



RAL Space Workshop: CME–CME Interaction

Interaction of successive coronal mass ejections and associated particle acceleration

Organizers: Noé Lugaz, Jackie Davies, Richard Harrison

Abstract

With the help of RAL Space, we will hold a small workshop to study the interaction of successive coronal mass ejections (CMEs) in the inner heliosphere, from the Sun to the Earth, and to investigate the associated particle acceleration processes. Our goal is to advance our current understanding of these complex phenomena. In particular, our effort will focus on the following science questions:

- (i) How common/frequent is CME-CME interaction between the Sun and the Earth?
- (ii) How do successive CMEs reconnect, contract and deflect as they interact?
- (iii) Are successive CMEs more efficient in accelerating particles; and if so, why?
- (iv) What happens to shock waves when they “hit” preceding eruptions or shock waves?
- (v) How may the interaction of successive CMEs enhance their geo-effective potential?
- (vi) Can CME-CME interactions result in accelerations beyond perfectly elastic or decelerations below inelastic?
- (vii) How does all of this vary with delay/distance/history of interaction?
- (viii) How does CME-CME interaction “look” in different type of observations (remote-sensing, energetic particle, bulk plasma properties)?

Dates and Venues

The workshop will take place in the Lincoln college in Oxford, UK (<http://www.linc.ox.ac.uk/>) in the week of 2014 March 17–21. We will start Monday afternoon and finish on Friday lunch time. Lunch and coffee/tea will be provided to everyone and breakfast, dinner and accommodation for the non-local participants, covering from Monday to Thursday, inclusive. If your plans are different from what’s written here (4 nights accommodation), please email me, Jackie Davies and Caroline Callard.

Participants

The following researchers will attend (L: local)

- 1- Mario Bisi (RAL Space, UK), **L**
- 2- Sergio Dasso (U. Buenos Aires, Argentina)
- 3- Jackie A. Davies (RAL Space, UK), **L**
- 4- Pascal Démoulin (Obs. Paris-Meudon, France)
- 5- Charles J. Farrugia (U. New Hampshire, USA)
- 6- Adriana Gulisano (IAFE, Argentina)
- 7- Mike Hapgood (RAL Space, UK), **L**
- 8- Richard Harrison (RAL Space, UK), **L**
- 9- Tim Howard (SwRI, USA)
- 10- Benoit Lavraud (IRAP, France)
- 11- Gang Li (U. Alabama- Huntsville, USA)
- 12- Noé Lugaz (U. New Hampshire, USA)
- 13- Olga Malandraki (Nat. Observatory of Athens, Greece)
- 14- Huw Morgan (Aberystwyth, Wales)
- 15- Matt Owens (Reading, UK), **L**
- 16- Athanasios Papaioannou (IAASARS, National Observatory of Athens, Greece)
- 17- Alexis Rouillard (IRAP, France)
- 18- Fang Shen (KLSW, China)
- 19- Manuela Temmer (Graz U., Austria)
- 20- Rami Vainio (U. Helsinki, Finland)
- 21- Bojan Vršnak (Hvar Obs., Croatia)
- 22- Yuming Wang (USTC, China)
- 23- Francesco Zuccarello (KU Leuven, Belgium)
- 24- Nathalia Alzate (Aberystwyth, UK)
- 25- Rahul Sharma (University of Sheffield, UK)
- 26- Wageesh Mishra (Udaipur, India)
- 27- Simon Good (Imperial College, UK)
- 28- Bob Forsyth (Imperial College, UK)

Schedule, etc.

The meeting will start with a few discussion-setting review talks on the different aspects of CME-CME interaction. The topics to be covered are: remote-sensing observations; in-situ measurements and geo-effectiveness; solar energetic particles and simulations.

We will also focus on 4 time periods for specific events:

- 2011 February 13-15
- 2011 August 2-9
- 2012 March 4-5
- 2012 Sep. 27-29

Some basic info can be found on the ISEST wiki at http://solar.gmu.edu/heliophysics/index.php/The_ISEST_Event_List.

Tentatively, we have a morning off on Wednesday with a start in mid-afternoon on Wednesday and a conference dinner the same evening. We could change this to have Wednesday afternoon off (and a conference dinner still planned for that evening).

Monday

13:30–14:00: Welcome – Introductions

14:00–14:10: Logistics

14:10–14:30: Scientific introduction to the workshop (Lugaz)

14:30–15:00: Introduction to remote-sensing observations of CMEs, current and future perspective (Harrison)

15:00–15:45: Review of remote-sensing observations of CMEs (Temmer)

15:45–16:30: Break

16:30–16:45: Recent events (Huw, Alzate, others?)

16:45–17:30: Review SEPs (Vainio)

17:30–17:45: Additional SEP topics (Li, Malandraki, Sandroos)

Tuesday

09:00–09:45: Review in-situ observations of CME-CME interaction (Gulisano)

09:45–10:30: Review simulations (Lugaz, Shen, Zuccarello)

10:30–11:00: Break

11:00–11:20: TBD 11:20–12:05: Review geo-effectiveness (Wang)

12:05–12:20: Some interesting features related to geo-effectiveness (Farrugia)

12:30–14:00: Lunch

14:00–15:45: Discussion of February 2011 events (Chair Vrsnak)

15:45–16:30: Break

16:30–18:00: Discussion of March 2012 events (Chair Lugaz)

Wednesday

Morning: off.

14:00–15:45: Discussion of March 2012 and September 2012 events (Chair Rouillard)

15:45–16:30: Break

16:30–18:00: Plans for L5 mission (Lavraud)

Evening: conference dinner.

Thursday

09:00–10:30: Changes in direction, velocity and energy during interaction (Chair Wang)

11:00–12:30: Changes in properties at 1 AU, arrival time and geo-effectiveness (Chair Dasso)

14:00–15:45: Effect of CME-CME interaction on particle acceleration (Chair Li)

16:30–18:00: Effect of CME-CME interaction on particle transport (Chair Malandraki)

Friday

09:00–10:30: Wrapping up of the discussion, what did we learn?

11:00–12:30: Future publication plans, future collaborations and proposals

12:30 End of workshop.

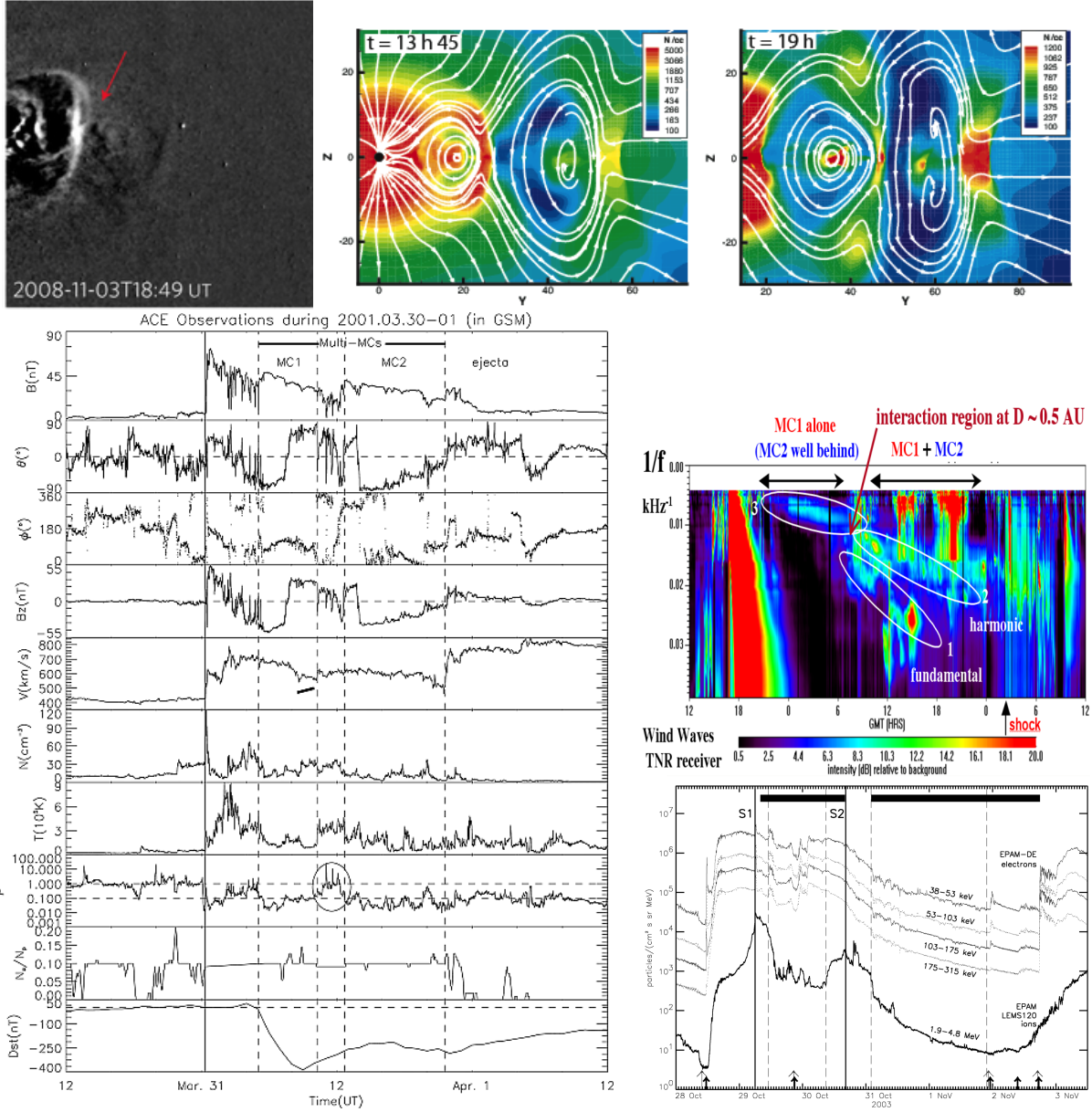


Figure 1: Different manifestations or studies of CME-CME interaction. From top left, clockwise: HI observations (C. Shen *et al.*, 2012), MHD simulation (Lugaz *et al.*, 2005) radio measurements (Dasso *et al.*, 2009), SEP measurements (Malandraki *et al.*, 2005) and *in situ* measurements (Wang *et al.*, 2003).