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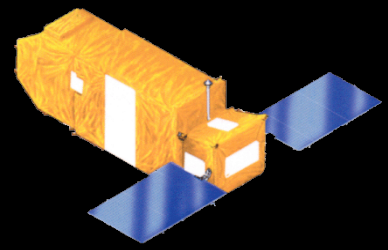

FUSE Mission Status

Bill Blair

FUSE Deputy PI

Chief of Observatory Operations

FOAC Meeting-November 2, 2004

Paris, France

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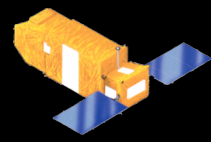
Recent Performance



- Preliminary Statistics for Cycle 5.5 (4/1/04 - 10/1/04):

	Time	Efficiency	Cy4 Ave.
Total science:	4.99 Msec	32.2%	37.4%
Primary science:	3.75 Msec	24.0%	22.1%
Secondary science:	1.24 Msec	8.2%	15.3%
Survey Programs:	0.69 Msec	(4.5%)	(11.9%)
Background Program:	0.59 Msec	(3.8%)	(3.4%)

- Lower total due largely to more aggressive scheduling practices (i.e., our attempts to reduce number targets from previous cycles).
  - Harder observations, more alignments and thermalization time.
  - Have actually *increased* # of constrained observations significantly.

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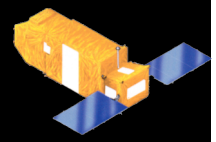
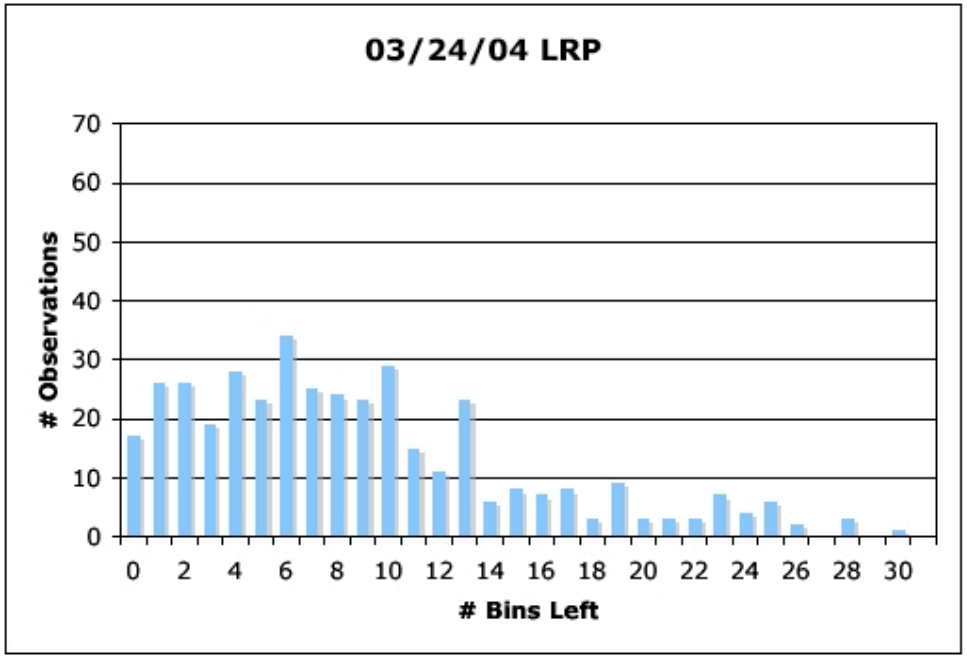
LRP--Mar. 24, 2004



Bin	Frequency	Cumulative %	Cumulative Sum
0	17	4.3%	17
1	26	10.9%	43
2	26	17.4%	69
3	19	22.2%	88
4	28	29.3%	116
5	23	35.1%	139
6	34	43.7%	173
7	25	50.0%	198
8	24	56.1%	222
9	23	61.9%	245
10	29	69.2%	274
11	15	73.0%	289
12	11	75.8%	300
13	23	81.6%	323
14	6	83.1%	329
15	8	85.1%	337
16	7	86.9%	344
17	8	88.9%	352
18	3	89.6%	355
19	9	91.9%	364
20	3	92.7%	367
21	3	93.4%	370
22	3	94.2%	373
23	7	96.0%	380
24	4	97.0%	384
25	6	98.5%	390
26	2	99.0%	392
27	0	99.0%	392
28	3	99.7%	395
29	0	99.7%	395
30	1	100.0%	396
More	0	100.0%	396



22% “Constrained” Observations

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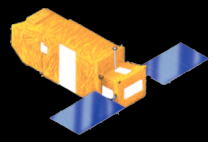
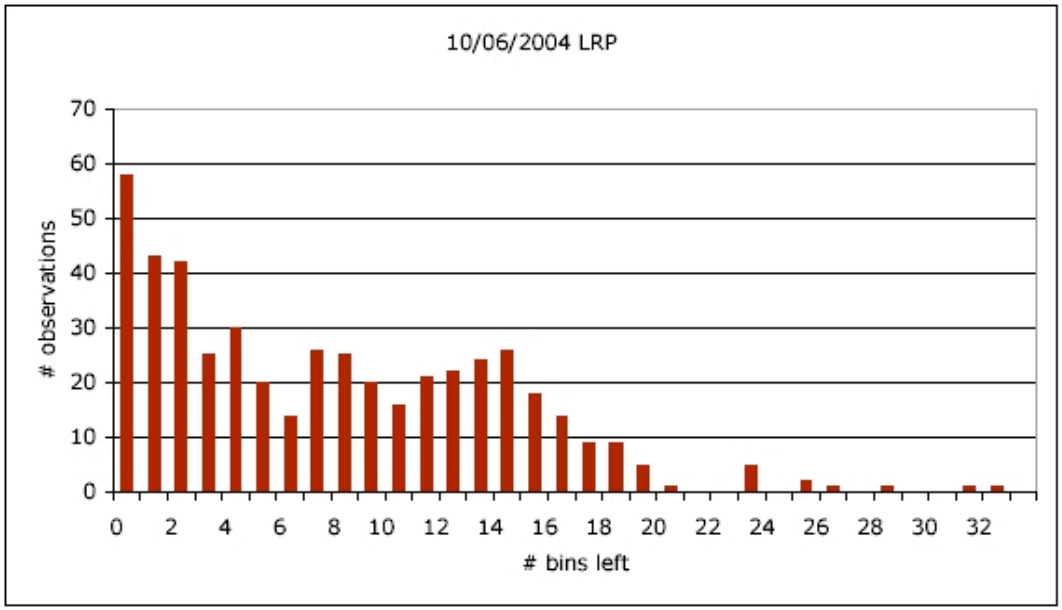
LRP--Oct. 6, 2004



Bin	Frequency	Cumulative %	Cumulative Sum
0	58	12.1%	58
1	43	21.1%	101
2	42	29.9%	143
3	25	35.1%	168
4	30	41.3%	198
5	20	45.5%	218
6	14	48.4%	232
7	26	53.9%	258
8	25	59.1%	283
9	20	63.3%	303
10	16	66.6%	319
11	21	71.0%	340
12	22	75.6%	362
13	24	80.6%	386
14	26	86.0%	412
15	18	89.8%	430
16	14	92.7%	444
17	9	94.6%	453
18	9	96.5%	462
19	5	97.5%	467
20	1	97.7%	468
21	0	97.7%	468
22	0	97.7%	468
23	5	98.7%	473
24	0	98.7%	473
25	2	99.2%	475
26	1	99.4%	476
27	0	99.4%	476
28	1	99.6%	477
29	0	99.6%	477
30	0	99.6%	477
31	1	99.8%	478
32	1	100.0%	479
More	0	100.0%	479



35% “Constrained” Observations

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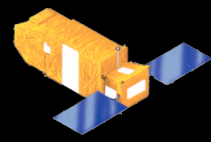
Overall Performance
(as of 10/1/2004)



Summary of All Science, Cycles 1-5.5

Cycle	N(obj)	N(obs)	Sci. Time (ks)	Eff (Tot/Pri)%
1	623	884	8914.6	28.2/28.2
2	527	736	9781.6	31.0/28.5
3*	522	868	13387.3	31.9/17.9
4	416	689	11995.1	37.9/22.3
5	179	326	4993.4	32.2/24.0
TOTAL	2267	3503	49072.0 ks	

*Cycle 3 was 16 months including 2 months of down time.

(Info thanks to Alex Fullerton.)

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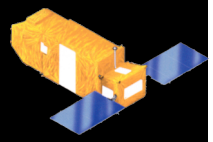
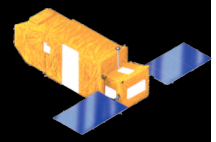
Expected Carry-over to Cycle 6



Schedulable programs carried over from Cycles 2-5 into the Cycle 6 time period (April 2005 - April 2006), based on LRP run of Oct. 6, 2004.

	Observations	Exp. Time (ks)
B programs:	2	16
C programs:	5	41
D prime:	6	99
D survey:	11	145
E prime (Std):	36	740
E prime (Legacy):	8	223
E survey:	26	498
P programs:	1	11
Q programs:	1	20
M programs:	5	34
TOTALS:	101	1827 ks

On HOLD: Totals



	No. Obs	Exp. Time (ks)	Comments
B programs:	0	0	Was 3/49 at last FOAC.
C programs:	10	89	Was 13/142.
D programs:	24	66	Was 41/202.
E Std. programs:	17	85	New
E Sur. Programs:	7	162	New; PI holds.
E Leg. programs:	28	1137	2-year programs.
P programs:	37	241	Was 42/257. (Include. 5 moving target obs)
M programs:	4	50	
Z programs:	1	33	Z007 - FUSE/COS Cross Calibration (!)
TOTALS:	129	1865.6 ks	

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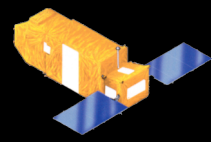
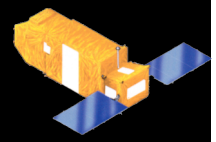
On HOLD: Overbright
(Subset of previous pg.)



	Observations	Exp. Time
C programs:	9	87 ks
D programs:	23	63 ks
E programs:	15	35 ks
P programs:	32	124 ks
TOTAL:	79	309 ks

Note: Not all of these will require defocus technique.
Details are still being assessed.

Total Carry-over to Cy6



	Observations	Exp. Time
B programs:	2	16 ks
C programs:	15	131 ks
D programs (std):	30	165 ks
D programs (sur):	11	145 ks
E programs (std):	53	825 ks
E programs (leg):	36	1360 ks
E programs (sur):	33	661 ks
P programs:	38	252 ks
Q programs:	1	20 ks
Z programs:	1	33 ks
M programs:	9	84 ks
TOTAL:	229	3692 ks

Total Survey CO:
806 ks

Total Prime CO:
2886 ks
(of which 1866 ks is on HOLD.)

(Information courtesy of Alice Berman, FUSE MP.)

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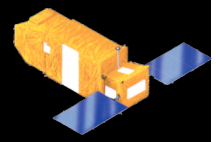
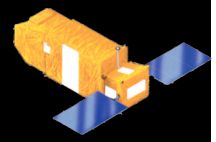
Progress on Pending Observations



	10/6/04 LRP		03/26/04 LRP	
Program	# obs	Time (ks)	# obs	Time (ks)
B	8	60	11	104
C	38	425	63	564
D prime	52	796	99	1583
D survey	23	222	3	290
P	34	282	51	391
Q	5	47	5	47
Z0xx	3	81	0	0
Z9xx	0*	0*	56	412
	163	1913	418	3963

*Remaining Z9XX targets removed from MPDB, May 2004.

FUSE Flux Calibration



- Monthly monitoring program of WD standards continues.
  - Sensitivity has been stable in 2004.
  - (Charts on following pages.)
- Safing event (closed doors) in early June 2004.
  - No evidence of any sensitivity impact in calibration data.
- High Voltage was raised (on all but segment 2A) on July 20, 2004. No ill-effects seen. New calibration files obtained and incorporated into CalFUSE.

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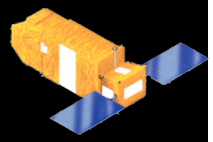
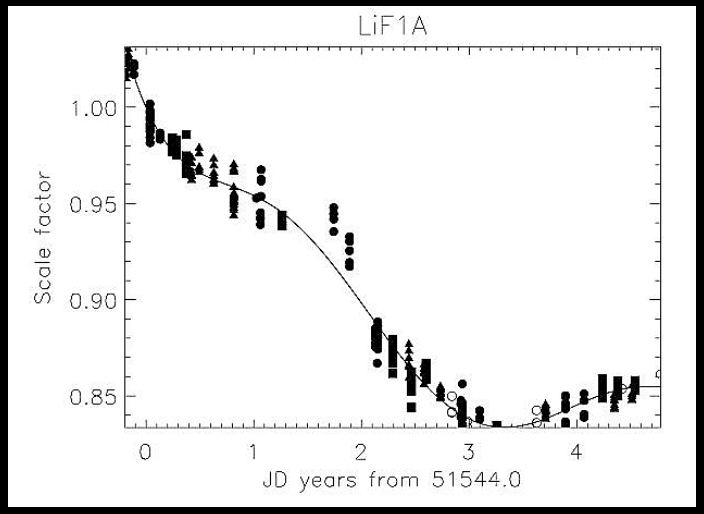
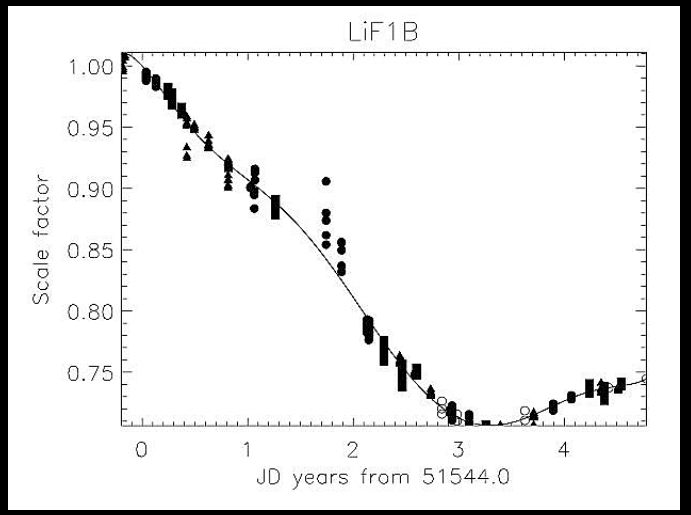
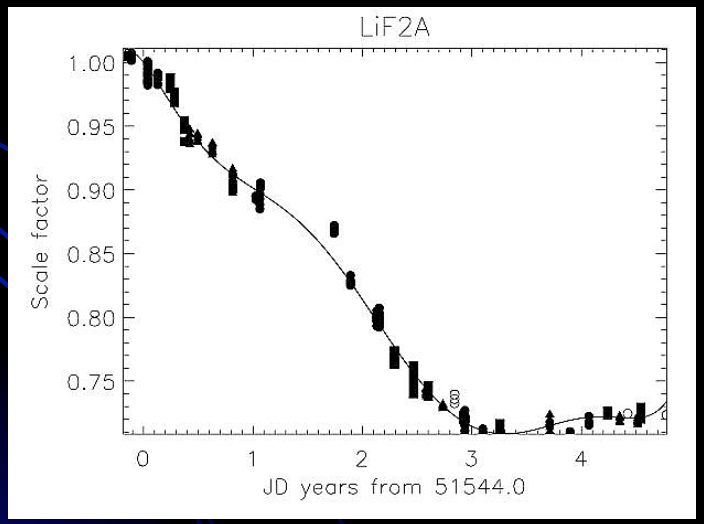
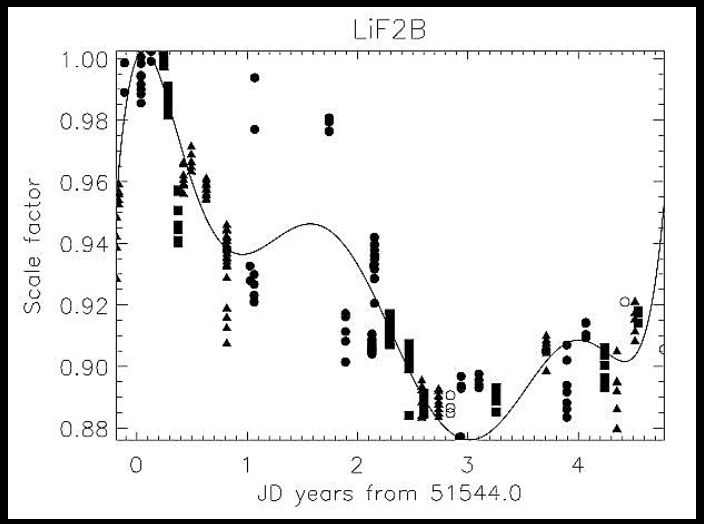
LiF Channel Sensitivity











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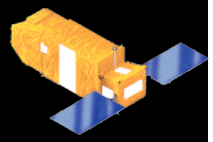
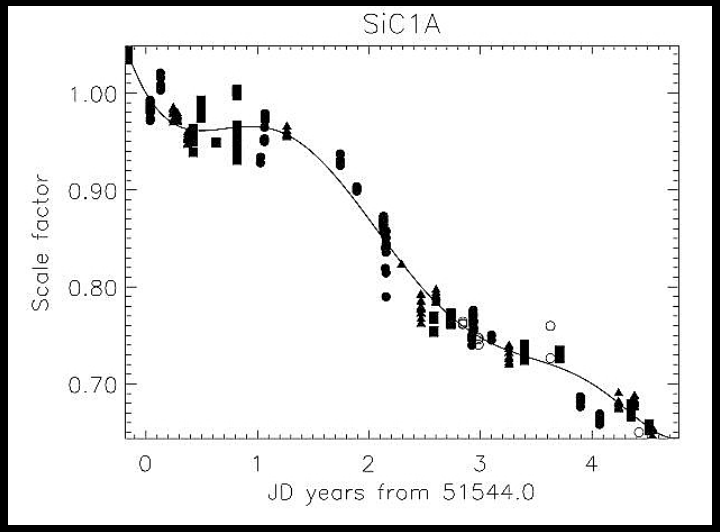
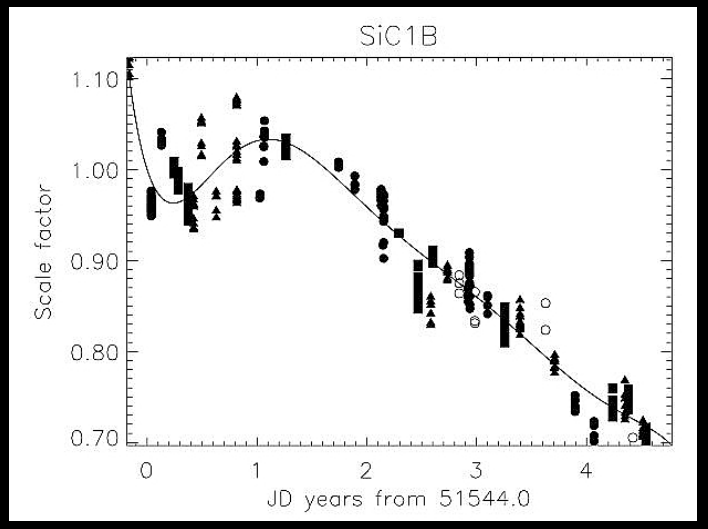
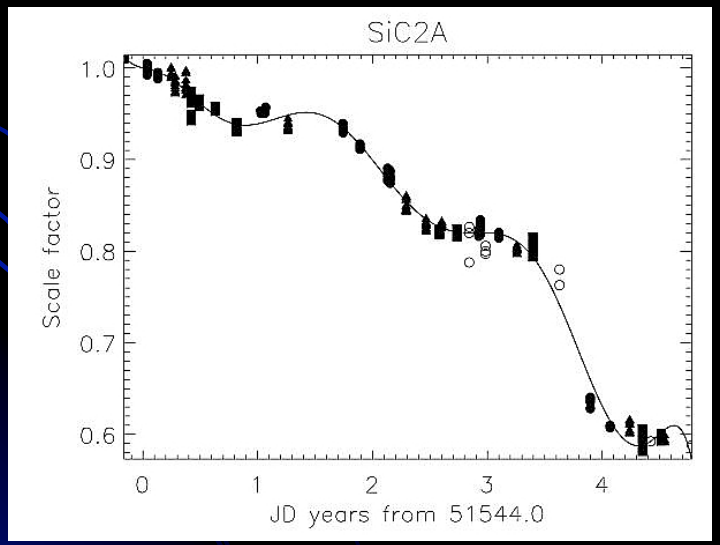
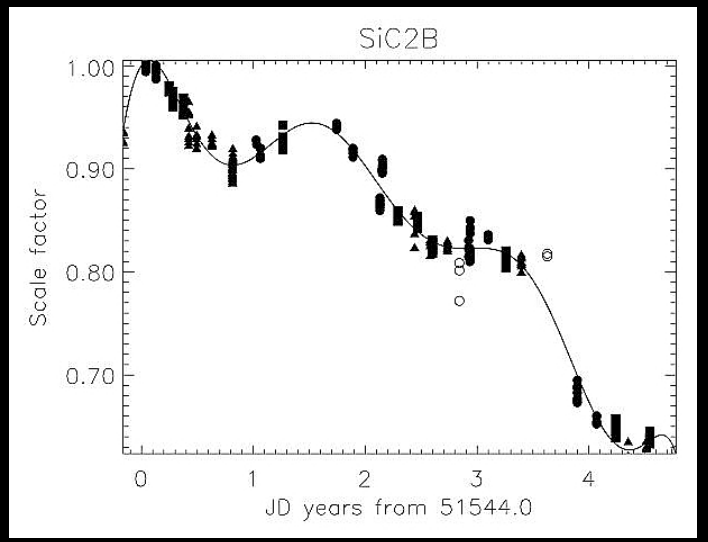
SiC Channel Sensitivity





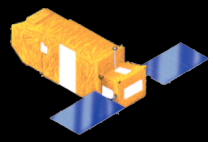






Nov. 2, 2004

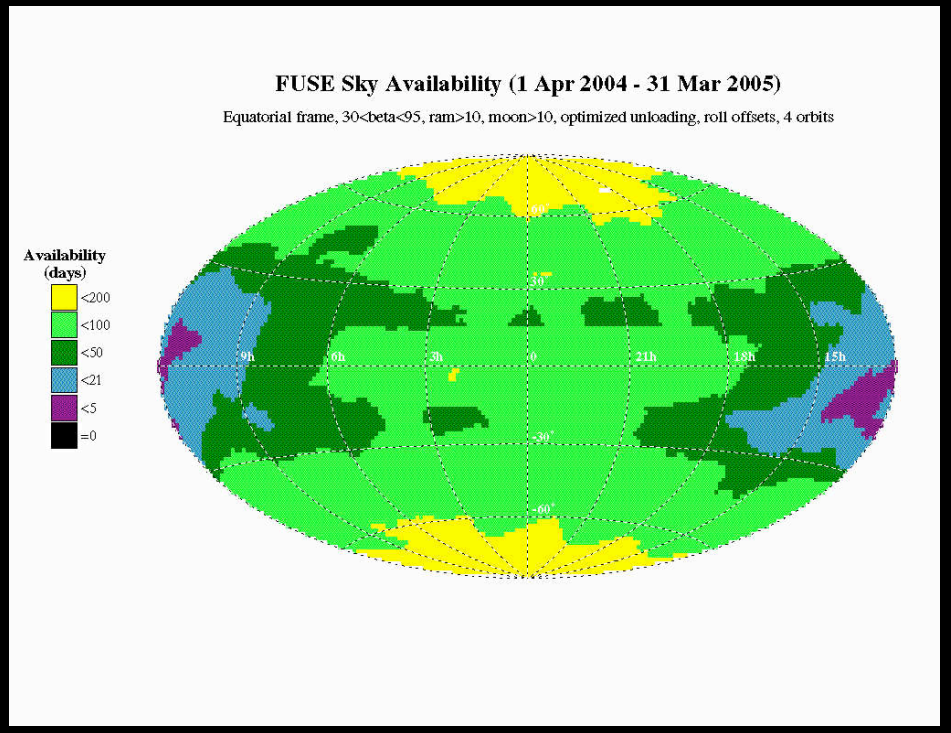
LWRS to MDRS Swaps



- Implemented in July 2004.
- Carefully reviewed science requirements of any/all current observations moved from LWRS to MDRS.
  - Doubled requested time only for targets with bona fide requirement for SiC coverage.
  - Set flag to use multiple Pkups per orbit.
  - Exempted SAFTSNPs and SiC-only bright target observations.
- ~100 observations affected; ~140 ks time impact.
- In Cycle 6 and beyond, require MDRS use for new HIST observations (I.e., require specific justification for new LWRS HIST requests).

Operations Status

- We have continued using two enhancements to improve sky availability:
  - Careful use of partially stable orbits.
    - Implemented “slow slew rate” for slews leaving marginal torque regions.
  - Use of positive roll offsets (up to 25 degrees).
    - Better MTB alignment to local B fields.
- As of now, sky coverage is as advertised for Cycle 6 NRA.



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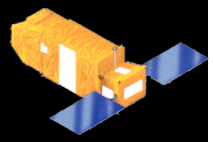
Operations Status, Gyros



- As of last FOAC, we were operating in 2-gyro mode on IRU-B.
- IRU-B developed a noisy pitch gyro, discovered Aug. 2004 (before it was a problem for operations).
  - Different gyro symptom than we had seen previously.
- Performance continued to degrade exponentially through August-September. (Chart-next page.)
- By mid-September, significant impacts seen for acq-reacqs and interplay between unloading and control functions.
  - Sept. 24th: IRU-B was power-cycled in attempt to reset the path-length controller circuit (dither mechanism--suspected problem).
    - No improvement was obtained.
- Sept. 28, 2004: transitioned to 1-gyro mode on IRU-B; have operated that way ever since. Guiding performance has been excellent. [chart]
- Except for minor tweaks to script timing and other parameters, operations have been nominal.
  - Slewing, unloading, target acqs-reacqs have been well-behaved.

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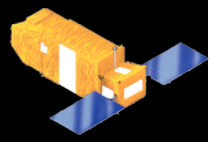
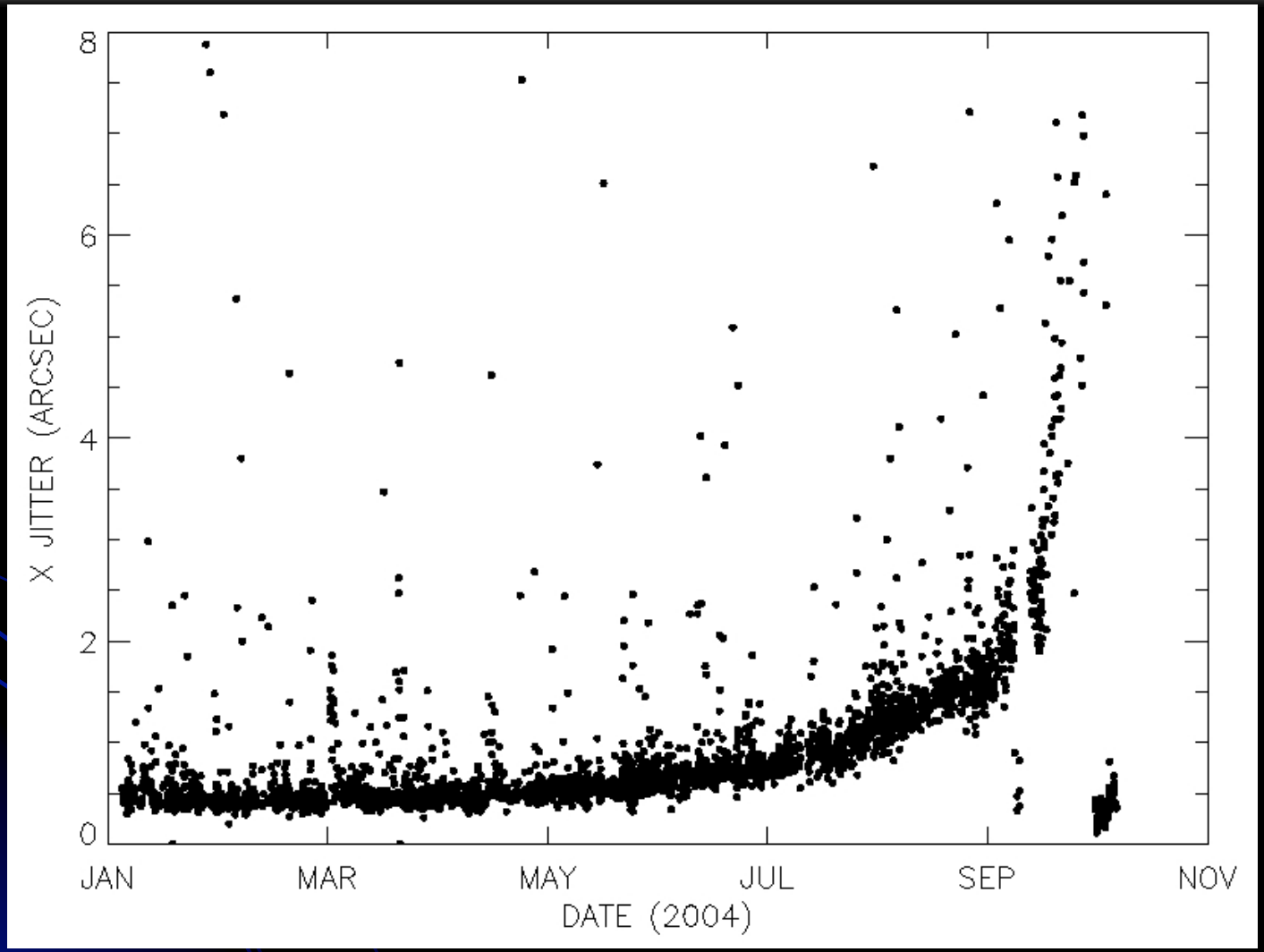
IRU-B Pitch Gyro Degradation





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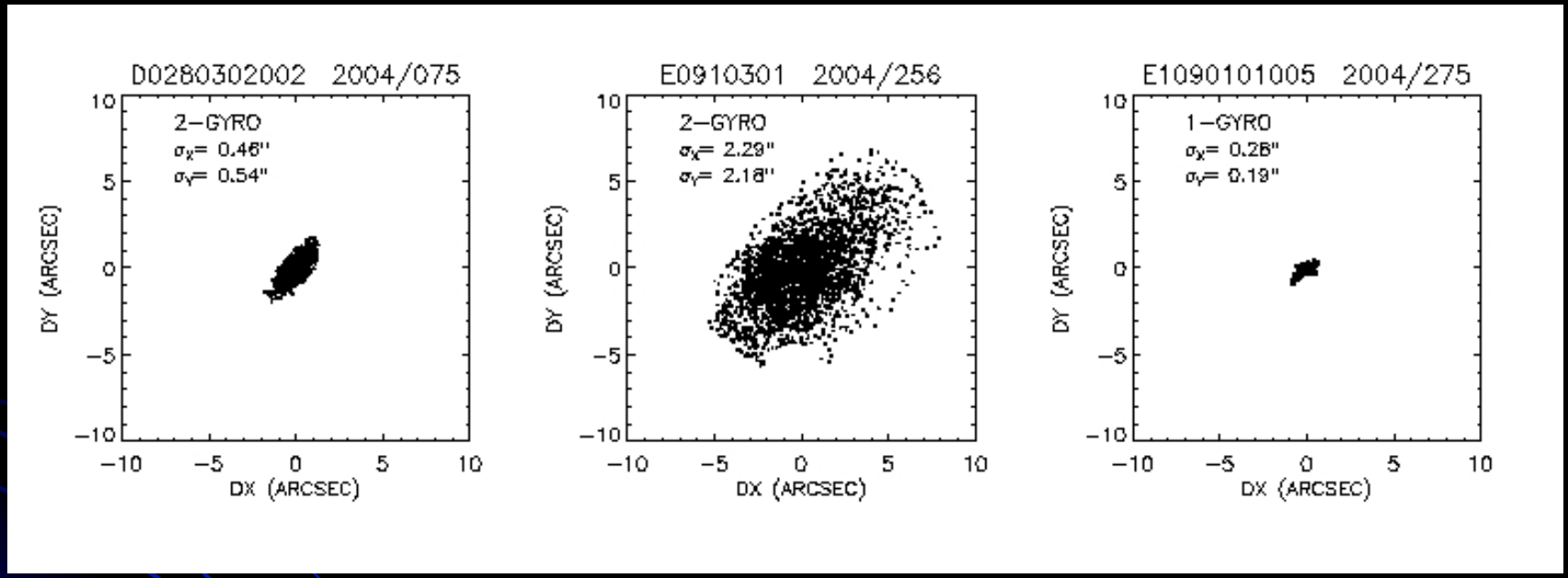
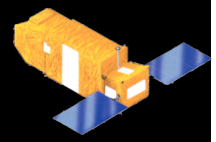
Jitter Examples



CalFUSE 3.0 Update

(Most info supplied by Van Dixon.)



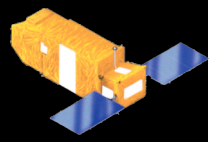
Since the April FOAC meeting:

- ✓ Upgraded OPUS and AUTODOG to support v3.0
- ✓ Completed a new set of calibration files (see ->)
- ✓ Ported CalFUSE v3.0 to the Mac.
- ✓ Released CalFUSE v3.0.7 in mid-August 2004.
- ✓ Released several updates to cf_edit.
- ✓ Began delivering v3.0 data to MAST in early Sept. 2004.

New Calibration Files:

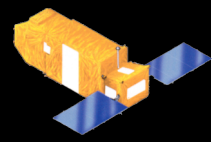
- New GEOM, PHAX, ASTG, and WAVE files improve resolution and wavelength calibration.
- VOLT - Detector HV raised in July
- MIRR - motion correction
- AEFF - New files for 2003-04
- BKGD - New files for 2003-04

CalFUSE: Ongoing Work



- Development of methods (and tools) to filter and combine IDF files.
- Wavelength-dependent effective-area curves for the entire mission.
- Improvements to on-line documentation of v3.0.
- PASP article on CalFUSE v3.0.
- Ongoing calibration file production and implementation (flux cal, backgrounds, etc.).
- Pipeline module(s) for overbright targets? [TBD]

Data Archiving and MAST



- All MAST raw files are v3.0 compatible.
- All but about 70 processed files are v1.8.7 or above.
- We are generating housekeeping files for all archival FUSE observations.
  - "Target of opportunity" temporary hire in control center.
- Problem discovered Sept. 2004: No IDF retrievals!
  - Discovered locally--had not heard from users. (Was it a problem and no one complained to us?)
    - Most users grab final processed data files?
  - Miscommunication with MAST; we thought this had been implemented. They now say the ICD needs to be updated before they will correct.
  - Testing covered ingest, but no testing of retrieval was possible prior to going live, and this apparently fell through the cracks.
  - Should be fixed by mid-November.

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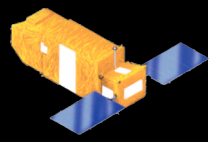
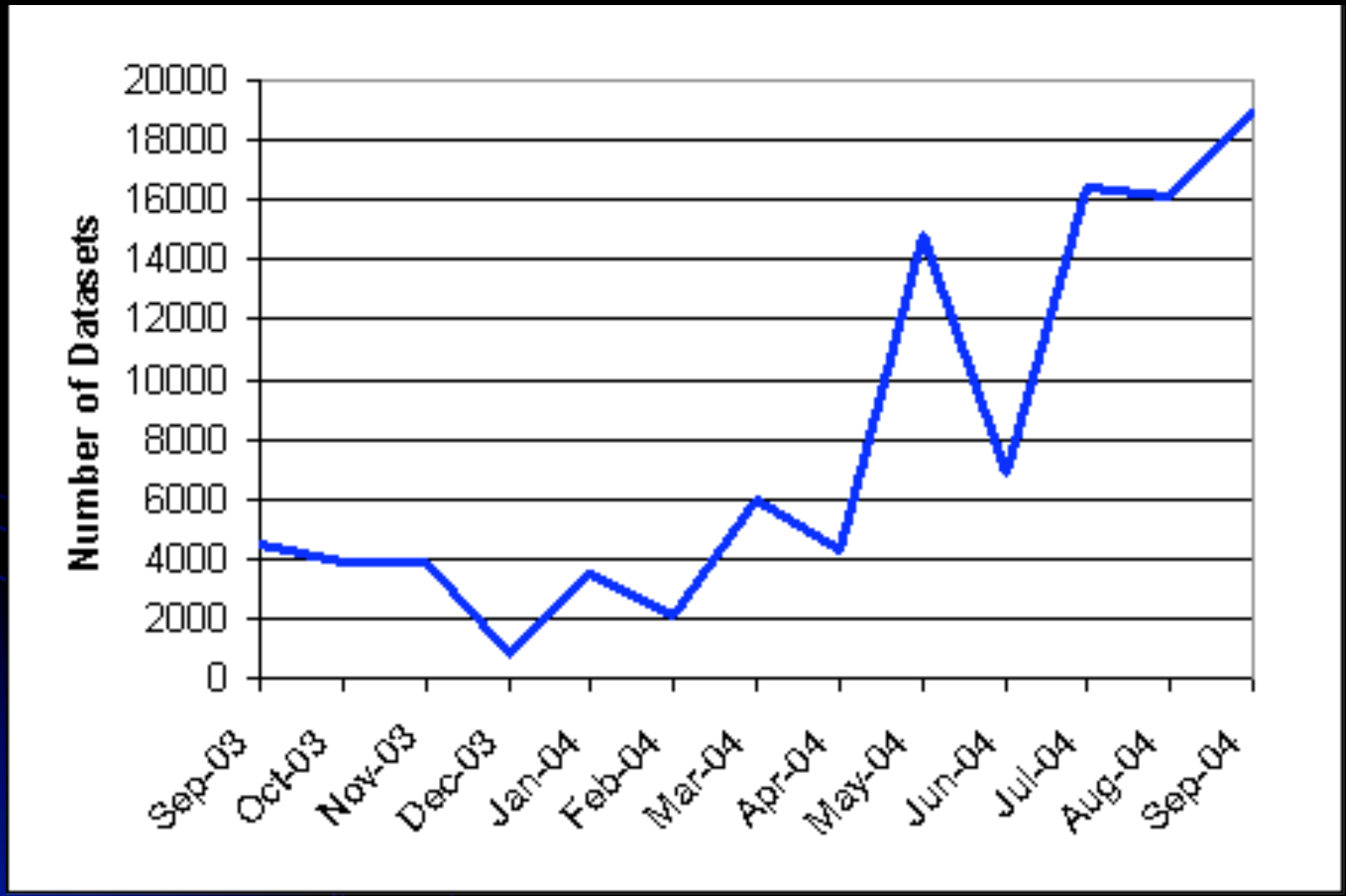
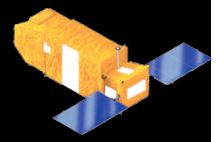
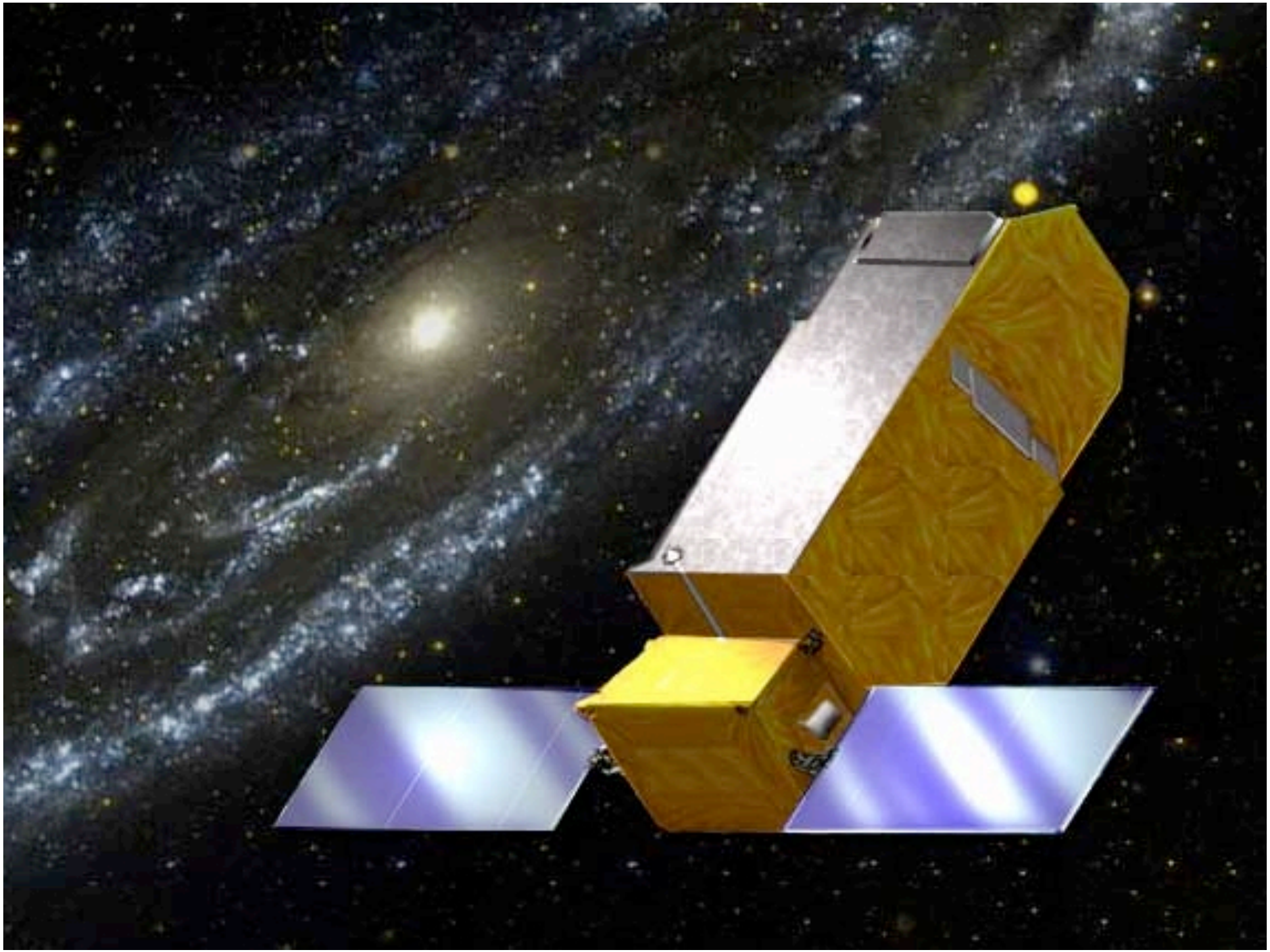
FUSE--MAST Retrievals





FUSE
Johns Hopkins University

Pending Work / Issues



- Alignment tools and modeling.
  - Feedback process to improve predictive motions.
  - Would improve alignments and data quality for everyone.
  - Might allow lowered frequency of alignment activities.
- Calibration file production: automate/streamline.
  - To ease burden on reduced staff downstream.
- Calibrations to improve final archive.
  - LSF characterization, “Worm” mapping, etc.
- Reprocessing/final archive of earlier data.
- 1-wheel contingency planning.
  - In project’s best interest to scope this out before it happens.
- E/PO activity: What can we improve or do differently?