

Working Group 4 on Campaign Events: Summary & Future Plans

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WG 4 Goals

- Integrate observations, theory and simulations to understand chain of cause-effect dynamics from Sun to Earth/1 AU for carefully selected events.
- Develop/improve the prediction capability for these transients' arrival and their potential impacts at Earth.
- Textbook cases are provided for the community, but a focus is on less well understood events, such as stealth & problem CMEs.
 - WG 4 wiki: http://solar.gmu.edu/heliophysics/index.php/Working_Group_4
- **Textbook** cases: Complete chain of a well-observed event from solar source, through IP propagation, to geoeffects.
- Not Textbook but **Understood** cases: Something is missing in the chain of a well-observed event but, *in retrospect*, we understand why.
- **Problem** cases: The chain is not complete and we do *not* understand why.
 - *ICME and storm but source is faint or missing (a “stealth” CME) or multiple sources*
OR
 - *Source is expected to be geoeffective but is not.*

ISEST / MiniMax WG 4 Event List

Dates	Source	Geo-response*	Dst	Type
<i>VarSITI-wide Campaign Study Events</i>				
1) 2012 July 12-14	X1 flare, fast CME	Shock, MC, Strong storm	-127	TB
2) 2012 Oct. 4-8	Strong CME, but multiple weak surface signatures, slow propagation to Earth	Medium storm	-105	P
3) 2013 March 15-17	M1 fl, EP, IV, fast halo	Shk, MC?, SEP, Strong stm	-132	TB
4) 2013 June 1	Slow CME on 27 May? CH influence? Cause of Strong stm unclear; CIR?		-119	P
5) 2015 March 15-17	C9;C2 fl, EP, fast CME	Shock, sheath, MC, "Super" storm	-223	P/U?
6) 2015 June 22-24	2 M-fl, fast halo CMEs	Shock, sheath, MC, SEP "Super" storm	-204	
<i>Other ISEST/MiniMax Study Events</i>				
7) 2012 March 7-9	X5 fl, wave, fast CME	Shock, MC, Strong storm	-131	TB
8) 2012 July 23-24	2 fls, EPs	Extreme ST-A event; "Strong storm"	Carr.-type	TB?
9) 2014 Jan. 6	CME <2000 km/s, over WL.	GLE at Earth	No	P/U
10) 2014 Jan. 7-9	X1 fl, wave, fast asym halo	Shock, SEP. No storm- CH deflection; AR channeling?	No	P/U
11) 2014 Sep. 10-13	X2 fl, wave, sym halo. Evolution of source AR also of interest.	Shock, MC, Mod. storm	-75	P/U

Type: **TB** = Textbook; **U** = Understand chain; **P** = Problem

xx) Events featured in this talk

➤ **Wed.: WG 4 Talks:**

T. Nieves-Chinchila (*Invited – given by N. Savani*) → Topologies of CME Flux Ropes

N. Srivastava → COMESEP forecasts

R. Montes → Ionospheric (TEC) effects

Y. Wang → IP deflection of CMEs (March 2015 event)

➤ **Discussion**

- Why do forecasts fail and how can we improve them?
 - Which/whose forecasts should we use for comparisons of event “predictions?”
 - Solar-heliospheric forecast models; eg, NOAA SWPC, UK Met, COMESEP, Affects, CCMC, 3DMHD, UCSD – Cone/WSA/Enlil –
 - Models that try to incorporate magnetic fields such as UMICH, SUSANOO
- Analyze the complications that arise when linking CMEs to ICMEs:
 - ~20% of important geostorms have CMEs-ICMEs but no *compelling* signatures in low corona or at Sun’s surface.
 - 10% are due to CIR-HSSs.
- Study combinations of shocks, including within CMEs, sheaths and multistep storms
- Sheath studies: needs attention

- Use of other data: eg, NMs or Cherenkov water like HAWC, IPS, STA, e-, waves ahead of shocks (SOHO; Posner, etc.)

- Flux Rope fitting: intercompare models for events;

Marubashi correlations with source orientation and polarity (tilt); PIL or arcade?

Double ARs; Trans. Eq. Loops/footpoints

Possible Interactions with Other Groups

Event	Storm	WG2, 3, 5	SPeCIMEN Magnetosp	ROSMIC Ionosp	SEE/WG6 Climate/SEPs
<u>VarSITI Events</u>					
1) 2012 July12	Strong	X	X		
2) 2012 Oct.4-8	Mod	X	X		
3) 2013 March 15	Strong	X-3	X		SEP
4) 2013 June1	Strong			X	
5) 2015 March 15	Super	X-3	X	X	2-step, CIR, deflection
6) 2015 June 22	Super	X-3	X	X	SEP 2-step, FD, hi dens.
<u>Other ISEST Events</u>					
7) 2012 March 7	Strong	X	X		
8) 2012 July 23	“Strong“	X	----	----	SEP
9) 2014 Jan. 6	None	?			GLE
10) 2014 Jan. 7	None	X			SEP
11) 2014 Sep. 10	Mod.	X	X		FD

Future Plans

- **Continue discussion/analysis of events and interpretations:**
 - **Add comments, data, simulations, etc. to wiki event page (or WG 4 page)**
 - **Keep references up to date**
 - **May add (or subtract) events**
- **Write papers on analyses:**
 - **Solar Physics Special ISEST Issue – Good chance for WG 4 members to submit papers on results on analysis of individual events, like March 2015, event groups/topics, interactions among other WG4 WGs and/or VarSITI groups**
- **Attend next ISEST session with VarSITI Workshop in Bulgaria in June.**
Also ISEST sessions at COSPAR in Istanbul in August.