerations: So What? Who Cares?

- To understand the magnitude of the forces acting on CMEs as they propagate through the corona
 - Escape speed from the photosphere is ~ 600 km/s, whereas the average CME speed is < 500 km/s(!)
- To understand the relationship between CMEs and other forms of solar activity. [Accurate CME Start Times!]
 - How are flares and CME's related? Both involve the eruption of a magnetic neutral line (but the spatial and temporal scales are different!)
- Study CME motions over a wide range of coronal and interplanetary scale heights

Observations of CME Accelerations

- **Not discussed here:**

- **X-ray: Yohkoh, Hinode, GOES SXI, RHESSI**

- **EUV/UV: SOHO UVCS *et al.***

- **Visible Spectroscopy: SOHO LASCO C1**

- **White-light Thomson-scattered corona:**

- **Skylab, P-78 Solwind, SMM C/P, Spartan**

- **STEREO CORs [Future!]**

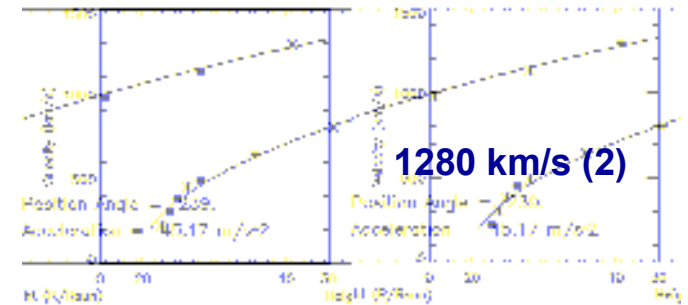
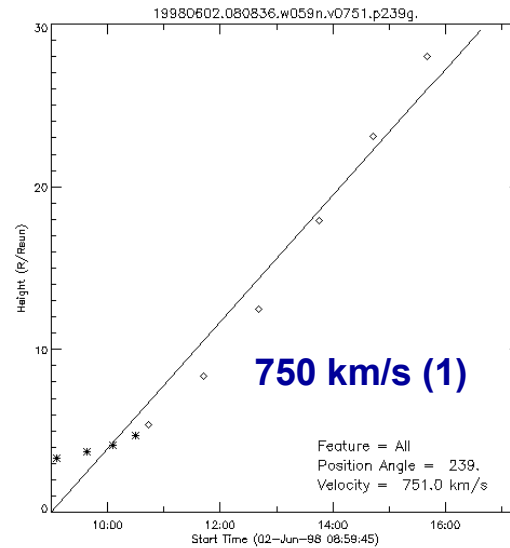
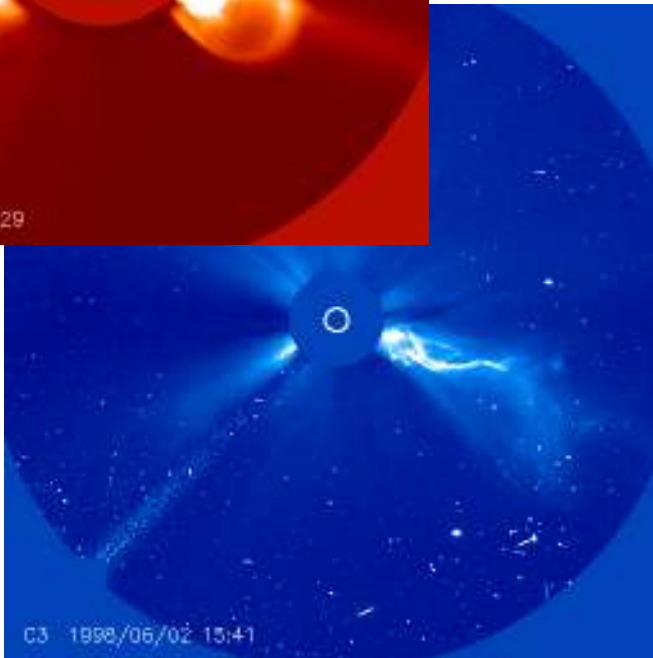
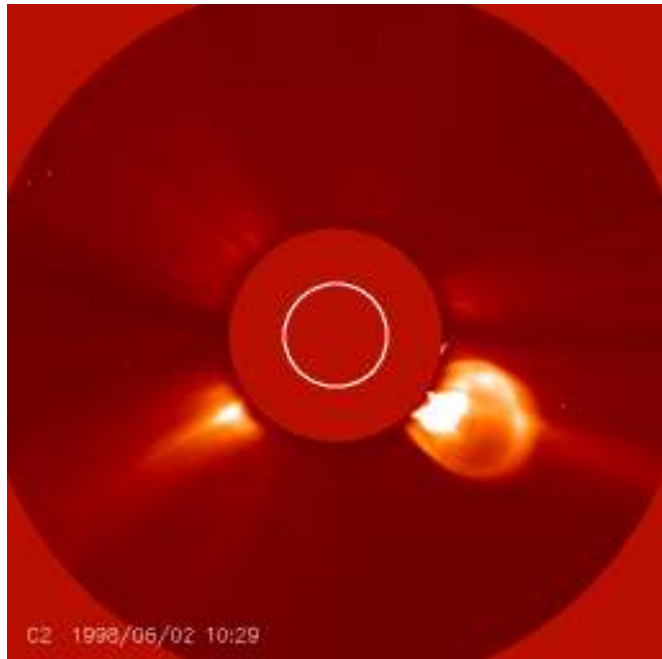
- **Wide field white-light imaging: SMEI and STEREO HI**

- **Results presented here come from observations of the white-light Thomson-scattered corona:**

- **MLSO MK3 and MK4 [low corona]**

- **SOHO LASCO C2 and C3 [outer corona]**

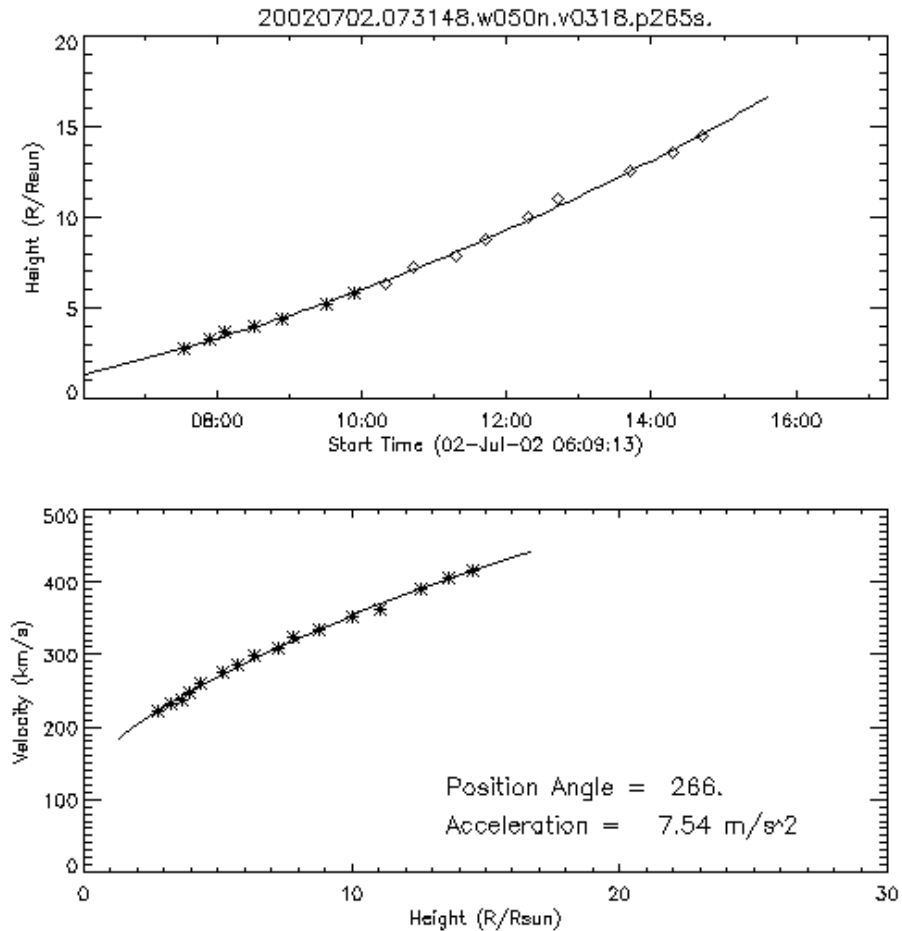
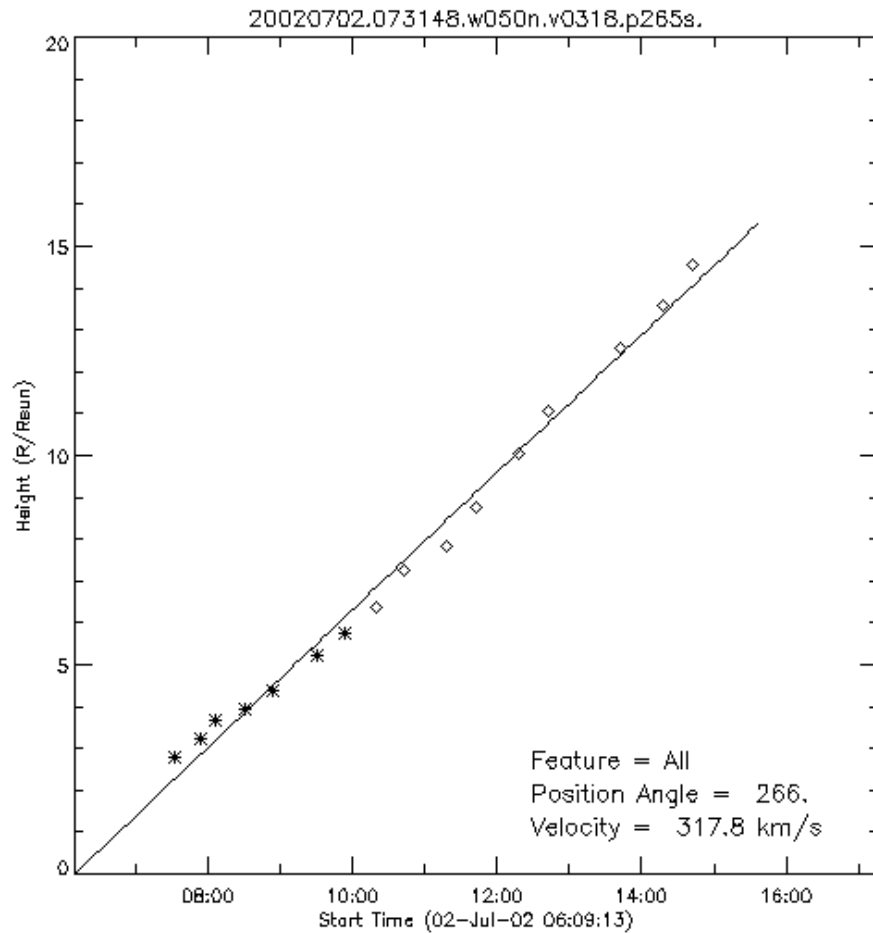
Measuring CME Speeds and Accelerations



SOHO LASCO 02-June-1998

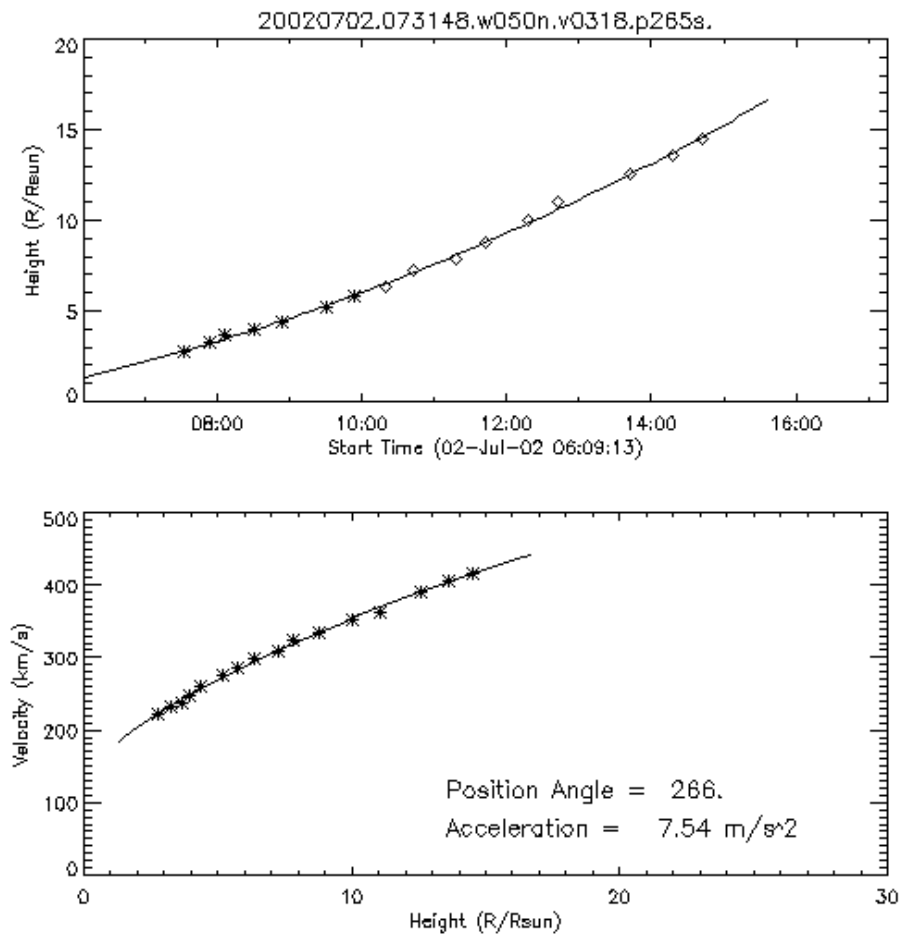
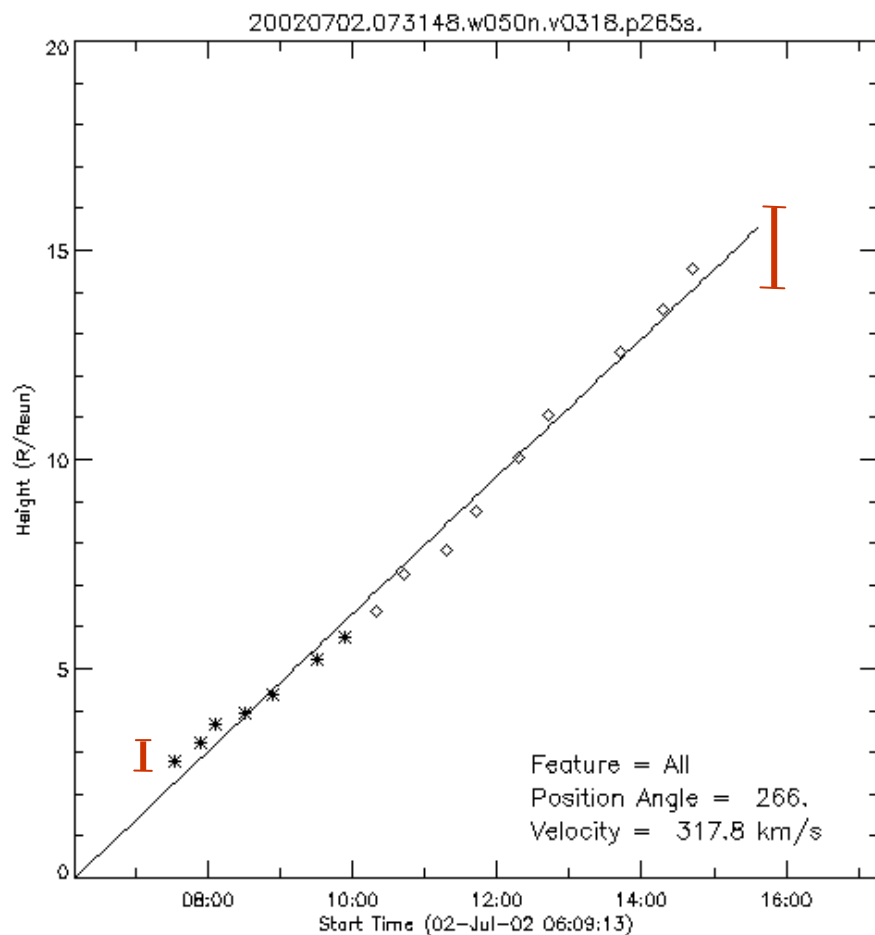
Courtesy S. Yashiro (<http://cdaw.gsfc.nasa.gov>)

Constant Speed or Acceleration?



Courtesy S. Yashiro (<http://cdaw.gsfc.nasa.gov>)

Constant Speed!



Courtesy S. Yashiro (<http://cdaw.gsfc.nasa.gov>)

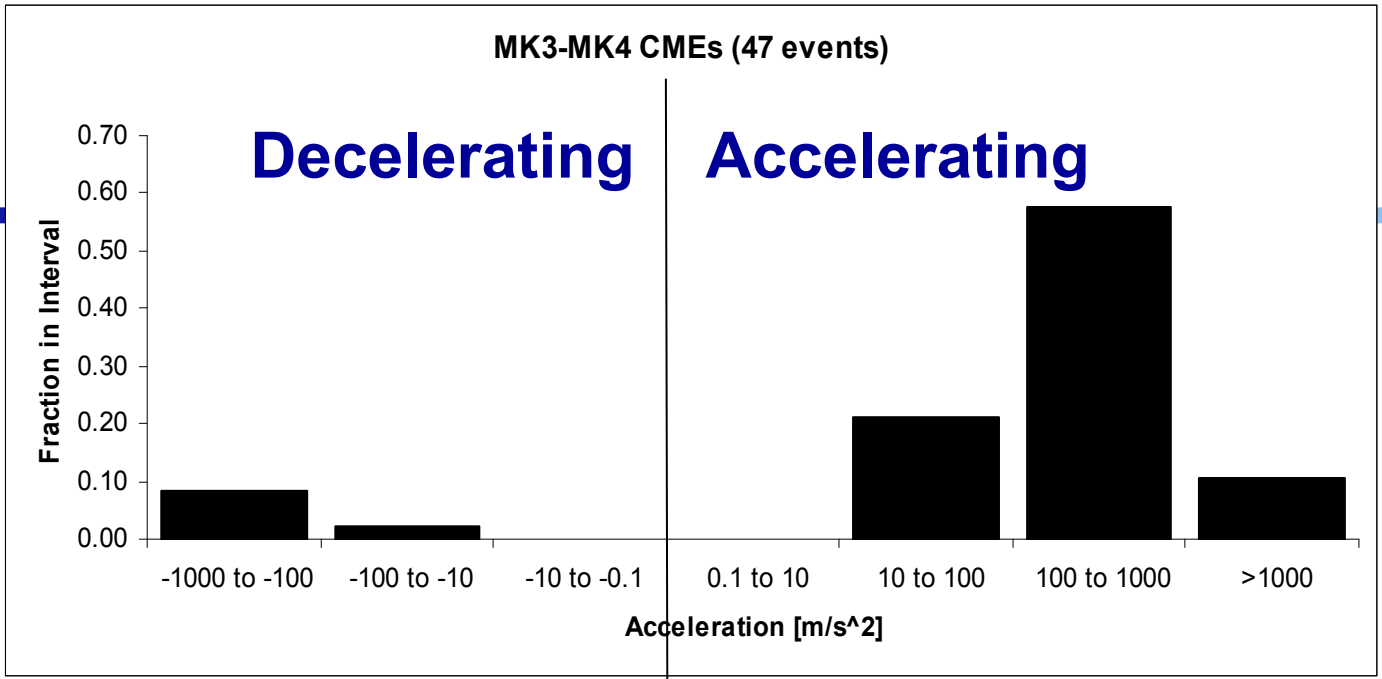
Measurements of CME Accelerations

- SMM C/P and SOHO LASCO

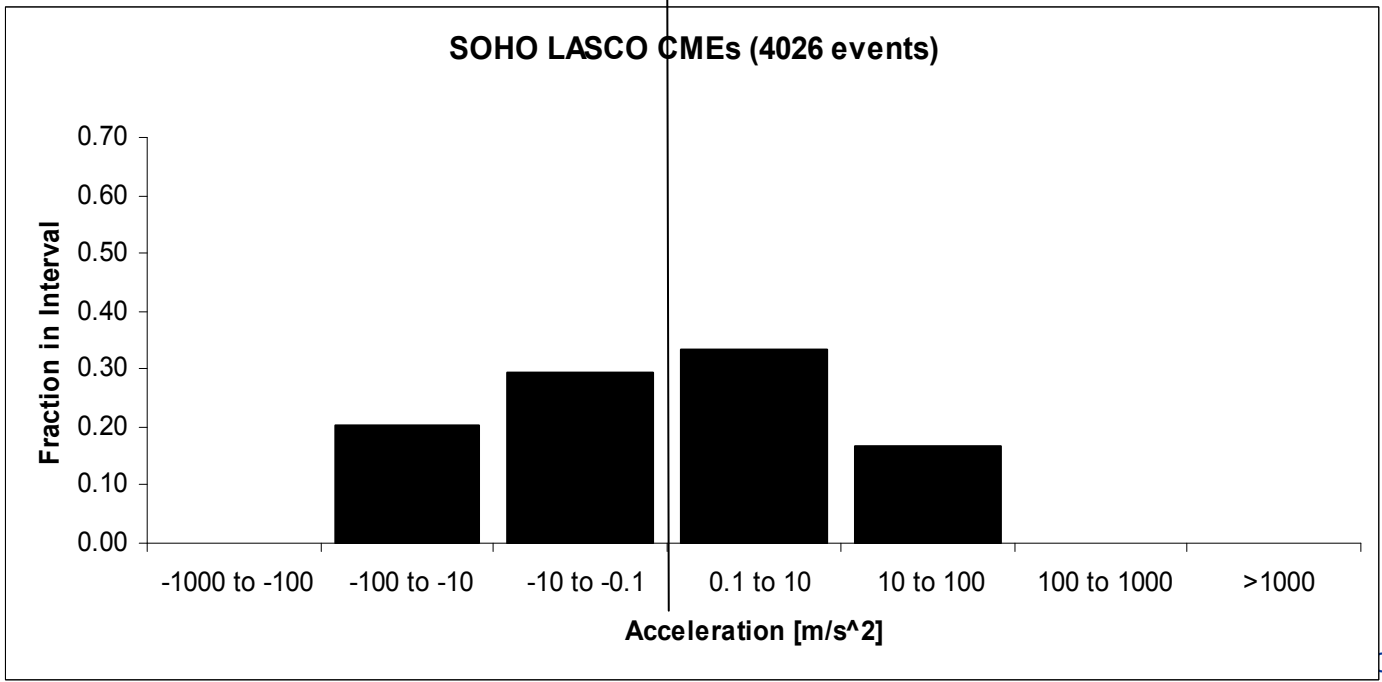
- ~80% can be fit by a linear function (constant speed)

- MLSO MK3 and MK4

- ~50% require a second order fit to h-t measurements

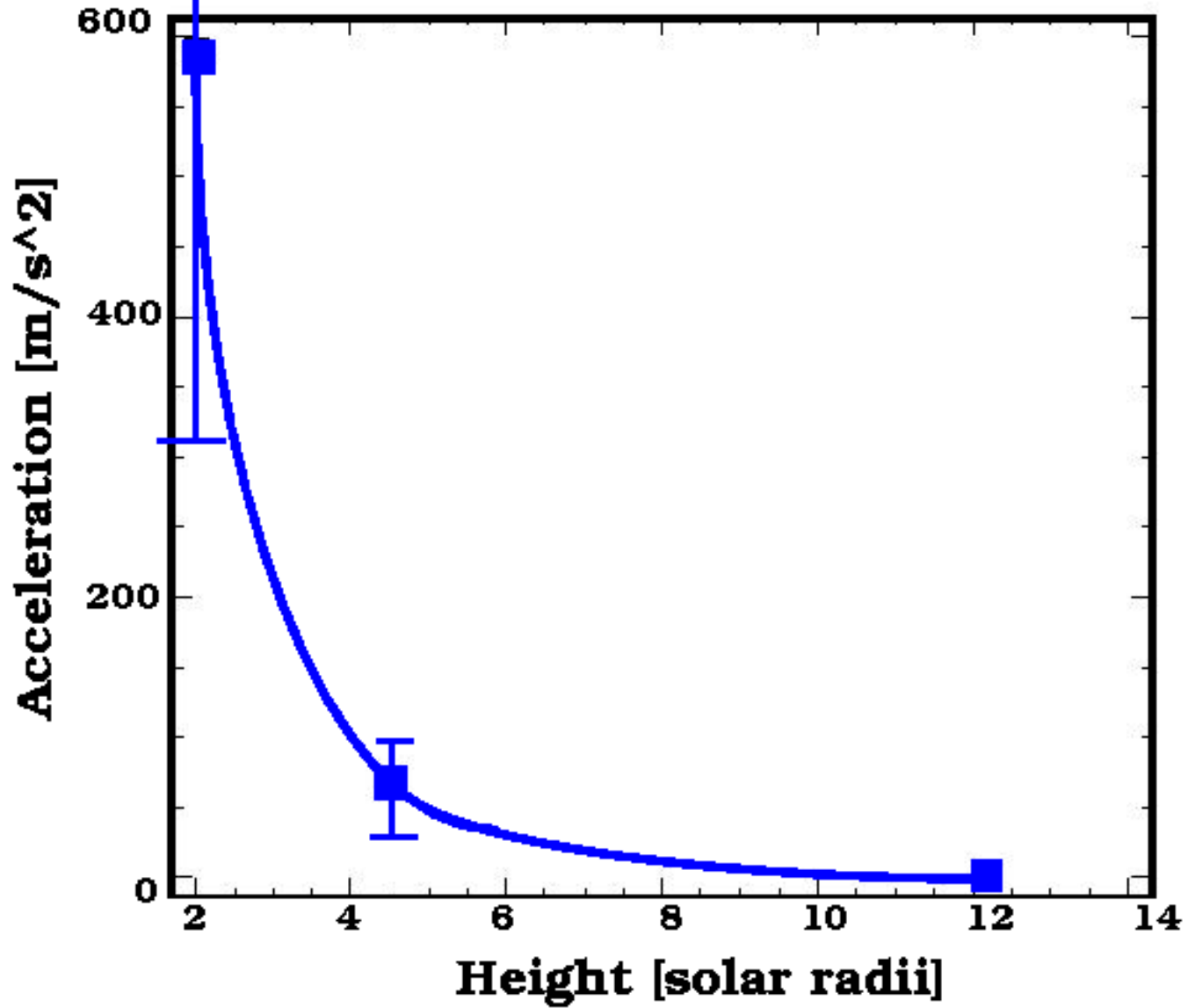


**Low
Corona
($<2.5 R_S$)**



**Outer Corona
($2-32 R_S$)**

CME Avg. Acceleration vs. Height



Decelerating Accelerating

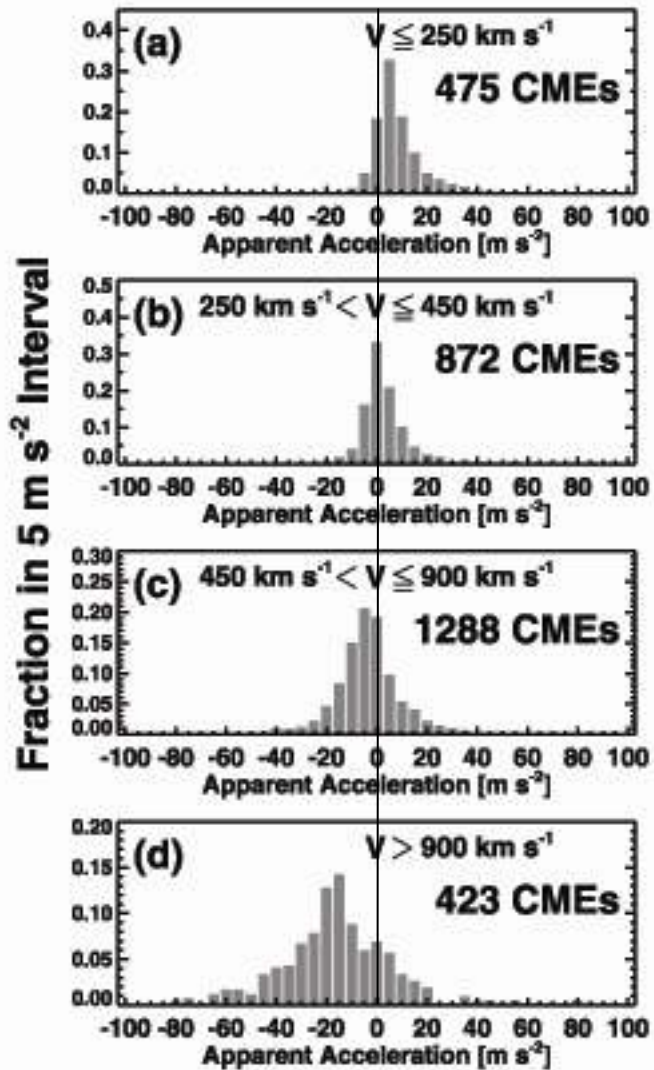
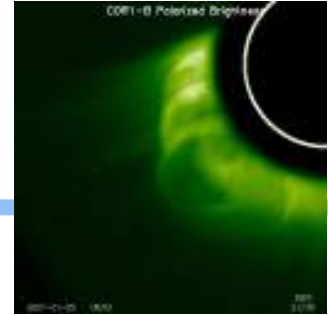


Figure 8. Acceleration distribution of the CMEs for various speed ranges. The fractions in 5 m s^{-2} interval are obtained by dividing the number of CMEs in each bin by the total number of CMEs.

3,058 LASCO CMEs
Yashiro *et al.*, 2003

Conclusions



- **Measurements of the initial phase of CME acceleration are important for understanding their origin and propagation**
- **CME acceleration greatest in low corona (Consistent with *St.Cyr et al. 1999, J. Zhang et al. 2001*)**
- **New observations from STEREO COR1 and MLSO MK4 will enable us to measure initial accelerations of CMEs**
- **New observations from SMEI and STEREO HI will allow us to measure CME deceleration far away from the Sun**

<http://cor1.gsfc.nasa.gov>



STEREO COR1

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WHAT'S NEW

PICTURE OF THE MOMENT



A STEREO EUMI and COR1 image overlay
These are available via the solar weather browser tool, downloadable from the Royal Observatory of Belgium in Brussels at: <http://sidc.oma.be/SWB/>
>> [View](#)

FEATURED MOVIE



A large CME off the northeast limb
A large CME off the northeast limb of the Sun detected on May 15, 2007, by both COR1-A and -B.
>> [View](#)

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Webmaster: Kevin Addison
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