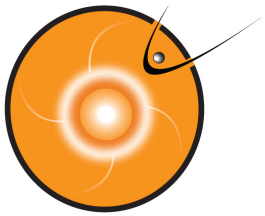


Metrics computations: Magnetopause crossings

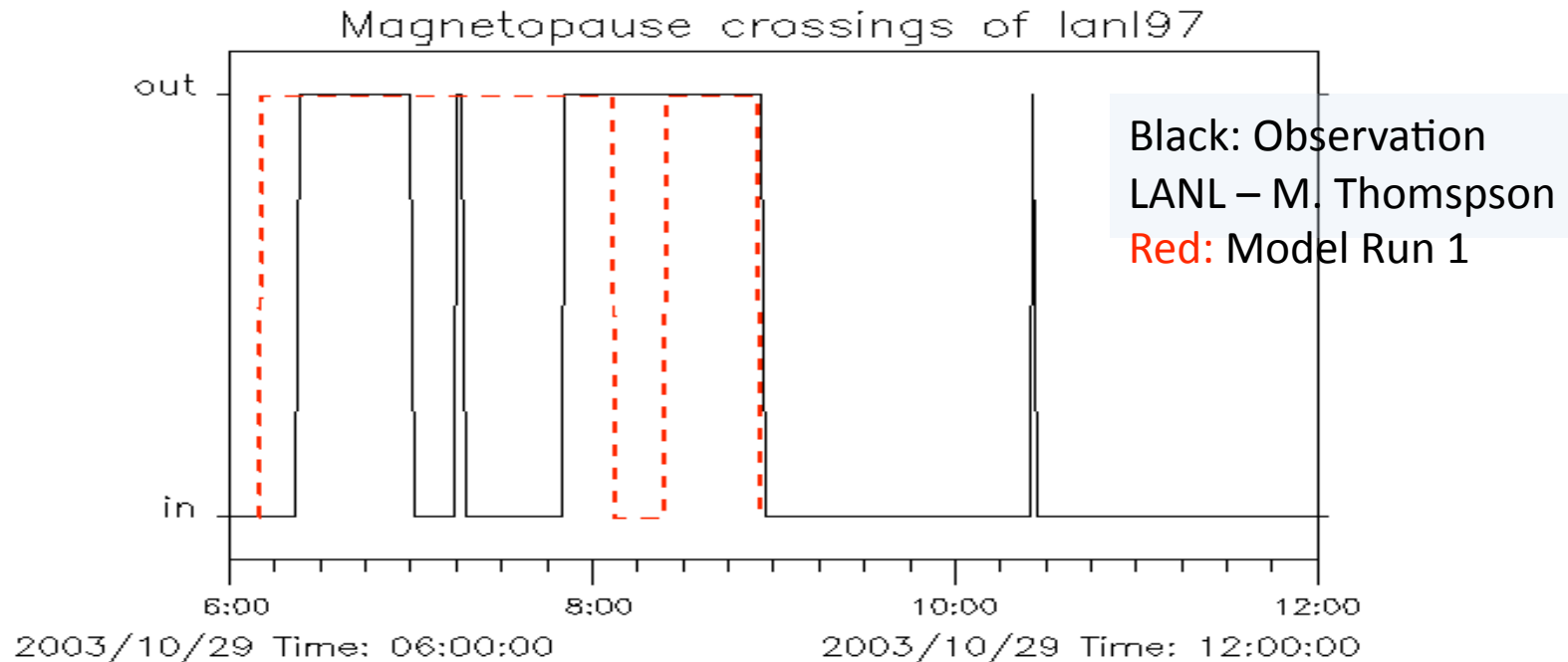
- **Event:** outside of magnetopause:
 - $B_z < 0$ for GOES magnetic field
 - Magnetosheath plasma encountered by LANL
- Test satellite position in model data every minute.
- Create matching 1-minute samples of periods inside and outside of magnetopause.
- Use contingency table (for Event/No Event data):

Forecast \ Observ.	Yes	No
Yes	Hit (N_H)	False ($N_{\bar{H}}$)
No	Miss	Null



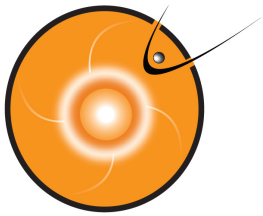
Magnetopause crossings

Graphical comparison



Time period of multiple magnetopause crossings seen by LANL97 within first 6 hours of event simulation.

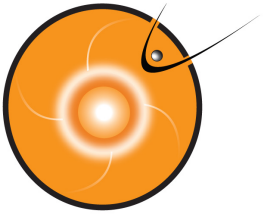
BATSRUS model runs underestimate magnetopause crossings.



Magnetopause Crossings

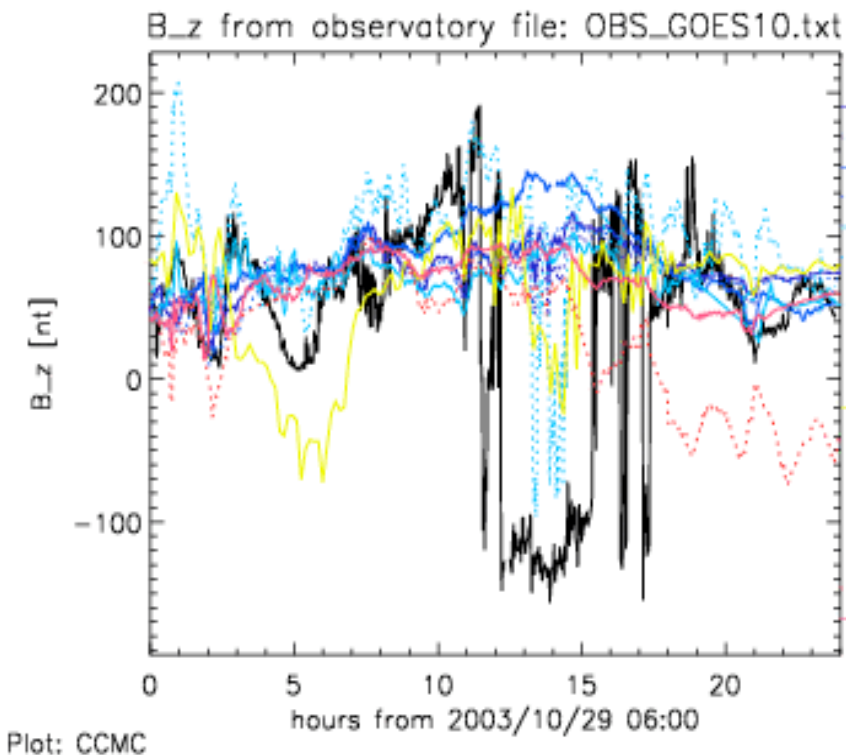
- 1-minute samples will yield a lot of misses and false positive predictions.
- **Suggestion:** Coarse-grain into forecast windows of 15, 30, or 45 minutes with at least once “outside of magnetosphere” as an event.
- Utility: $U_f = BN_H - CN_{\overline{H}}$ Best if large and > 0
- Forecast Ratio: $R_f = N_H / N_{\overline{H}}$ Best if infinity

Need estimates for “Benefit” B and “Cost” C

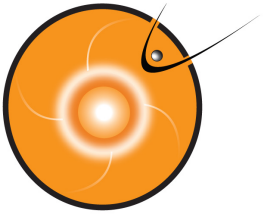


Event 1 - event-based metrics analysis

- N_H and $N_{\bar{H}}$ can be calculated from GOES data.
- Example: Window size of 30 minutes in 24-hour data.

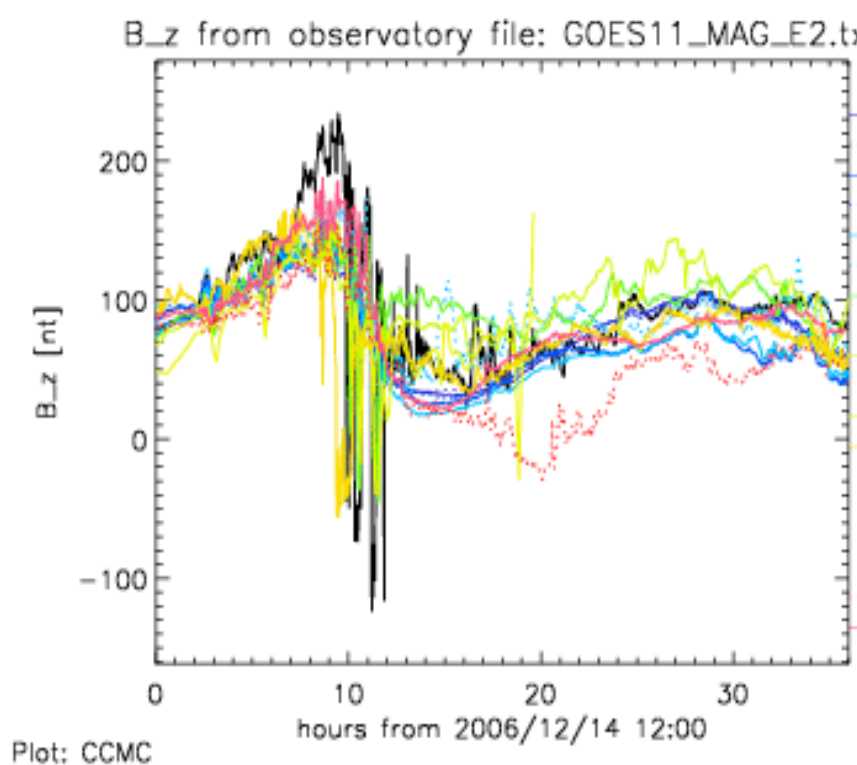


Model Run	Bz<0	Bz>0	N_H	$N_{\bar{H}}$	R_f
1_SWMF	13	32	0	0	-NaN
2_SWMF	13	32	0	0	-NaN
3_SWMF	13	32	0	0	-NaN
4_SWMF	13	32	0	0	-NaN
5_SWMF	13	32	0	0	-NaN
6_SWMF	13	32	5	0	Infinity
3_OPENGGCM	13	32	3	7	0.429
1_T96	13	32	4	14	0.286
1_T04	13	32	0	0	-NaN



Event 2 – event-based metrics

Few crossings observed by GOES11 and GOES12
 None was observed by the models for GOES11.



Variable:	GOES11_MAG_E2.txt				
Model Run	Bz<0	Bz>0	N_H	N_Hbar	R_f
1_SWMF	5	64	0	0	-NaN
2_SWMF	5	64	0	0	-NaN
3_SWMF	5	64	0	0	-NaN
4_SWMF	5	64	0	0	-NaN
5_SWMF	5	64	0	0	-NaN
6_SWMF	5	64	0	0	-NaN
1_OPENGGCM	5	64	4	0	Infinity
2_OPENGGCM	5	64	0	0	-NaN
3_OPENGGCM	5	64	4	2	2.000
1_LFM	5	64	2	2	1.000
1_T96	5	64	0	10	0.000
1_T04	5	64	0	0	-NaN