RAM-SCB Dst Validation

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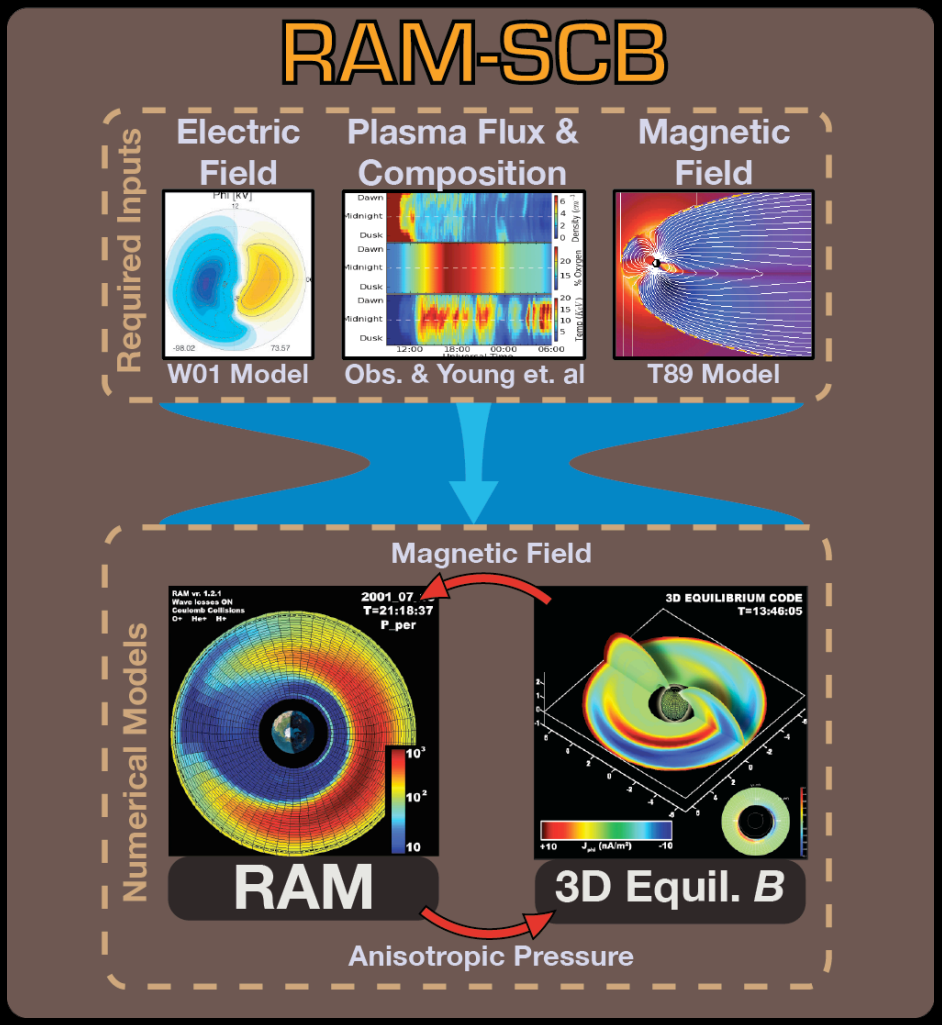

- RAM-SCB (**R**ing current **A**tmosphere interactions **M**odel with **S**elf **C**onsistent **B**Magnetic field) combines a kinetic ring current model with a force balanced 3D magnetic field model.
- RAM Dst is obtained through the Dessler-Parker-Sckopke relationship; does not include tail currents, etc.
- Metrics: PE, nRMSE, Pearson's r

$$nRMS = \sqrt{\frac{\sum_{i=1}^{n}(x_i - y_i)^2}{\sum_{i=1}^{n} x_i^2}}$$

$$PE = 1 - \frac{< x - y >}{\sigma_{Obs.}^2}$$

$$r = \frac{1}{n-1}\frac{\sum(x-\bar{x})(y-\bar{y})}{\sigma_x \sigma_y}$$

Run, RAM-SCB, Run

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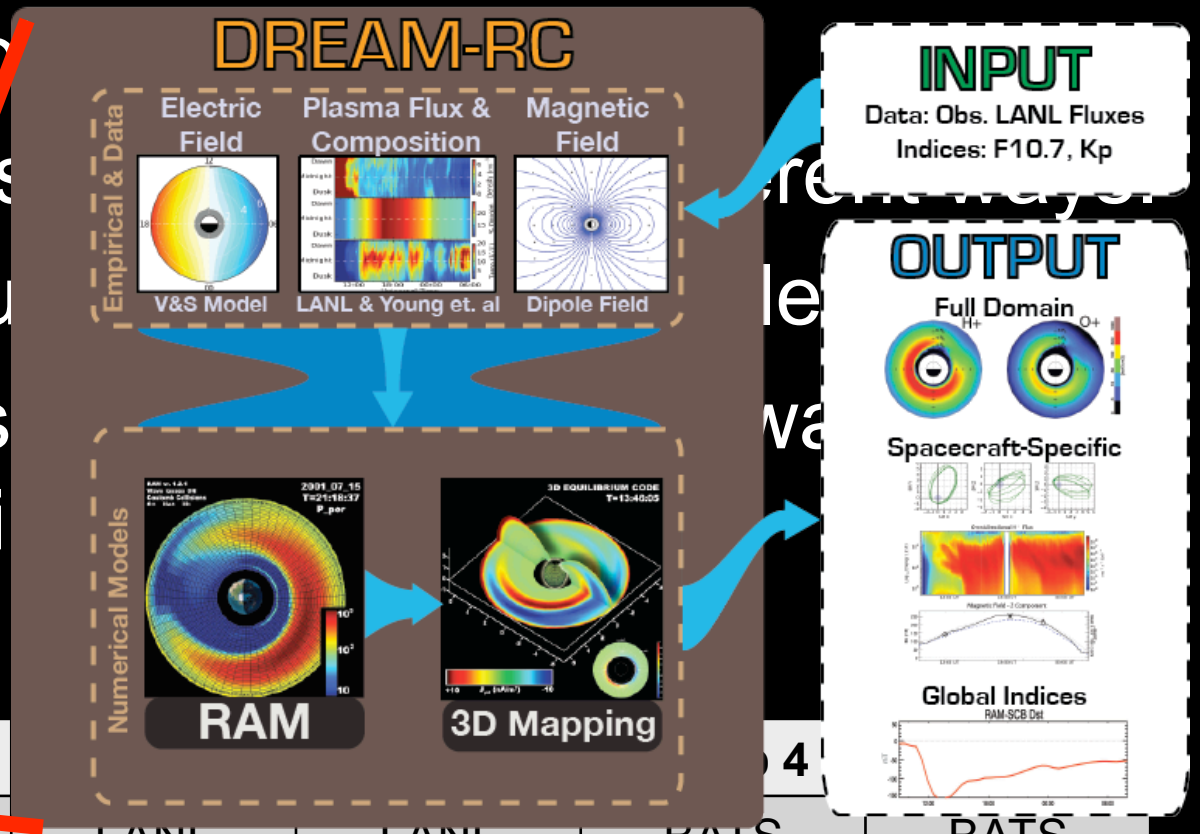
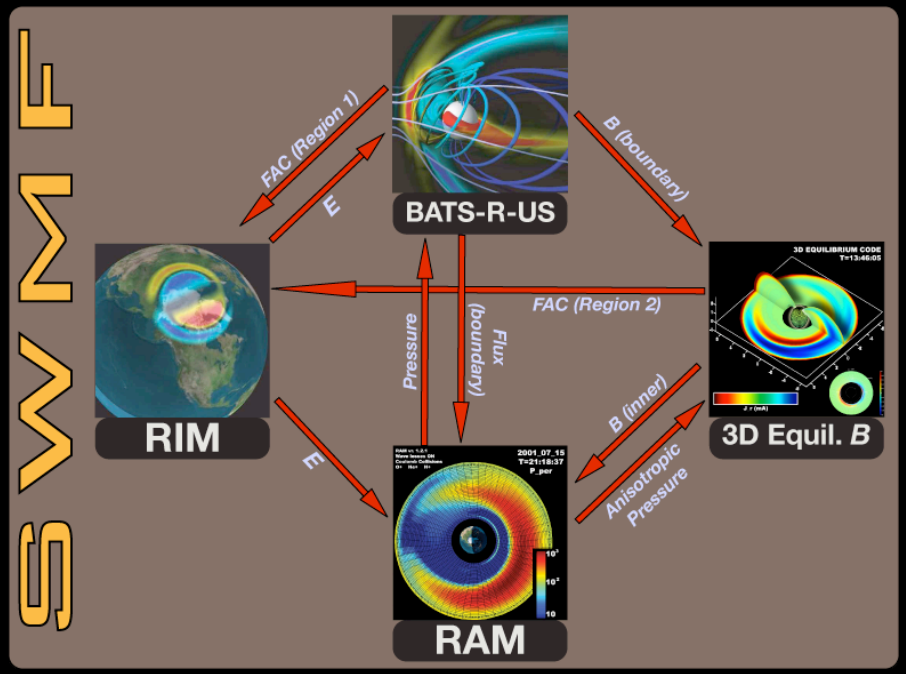
- Let's run this co
- All four event
- 13 "successfu
- Magnetopaus
  problem in fai
- Which set-up

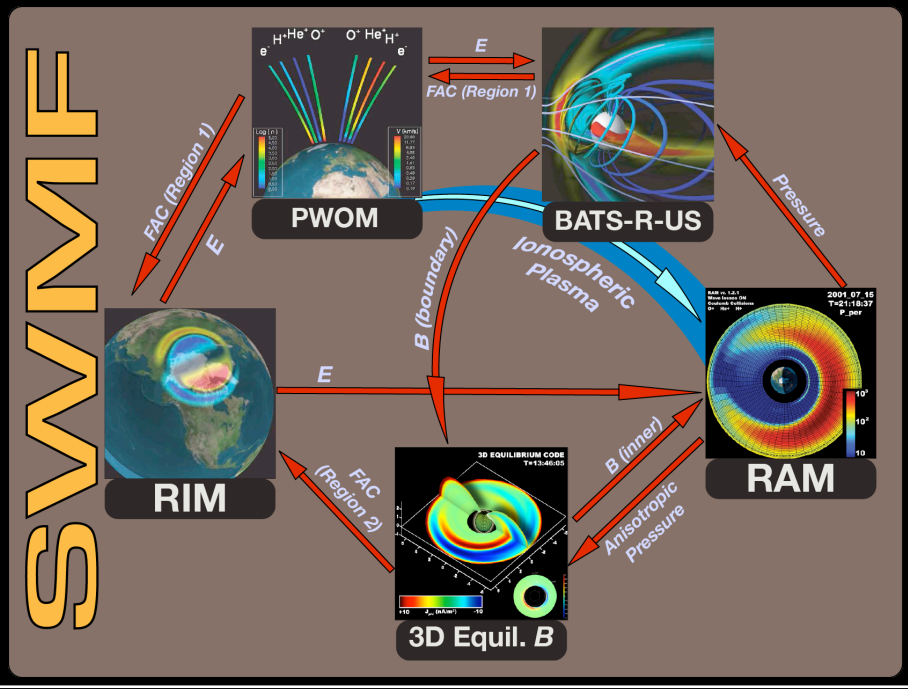


	Setup 1				4
Flux	LANL	LANL	LANL	BATS	BATS
Comp.	Young	Young	Young	Young	PWOM
B	Dipole	Dipole	T89-SCB	BATS-SCB	BATS-SCB
E	V&S	W2K	W2K/SCB	RIM/SCB	RIM/SCB

SWMF Coupling

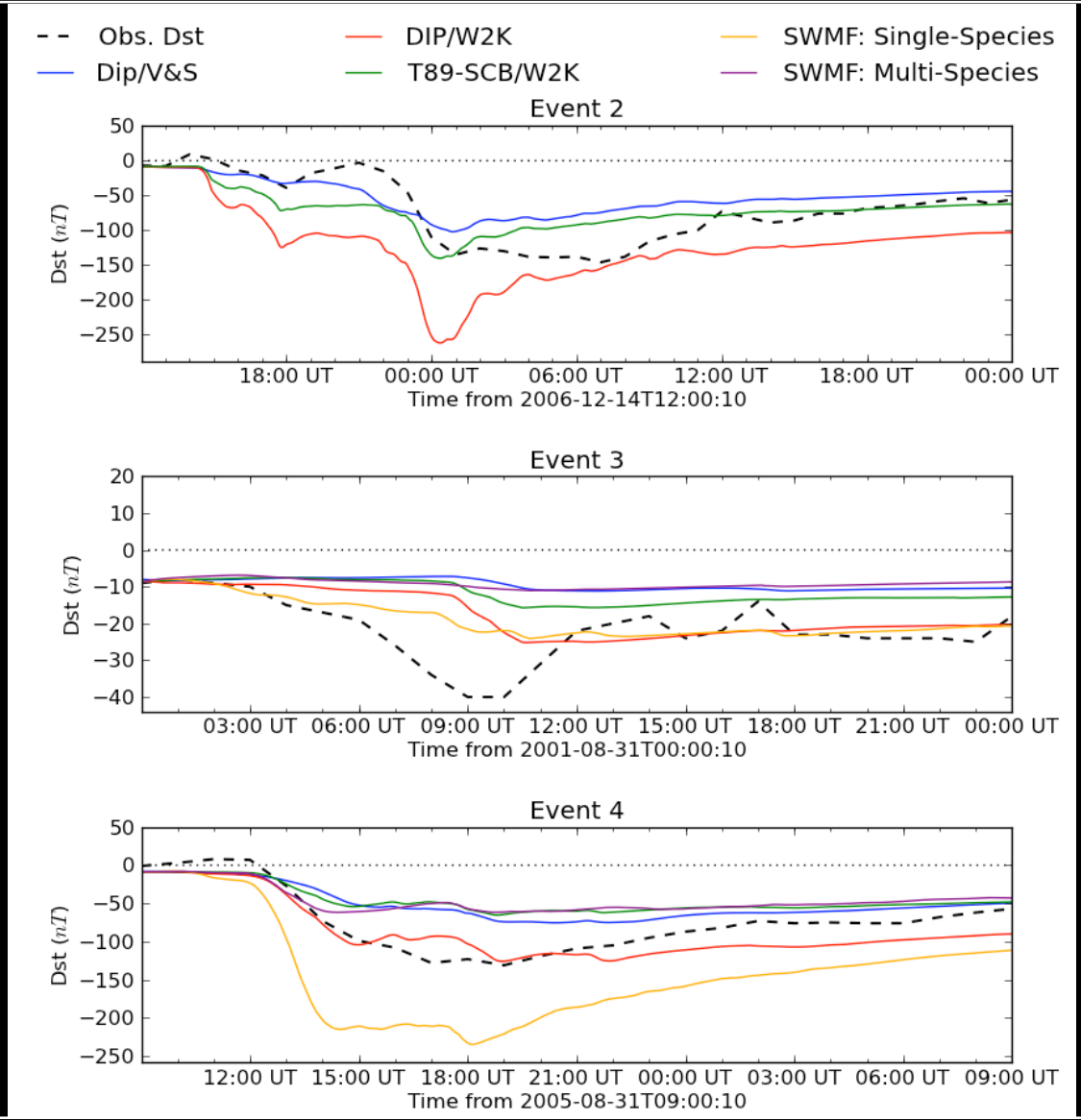


For this work, couplings are ***one-way*** with RAM-SCB!



See *Welling et al.* 2011 in JGR for coupling details & results.

We're gonna need a bigger plot.



The Matrix

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Event 2	Setup 1	Setup 2	**Setup 3**
Pred. Eff.	0.464	-0.793	0.582
nRMSE	0.399	0.730	0.352
Corr. Coeff.	0.863	0.774	0.799

Event 3	Setup 1	Setup 2	Setup 3	**Setup 4**	Setup 5
Pred. Eff.	-2.373	-0.236	-1.441	0.211	-2.310
nRMSE	0.638	0.386	0.543	0.307	0.632
Corr. Coeff.	0.052	0.368	0.363	0.578	0.637

Event 3	Setup 1	**Setup 2**	Setup 3	Setup 4	Setup 5
Pred. Eff.	0.304	0.608	0.056	-2.633	0.020
nRMSE	0.378	0.284	0.440	0.864	0.453
Corr. Coeff.	0.890	0.882	0.885	0.955	0.912

What Did We Learn?

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- Few, if any, patterns in ring current validation results.
- More events; climatological approach may yield clearer statistical picture (e.g. Morley).
- Results depend on the *combination* of inputs. How do we know which is correct?
- Our best results have come from two-way coupling with the SWMF (not shown).
- Cross-comparisons between ring current codes will not tell us very much.

Two-Way Coupling is Best Coupling

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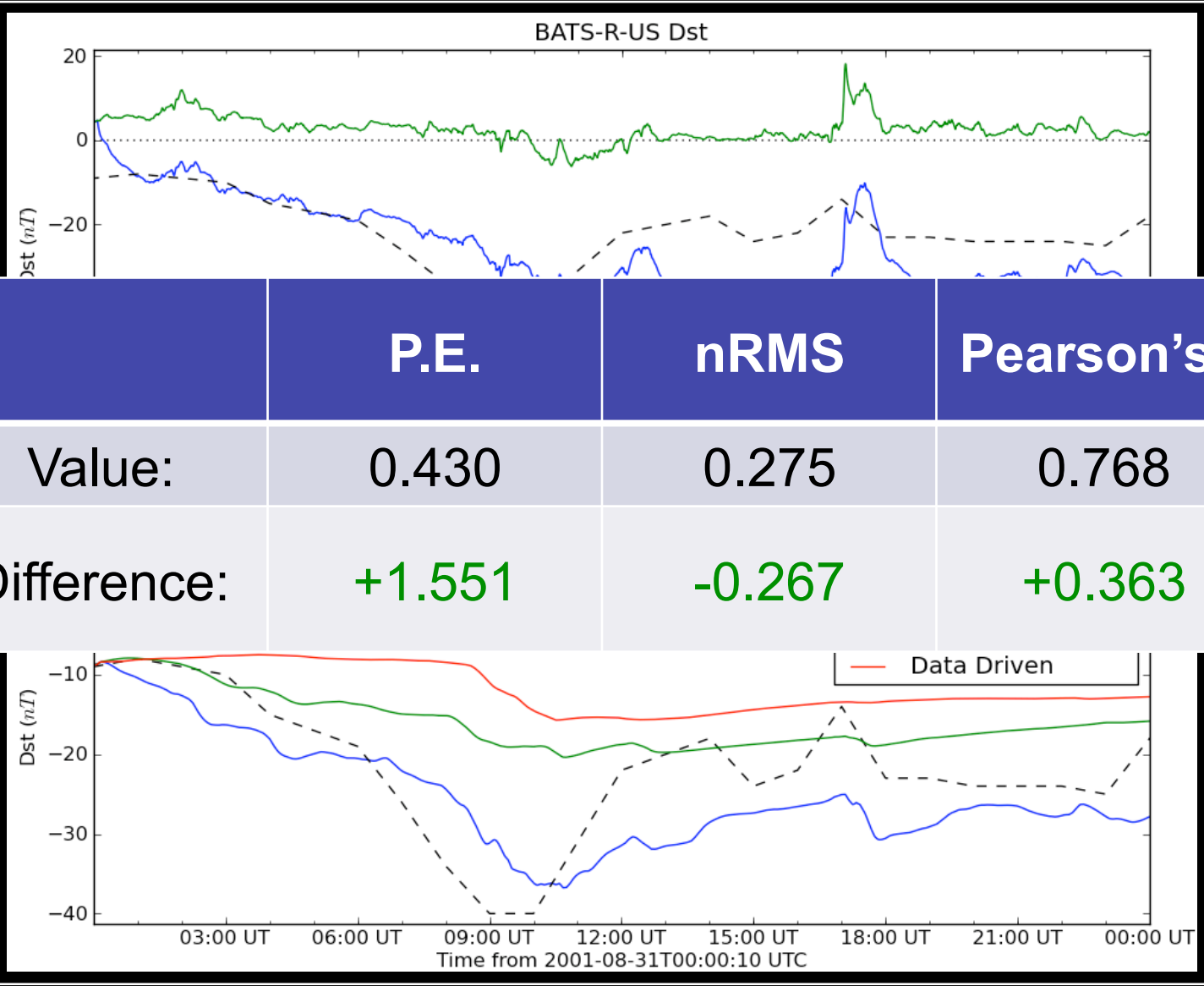

	P.E.	nRMS	Pearson's r
Value:	0.430	0.275	0.768
Difference:	+1.551	-0.267	+0.363

Effects of Two-Way Coupling

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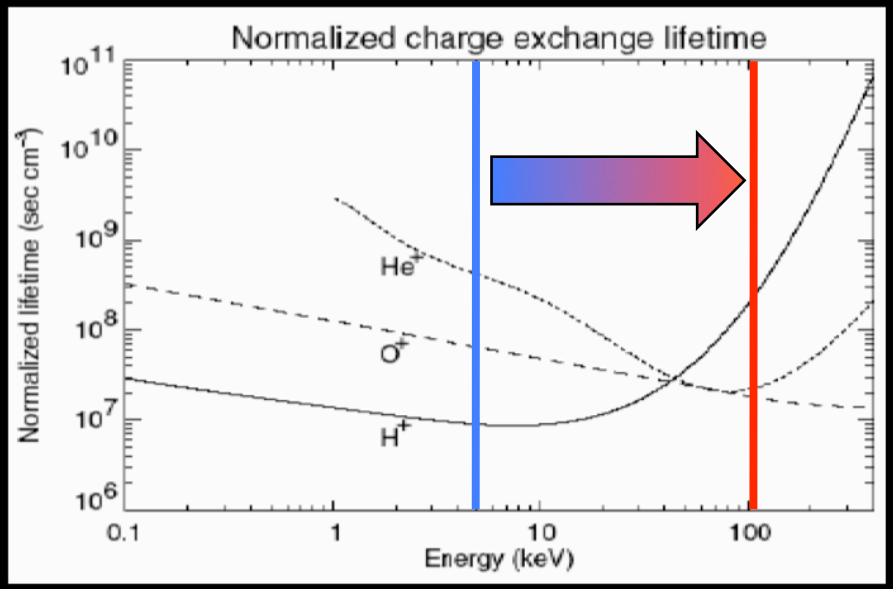
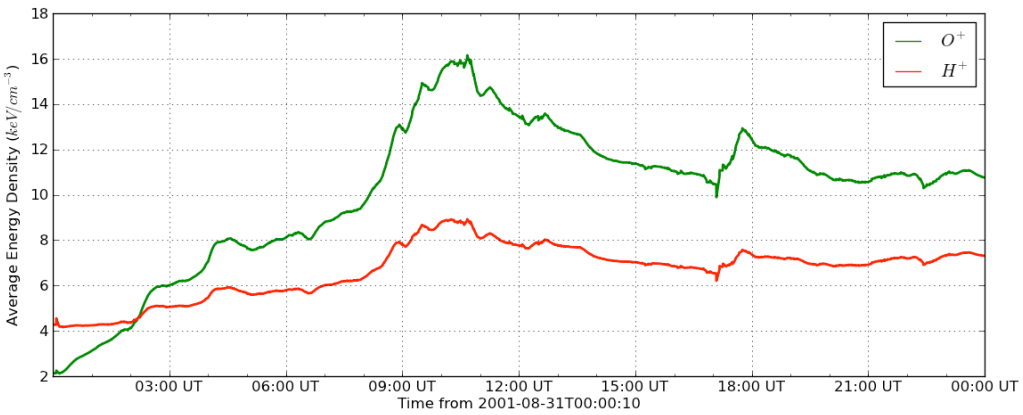
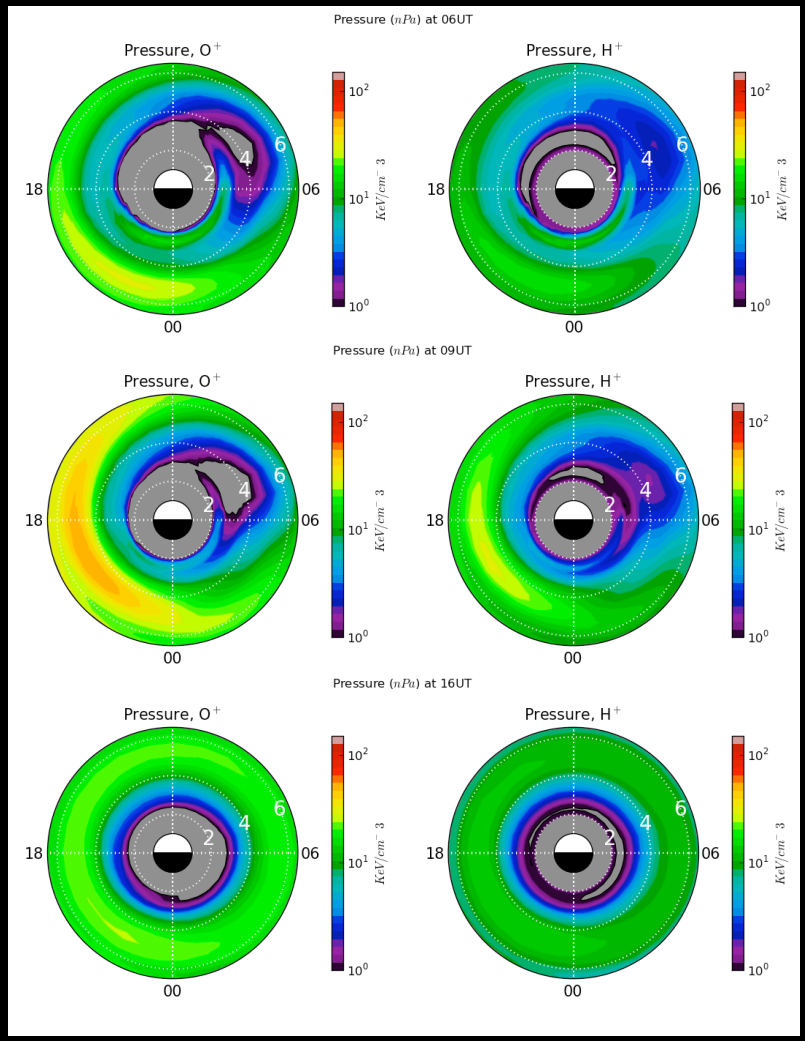
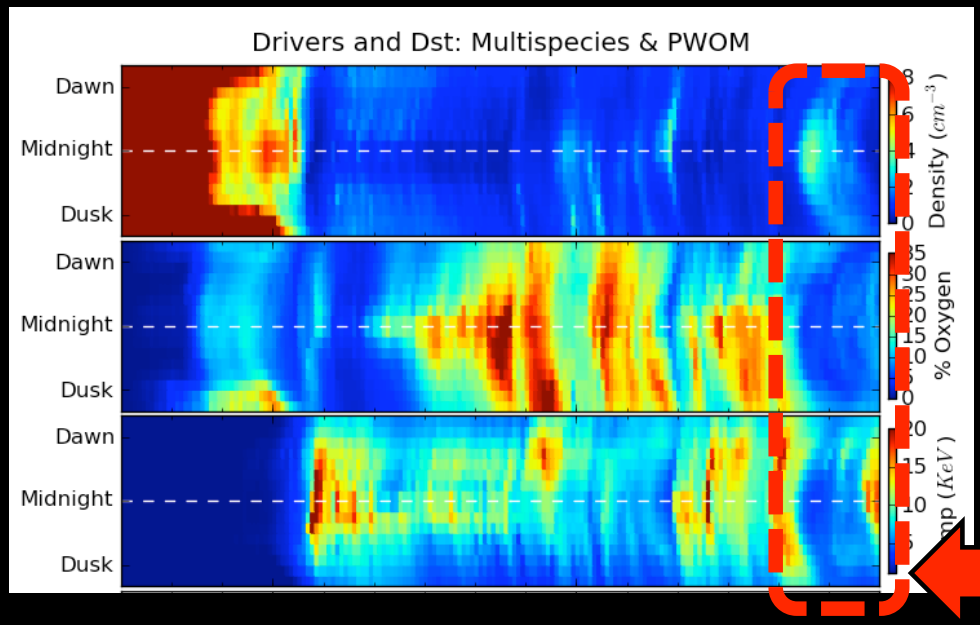
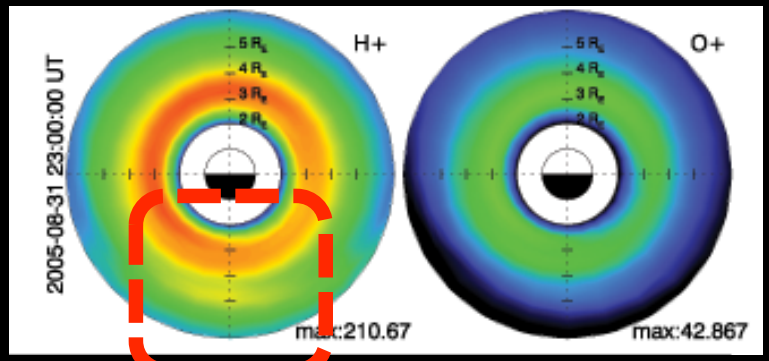






Substorms: We get 'em!





We get 'em right! (sometimes)

Sometimes, they look alright.

- Clear plasmoid & Dipolarization.
- Clear correlation with observed event.

The extent to which they capture important macro dynamics is unknown.