

**RBSP**

**Radiation Belt Storm Probes**

# **PSBR Science Investigation Status**

**Joe Mazur**

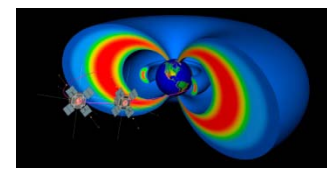
**The Aerospace Corporation**

**RBSP SWG**

**20 October 2011**



# RPS I&T Phase Functional Tests



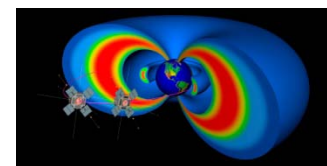
Date	FM1 Test	Alpha collect	Muon collect	Notes
4/5/2011	CPT	Y	N	First CPT after integration
7/26/2011	LFT	N	N	MSIM-2
7/27/2011	LFT	N	N	MSIM-2
7/28/2011	LFT	N	N	MSIM-2
8/24/2011	LFT	N	N	EMI sniff
9/22/2011	CPT	Y	N	S/C-A voltage testing; no RPS issues with FM1 CPT run during spacecraft voltage at 34.98 v or 24.05 v.
9/29/2011	CPT	Y	N	S/C-A CPT

Date	FM2 Test	Alpha collect	Muon collect	Notes
3/25/2011	CPT	Y	N	First CPT after integration
4/11/2011	CPT	Y	N	
5/5/2011	CPT	Y	N	
5/27/2011	LFT	N	N	
7/11/2011	LFT	Y	N	MSIM-2
7/12/2011	LFT	N	N	MSIM-2
7/13/2011	LFT	N	N	MSIM-2
7/29/2011	LFT	N	Y	Stand-alone muon collect with RPS boresight aligned with the vertical; 35 events in 7:32 (4.7/hr)

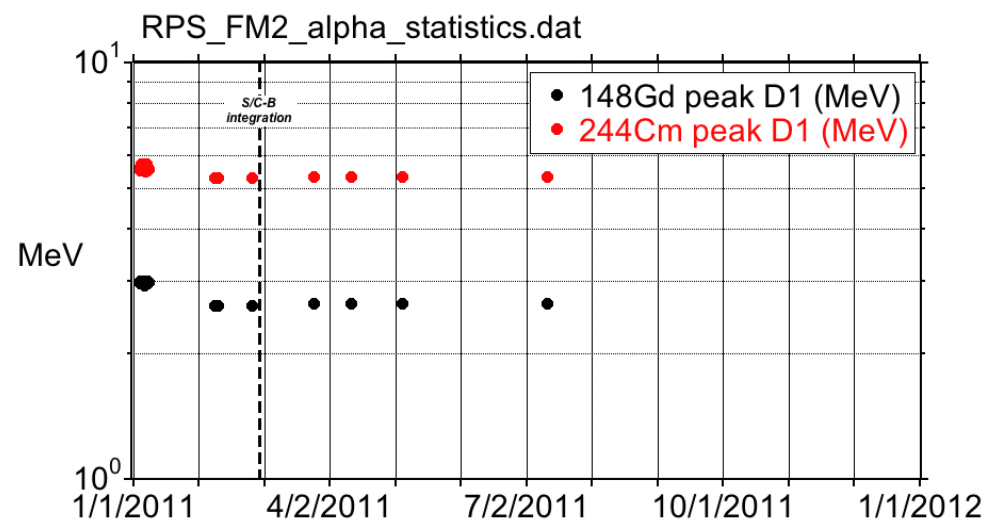
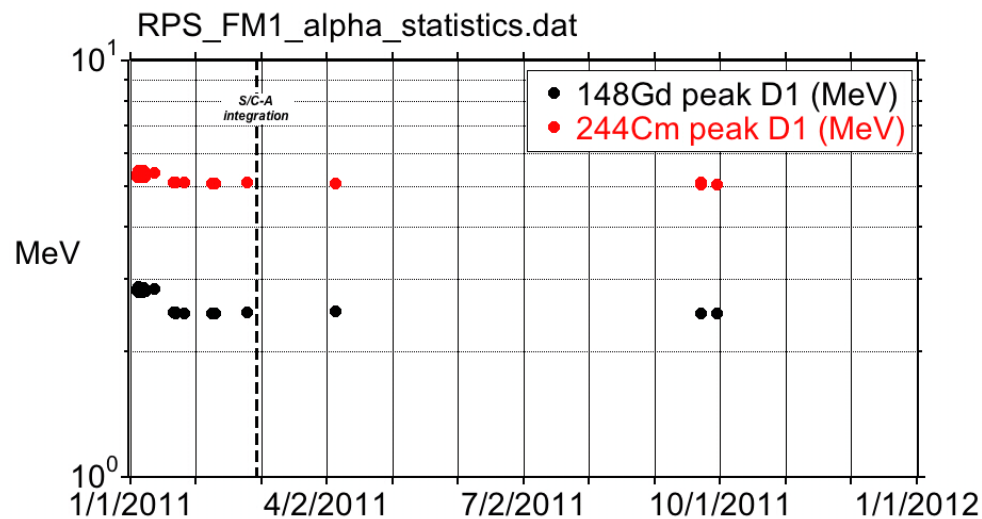
- **I&T functional test tallies (FM1/FM2): 7/8**
- **Muon collects (FM1/FM2): 0/1**
- **Alpha collects (FM1/FM2): 3/4**



# RPS Alpha Source Trending

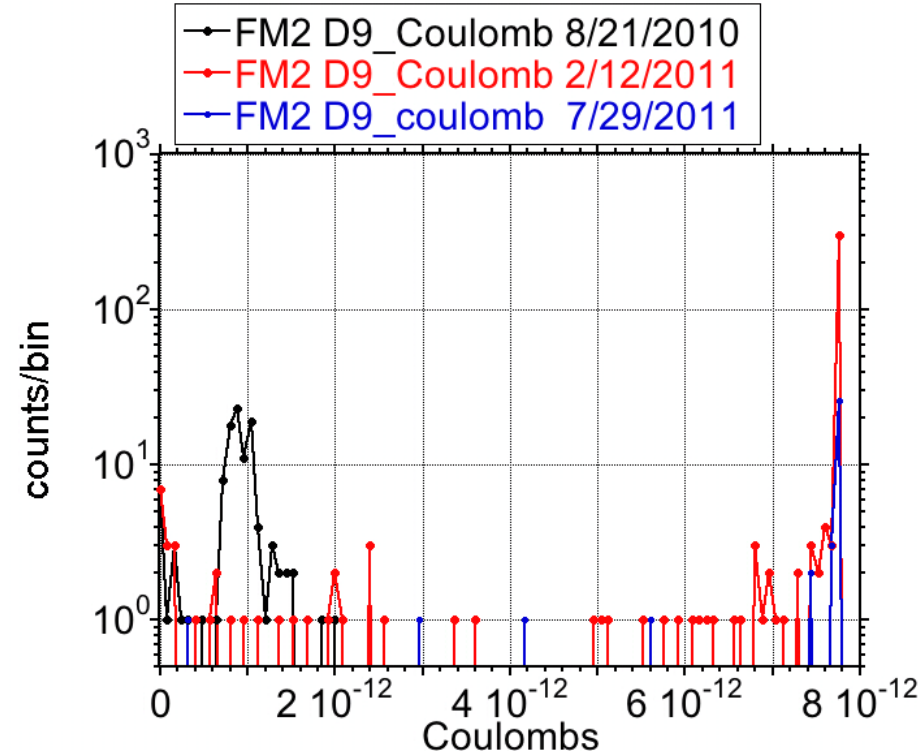
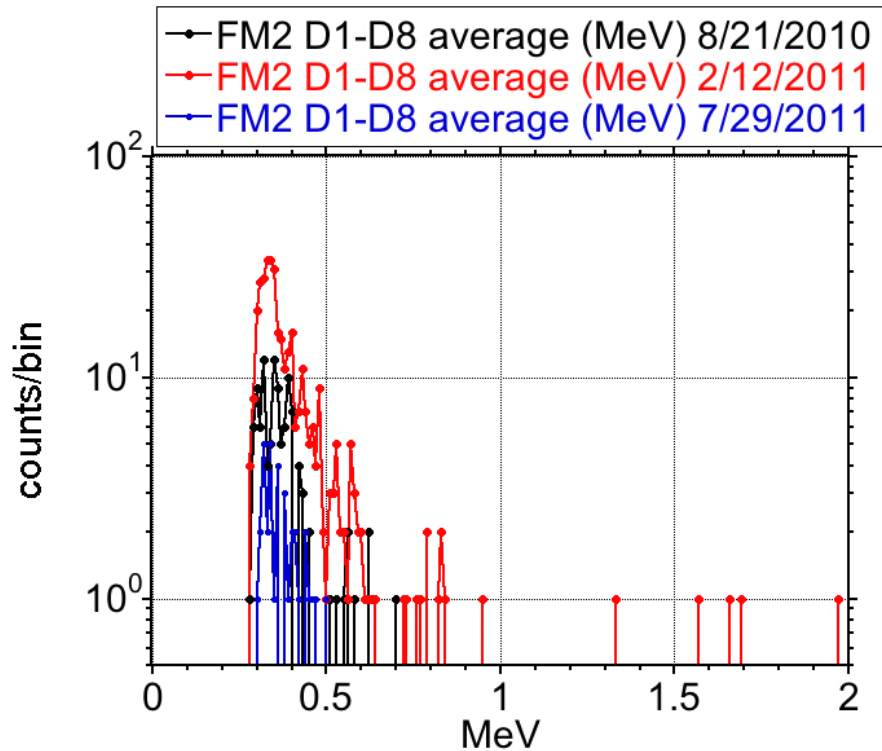
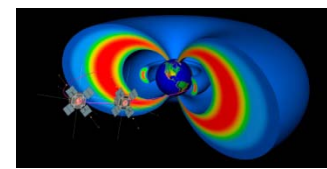


- Alpha sources allow us to monitor SSDA performance
- Variations seen in these charts during January I-TVAC reflect temperature-dependence that has not yet been factored into the alpha analysis
- Total number of alpha collects for flight models
  - FM1: 53
  - FM2: 37
- No change in alpha responses since integration; no issues

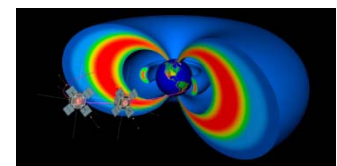




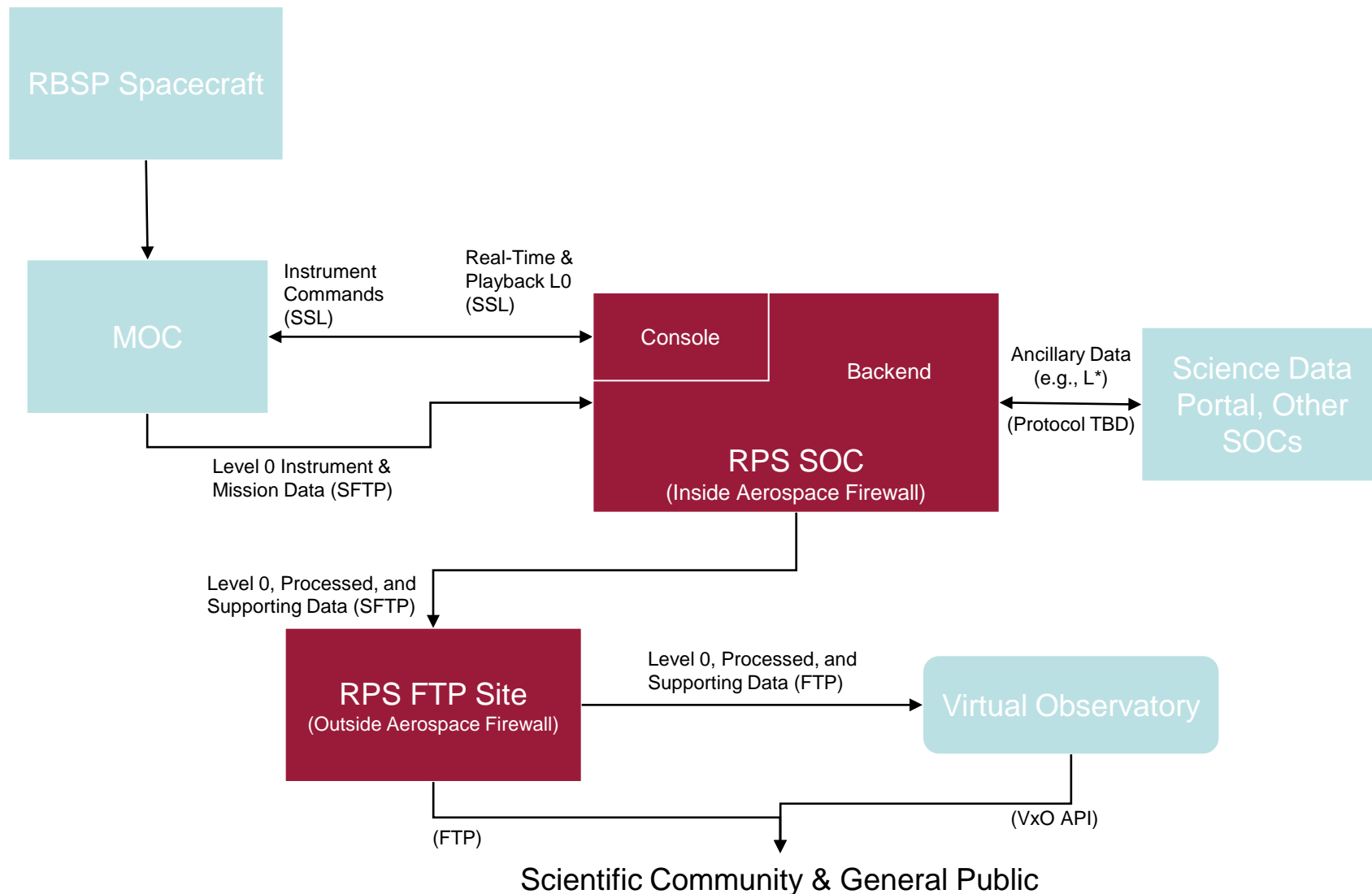
# RPS FM2 Muon Collect

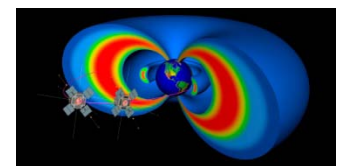


- **7/29/2011 test allowed us to collect muons for ~ 7.5 hours in a zenith-facing attitude**
- **Comparison to pre-ship responses in February 2011: no change**

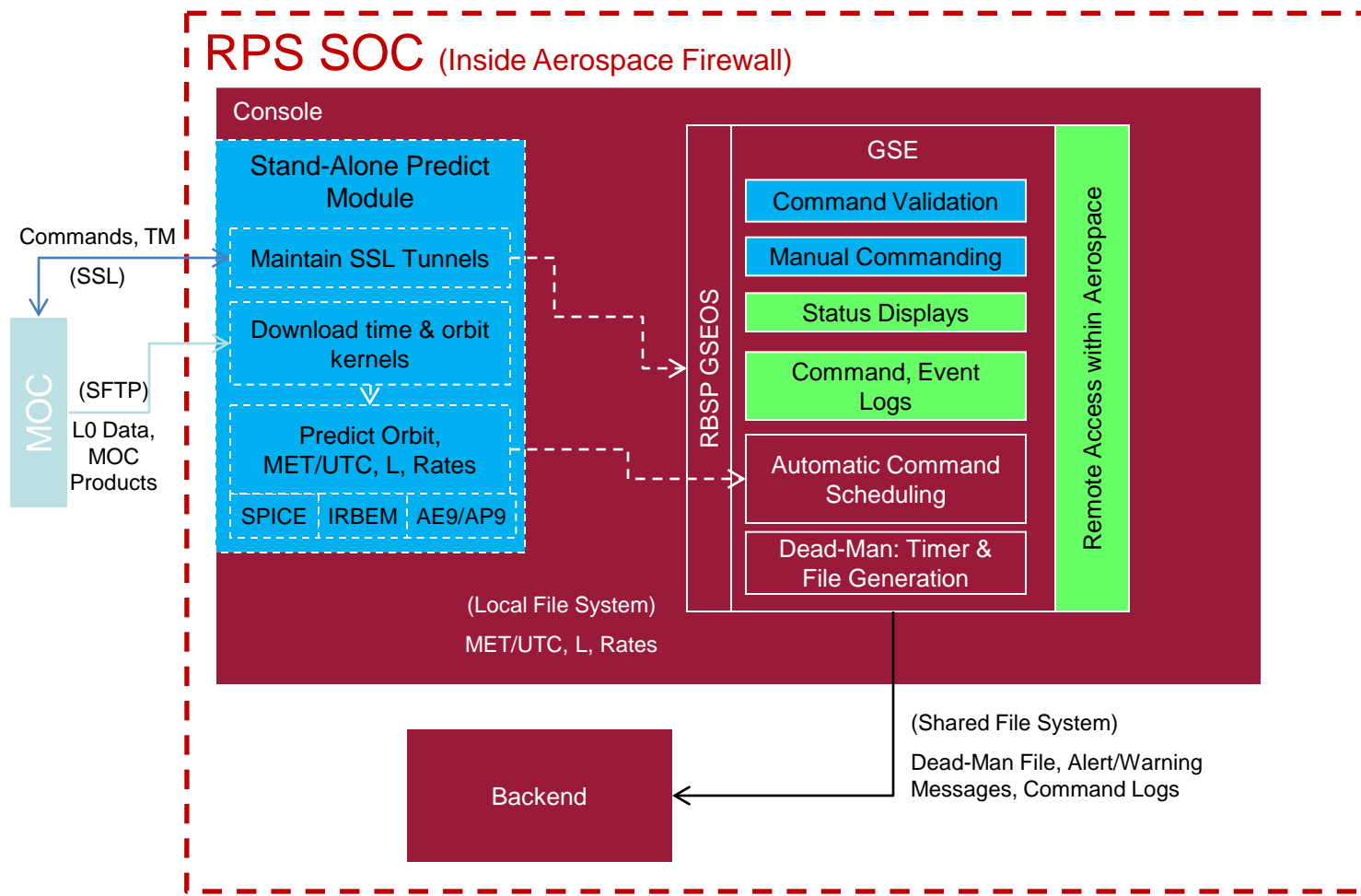


# RPS SOC in Context





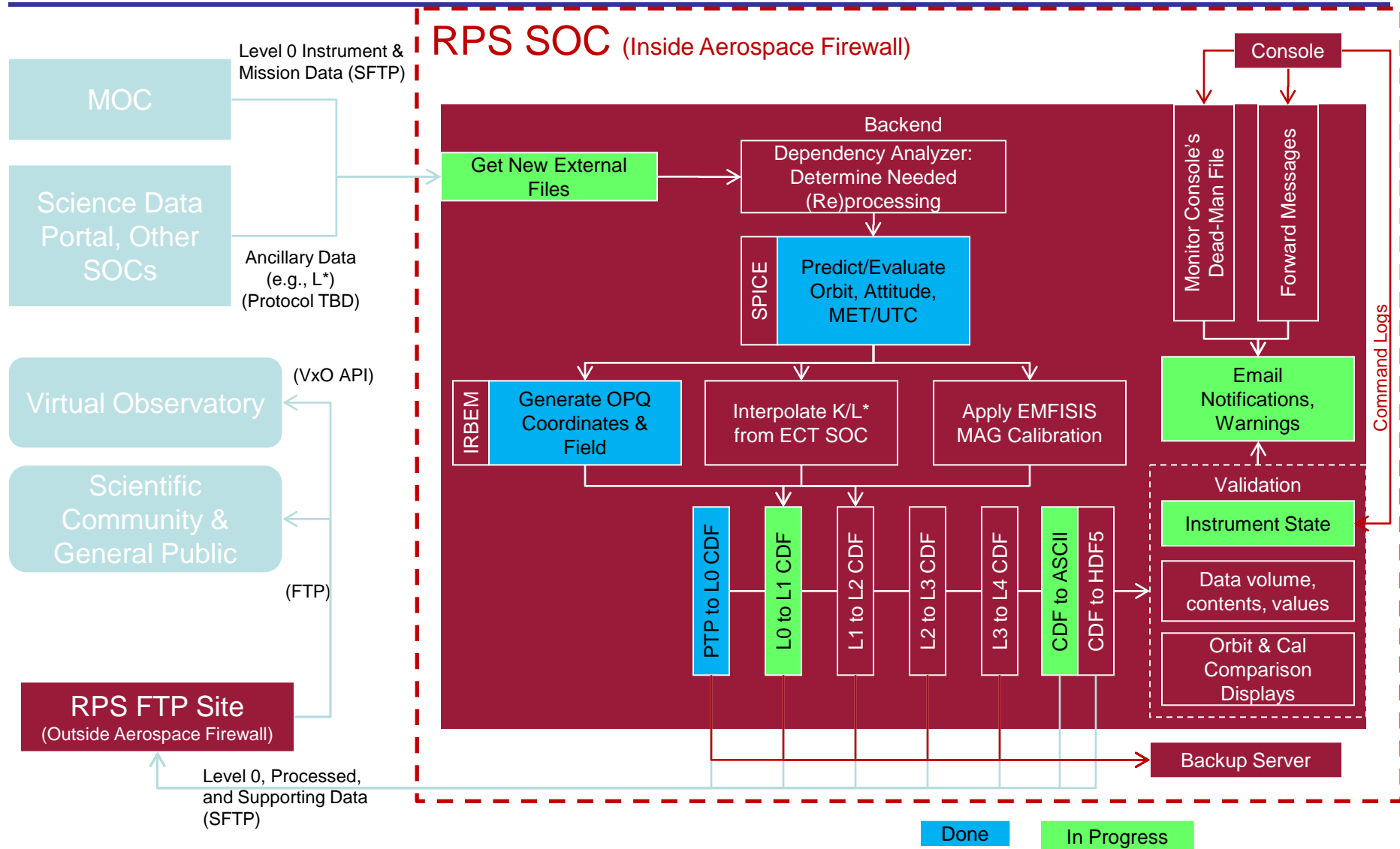
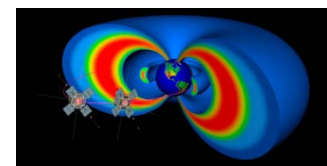
# RPS SOC Console Status



Done      In Progress

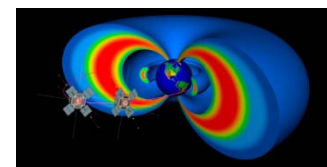


# RPS SOC Backend Status

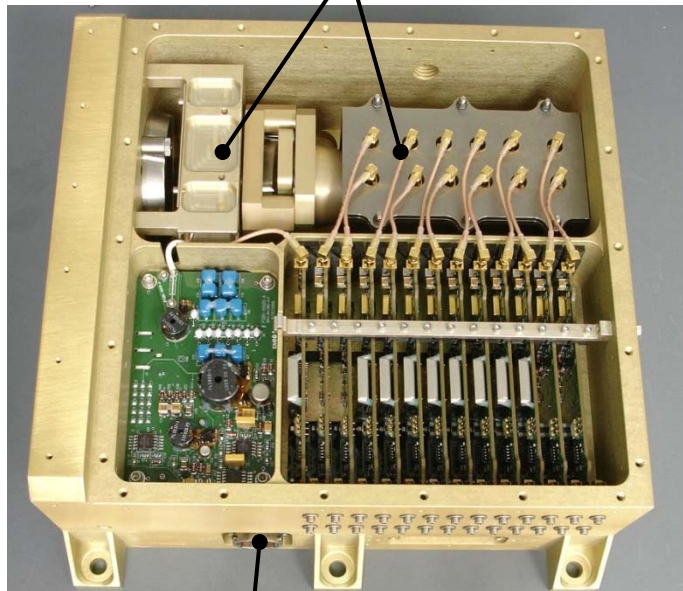




# RPS Space Weather Capabilities



Coincidence rates  $>60$  MeV H &  
 $>400$  MeV H



Total ionizing dose  
& dose rate, 2  
micro dosimeters  
in each RPS (front  
& side)



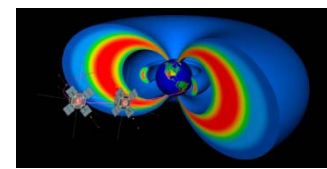
Counters of glitches on  
1pps & command lines







# RPS Space Weather Packet

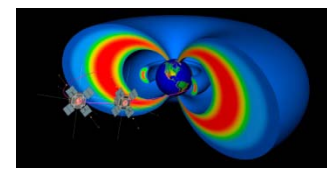


- The entire RPS 1-second rate & housekeeping packet is included in the RBSP space weather downlink
- These items will be of most interest for space environment effects at RBSP and in the inner magnetosphere

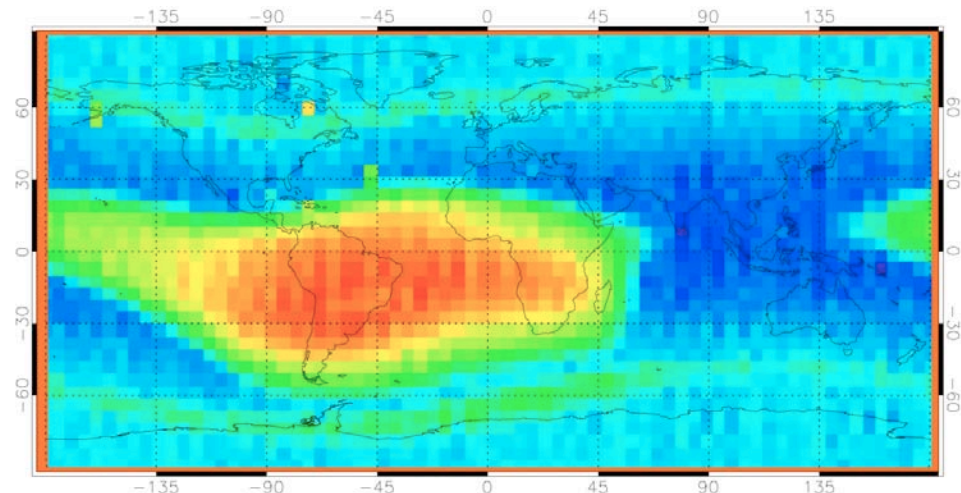
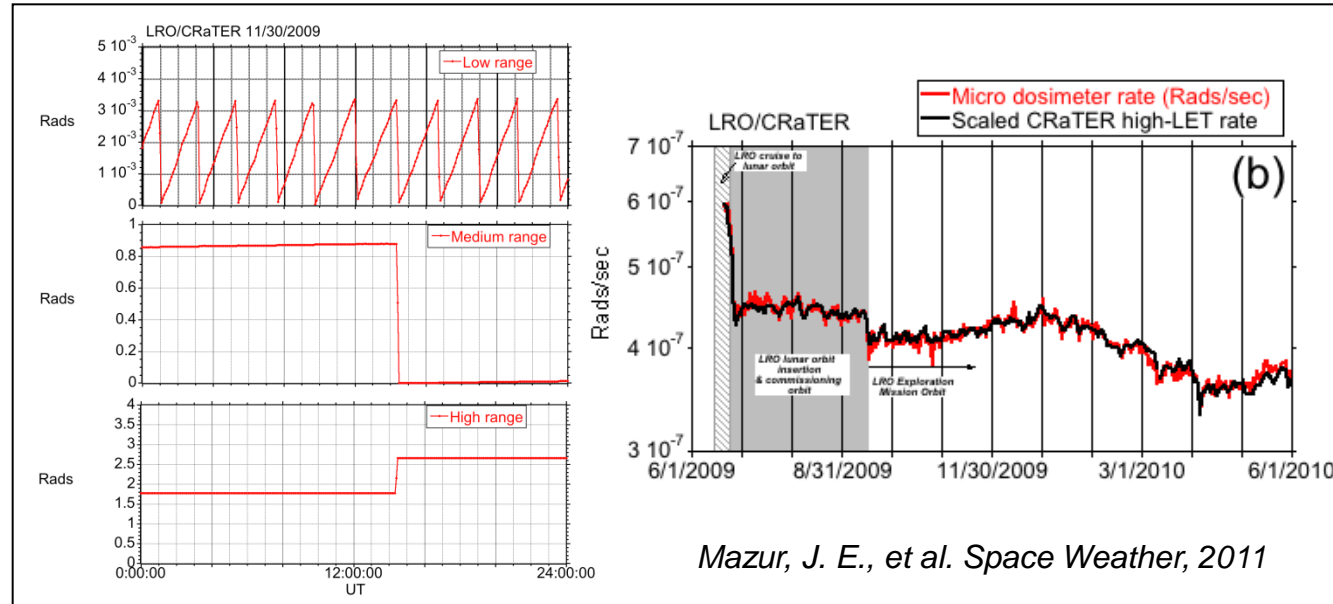
Data items	Physical quantity	Space weather uses
PEN rate	Flux of >60 MeV H	<ul style="list-style-type: none"> <li>•Single event effects</li> <li>•Awareness of where RBSP is in relation to inner belt</li> <li>•Access of solar energetic particles to inner magnetosphere</li> </ul>
CHE rate	Flux of >400 MeV H	Same as PEN rate
Micro dosimeter low range	Accumulating dose <ul style="list-style-type: none"> <li>• 0-3.494 mRads</li> <li>• 13.65 <math>\mu</math>Rads/step</li> </ul>	<ul style="list-style-type: none"> <li>•Total dose &amp; dose rate behind 3.25 g/cm<sup>2</sup> (474 mils Al)</li> <li>•Count rates of &gt;53 MeV H &amp; &gt;5.3 MeV e<sup>-</sup></li> </ul>
Micro dosimeter medium range	Accumulating dose <ul style="list-style-type: none"> <li>• 0-894.6 mRads</li> <li>• 3.494 mRads/step</li> </ul>	Same as low range
1pps & command line glitch counters	Mod-16 counts of pulses with <120 nsec width	Accumulated ESD event history and instantaneous ESD rate



# RPS Micro Dosimeters

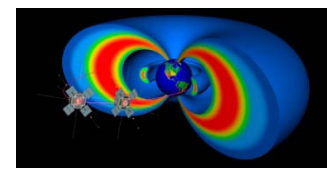


- **Simple linear conversions from voltage to accumulated dose**
- **~14 microRad/second resolution**
- **Ground-based processing is necessary to accurately calculate total dose and dose rate**
- **Flight experience to date:**
  - LRO (lunar orbit)
  - RPP (1200 km polar LEO)





# Summary



- **RPS performance has been nominal in I&T**
- **RPS SOC is still in development but most of the automated tasks will be ready for spacecraft thermal vacuum & balance testing**
- **RPS space weather-related measurements cover the hazards of total dose, single-event effects, and electrostatic discharges**