Jason Byrne <jbyrne6@gmail.com>

HI and ACE

7 messages

Peter Gallagher <peter.gallagher@tcd.ie> **20 August 2009 05:22**
To: james mcateer <james.mcateer@tcd.ie>, Shane Maloney <shane.maloney98@gmail.com>, Jason Byrne <jbyrne6@gmail.com>

OK, yet another email about fitting!

hi_ace_log.tiff shows a const acceleration fit to the HI data and an approximate "height" of 215 R_sun for ACE and an arrival time of 16-Dec-2008 10:00 (on a log-log plot). Very rough I know, but have a look at how well a const (-ve) acceleration fit is. The residuals in the HI data are +/-0.5 R_sun.

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I think the important thing overall is that a small negative (very near zero) value for the acceleration at HI distance and beyond gets the ETA@ACE about right.

Peter.

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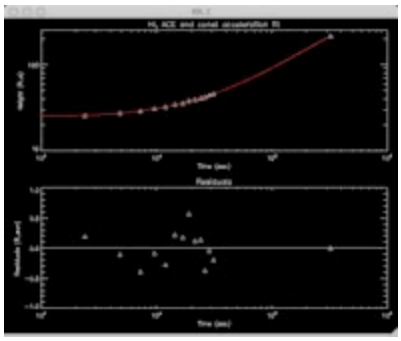
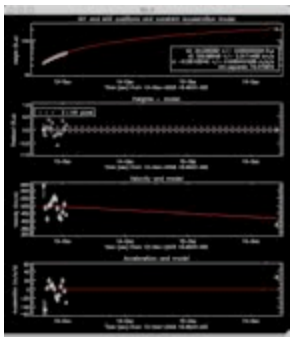
3 attachments



hi_ace_log.tiff
23K



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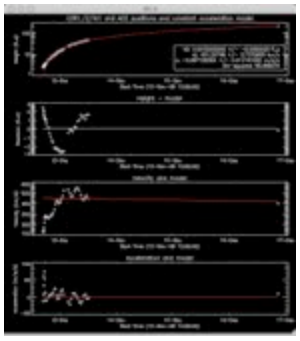

all.tiff
36K

Jason Byrne <jbyrne6@gmail.com> **20 August 2009 18:07**
To: Peter Gallagher <peter.gallagher@tcd.ie>
Cc: james mcateer <james.mcateer@tcd.ie>, Shane Maloney <shane.maloney98@gmail.com>

Ok, so I'm thinking here's a possible picture to paint:

Given the height-time curve from our 3D reconstruction we can model the speed of the CME (after the initial acceleration phase) by an appropriate drag equation which shows the velocity of the CME tends toward the solar wind velocity as provided by the Sheeley Model in this range (>500km/s from 10-50 Rsun).
Subsequent propagation of the CME with the ENLIL Cone Model shows that it may in fact catch up to a slow solar wind stream which causes a further slowing of the CME at distances >50 Rsun as it continues towards Earth.
Finally, given the ACE in-situ data of the solar wind parameters over the expected arrival window of the CME (15-16th Dec) we see the slow solar wind could actually be as low as 312km/s which means the CME would not arrive until around ~08:00 UT on the 16 Dec in agreement with Davis et al.

Just trying to incorporate all the evidence to a final description in conveying how the CME propagates to Earth, and I'm starting to convince myself of it!

Jason.

2009/8/20 Peter Gallagher <peter.gallagher@tcd.ie>
[Quoted text hidden]

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Mob: +353-(0)87-6325173
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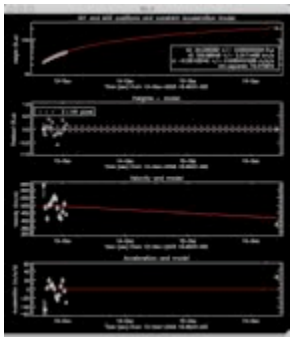
3 attachments



hi_ace.tiff
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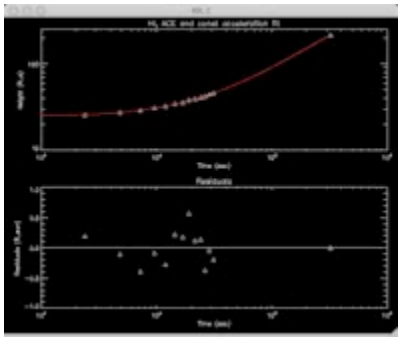

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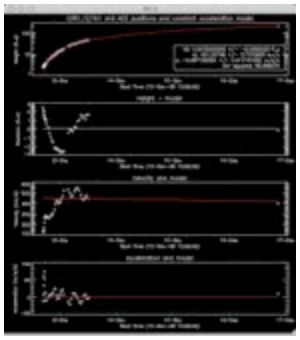

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36K

Peter Gallagher <peter.gallagher@tcd.ie> **20 August 2009 19:43**
To: Jason Byrne <jbyrne6@gmail.com>
Cc: james mcateer <james.mcateer@tcd.ie>, Shane Maloney <shane.maloney98@gmail.com>

... I'd agree with that all right. Taken me a while to get my head around it as well.

PG

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On 20 Aug 2009, at 12:07, Jason Byrne wrote:

> Ok, so I'm thinking here's a possible picture to paint:
>
> Given the height-time curve from our 3D reconstruction we can model the speed of the CME (after the initial acceleration phase) by an appropriate drag equation which shows the velocity of the CME tends toward the solar wind velocity as provided by the Sheeley Model in this range (>500km/s from 10-50 Rsun).
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> Just trying to incorporate all the evidence to a final description in conveying how the CME propagates to Earth, and I'm starting to convince myself of it!
>
> Jason.

2009/8/20 Peter Gallagher <peter.gallagher@tcd.ie>

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Peter Gallagher <peter.gallagher@tcd.ie> **20 August 2009 19:47**
To: Jason Byrne <jbyrne6@gmail.com>
Cc: james mcateer <james.mcateer@tcd.ie>, Shane Maloney <shane.maloney98@gmail.com>

> Finally, given the ACE in-situ data of the solar wind parameters over the expected arrival window of the CME (15-16th Dec) we see the slow solar wind could actually be as low as 312km/s which means the CME would not arrive until around ~08:00 UT on the 16 Dec in agreement with Davis et al.

I like this idea that the CME catches up with the slow-speed stream and is therefore slowed by it in the final portion of its trajectory.

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> Jason.
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> 2009/8/20 Peter Gallagher <peter.gallagher@tcd.ie>
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---<hi_ace_log.tiff><hi_ace.tiff><all.tiff>

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Shane Maloney <shane.maloney98@gmail.com> **21 August 2009 16:55**
To: Peter Gallagher <peter.gallagher@tcd.ie>
Cc: Jason Byrne <jbyrne6@gmail.com>, james mcateer <james.mcateer@tcd.ie>

Yea I think this is the most coherent picture and explains that velocity data and the arrival time nicely.

Initial acceleration (Lorentz) -> Acceleration (Drag due to high speed SW) -> Deceleration (Slow speed stream ahead)

Before the ENIL we had no way of knowing what was ahead of CME no we can explain it nicely but . . . .

The ENIL runs are only taking a day so can do a few, the only problem I have is that there seems to be no way
to get a height-time plot from the ENIL, I even email the CCMC to as them to no avail. Ill keep on trying but may
end up being used as corroboration rather that a nice height-time plot.

Shane
[Quoted text hidden]

R. T. James McAteer <james.mcateer@tcd.ie> **21 August 2009 18:16**
To: Shane Maloney <shane.maloney98@gmail.com>
Cc: Peter Gallagher <peter.gallagher@tcd.ie>, Jason Byrne <jbyrne6@gmail.com>

Agreed. Good detective work. Seems like we have a coherent picture now, so we can make progress on the final paragraph.

I plan to work on the mass problem on ties.

James.mcateer@tcd.ie
Sent from my iPod
[Quoted text hidden]

Jason Byrne <jbyrne6@gmail.com> **24 August 2009 17:47**
To: "R. T. James McAteer" <james.mcateer@tcd.ie>
Cc: Shane Maloney <shane.maloney98@gmail.com>, Peter Gallagher <peter.gallagher@tcd.ie>

Hi,

The Davis paper is indeed published: http://adsabs.harvard.edu/abs/2009GeoRL..3608102D

This means we can comment on their lower HI1 speeds compared to our reconstruction, and use their observed HI2 speeds to reinforce our postulate that the CME is slowed and thus reaches ACE at the time they suggest (~08:00UT 16-Dec-08).

Jason.

2009/8/21 R. T. James McAteer <james.mcateer@tcd.ie>
[Quoted text hidden]

[Quoted text hidden]

Davis_etal_12Dec08CME_GeoLett_2009.pdf
451K
