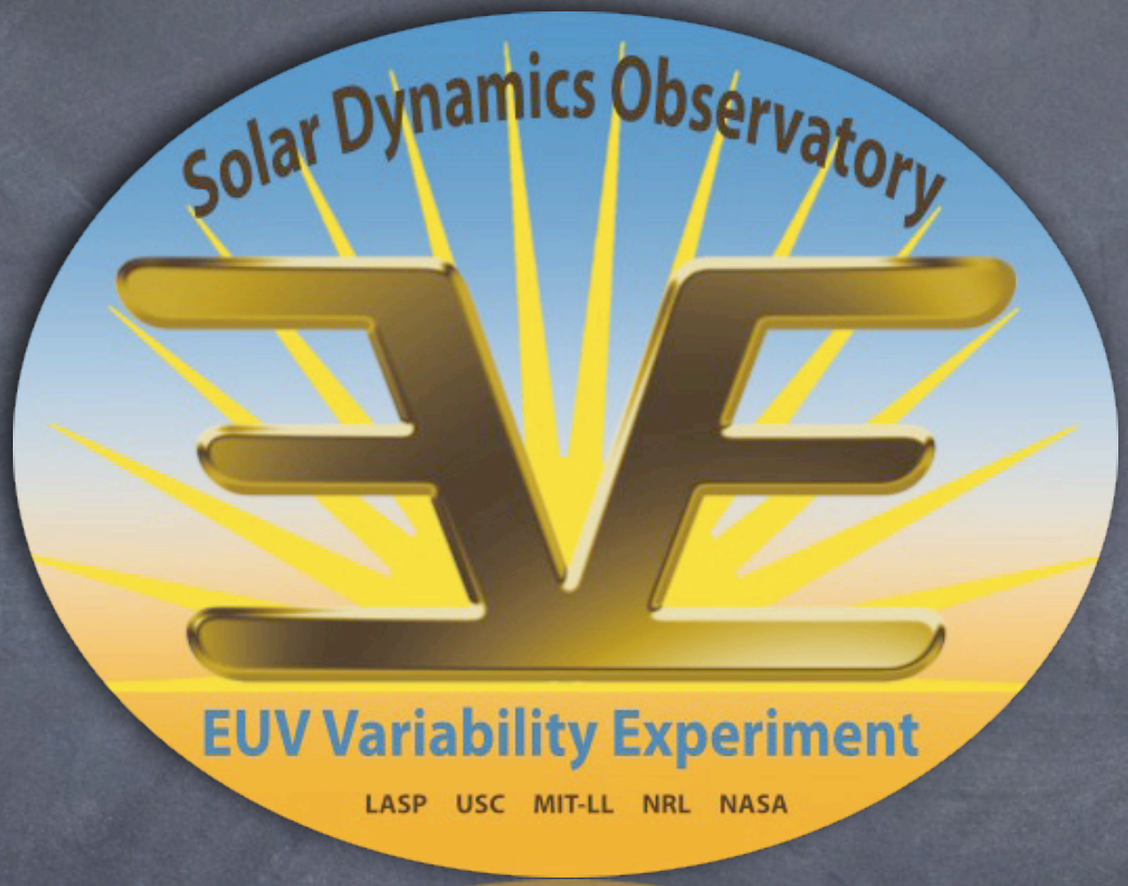
EVE Status



Andrew Jones and the EVE Team

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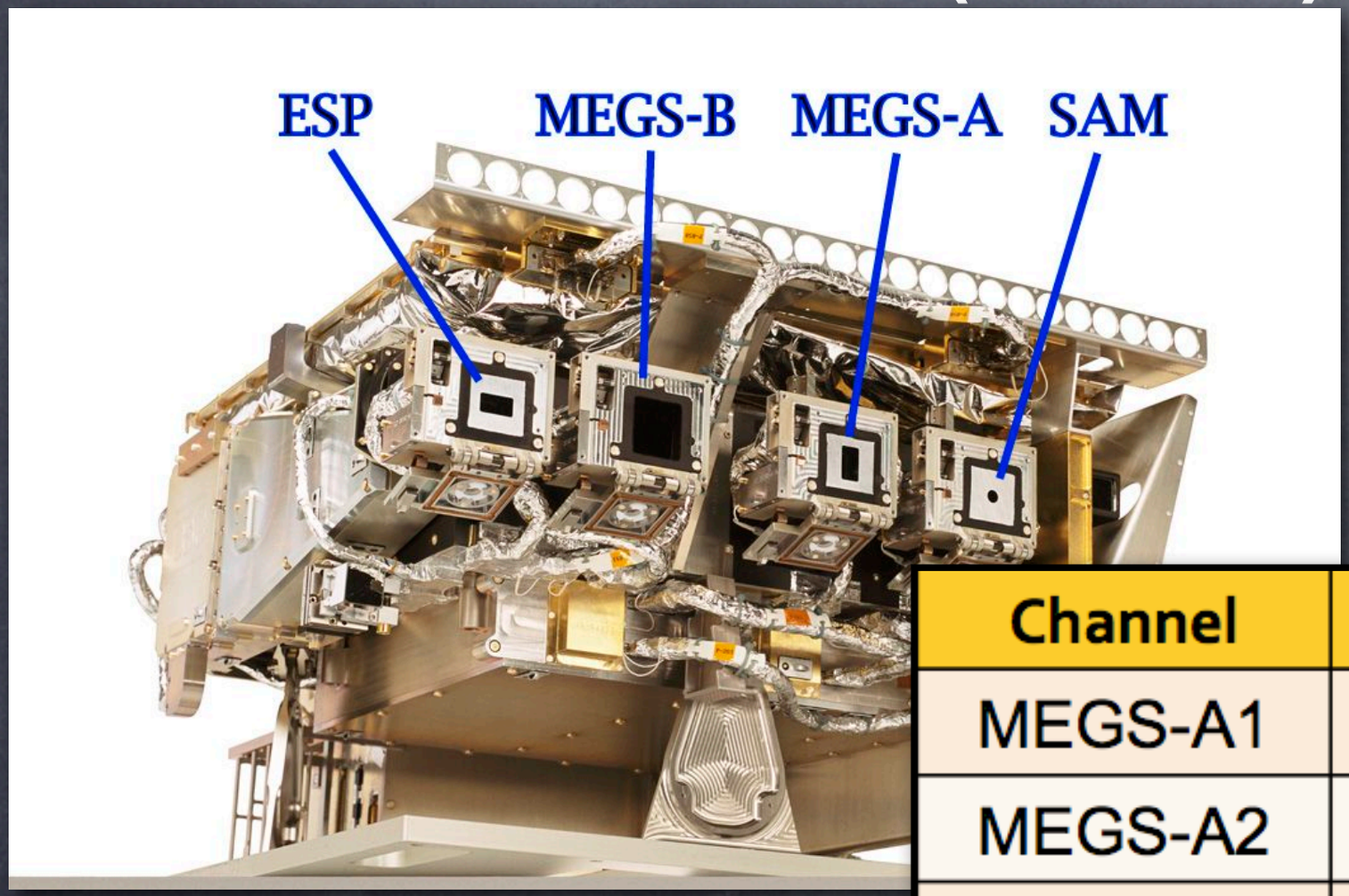
Thank You

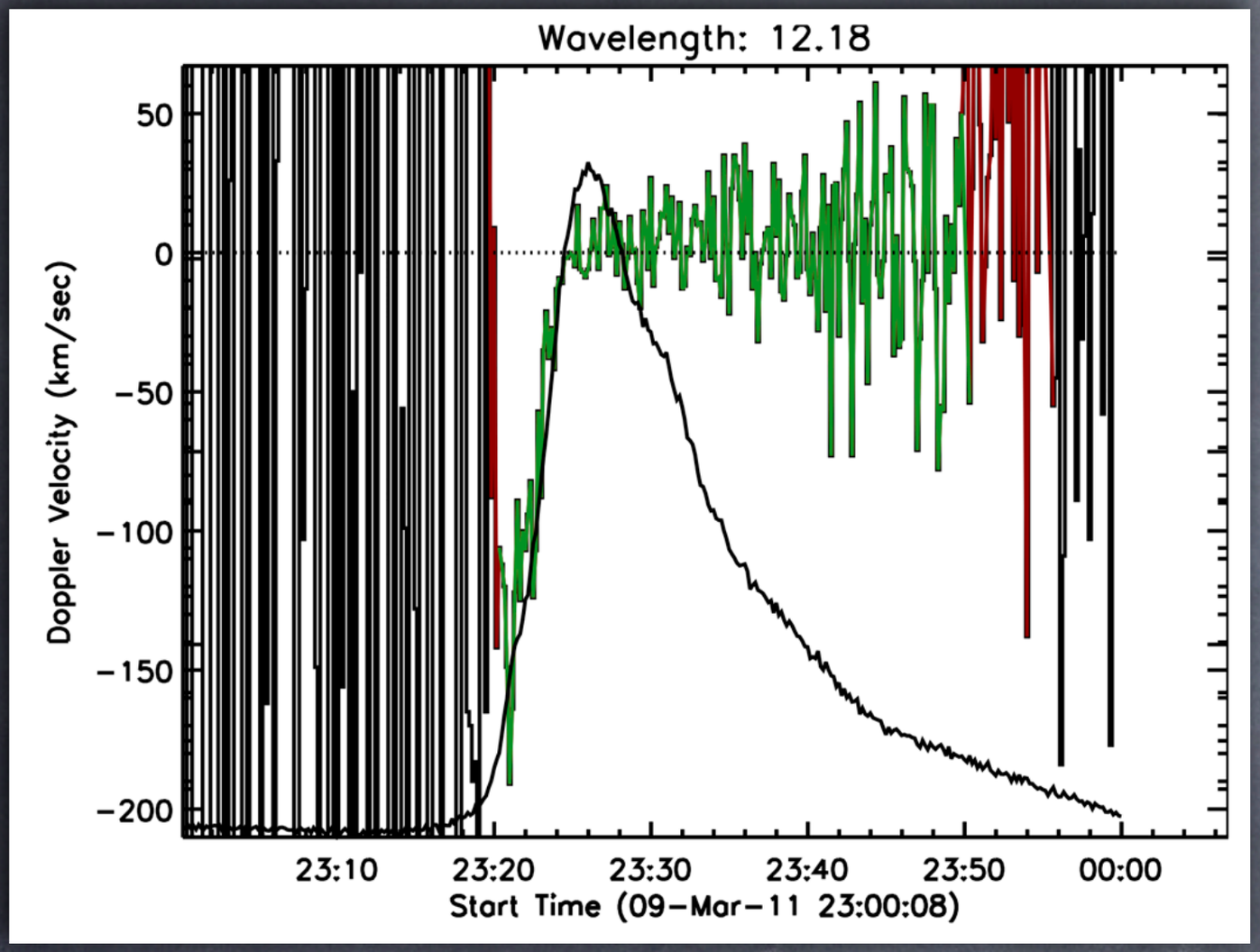
- **Marie** for all the work she put in after the ISSI proposal was rejected
- **STCE** for funding these workshops
  - This will allow us to make some real progress in the Solar EUV inter-comparisons and:
    - Understand and improve calibration methodologies
    - Understanding Degradation
    - Provide the community with a better data product
    - Build better instruments
- **PROBA2** for a G.I. grant that Don McMullin and I are using for LYRA degradation and absolute irradiance studies
- **All of you** for coming and helping with these problems!

EUV Variability Experiment (EVE)



Channel	λ Range	Δλ	Δt
MEGS-A1	6-18 nm	0.1 nm	10 sec
MEGS-A2	18-37 nm	0.1 nm	10 sec
MEGS-B	37-106 nm	0.1 nm	10 sec
MEGS-SAM	0.1-7 nm	(1 nm)	10 sec
MEGS-P	121.6 nm	1 nm	0.25 s
ESP	0.1-38 nm	4 nm	0.25 s

EVE Doppler Shifts

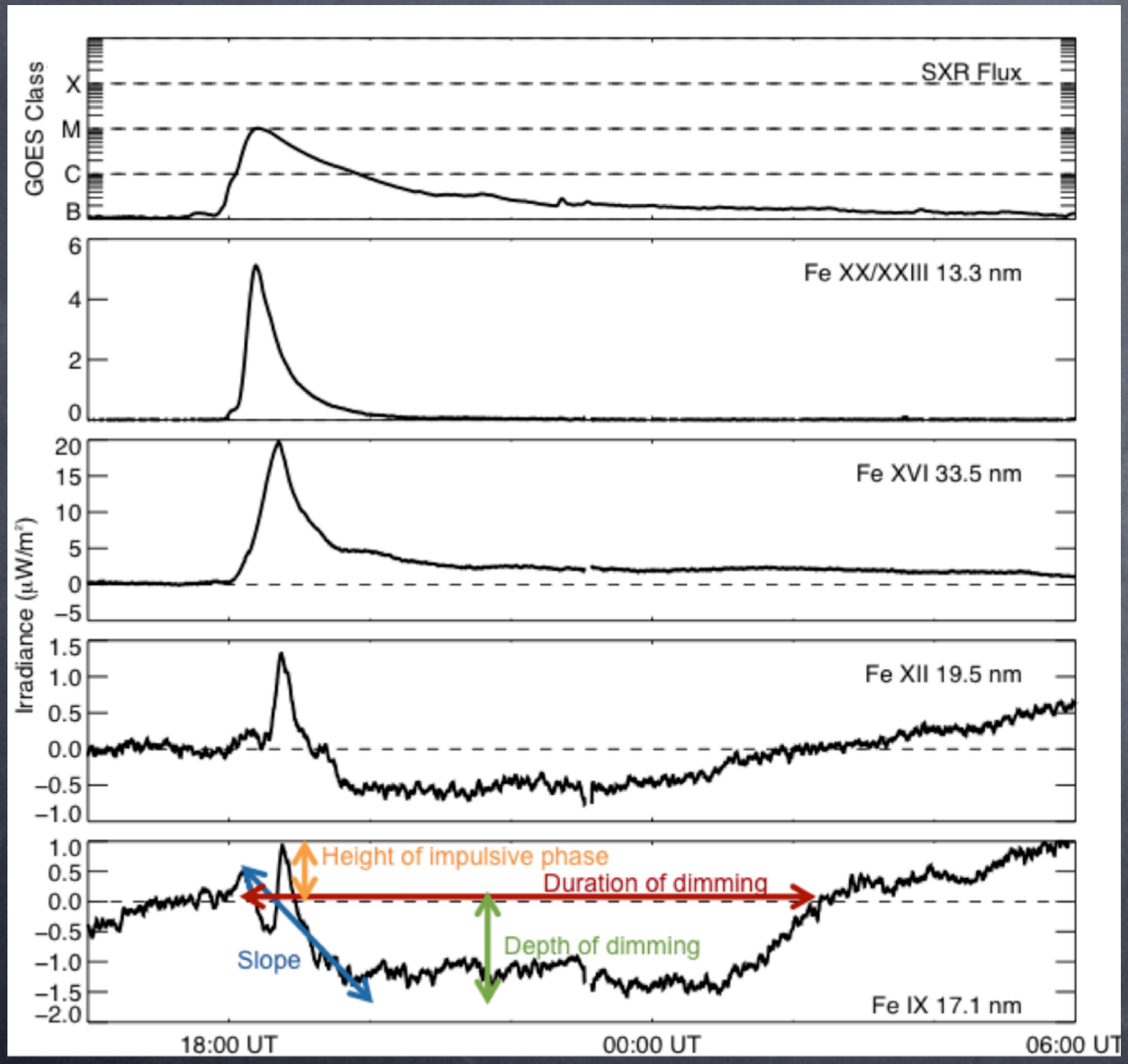


- EVE observes Doppler shifts during flares
- Works well at disk center
- More complicated for flares off disk-center due to instrumental optical wavelength

Hudson et al,, *Solar Physics*, **273**, 2011

Phil Chamberlin's talk later this afternoon

Disc-Integrated Dimming



See Poster by Mason et al. for more information

Dimming Mechanisms

- Mass loss (core)
- Thermal-evolution
- Wave
- Obscuration
- Doppler shift

What can this tell us about CMEs ?

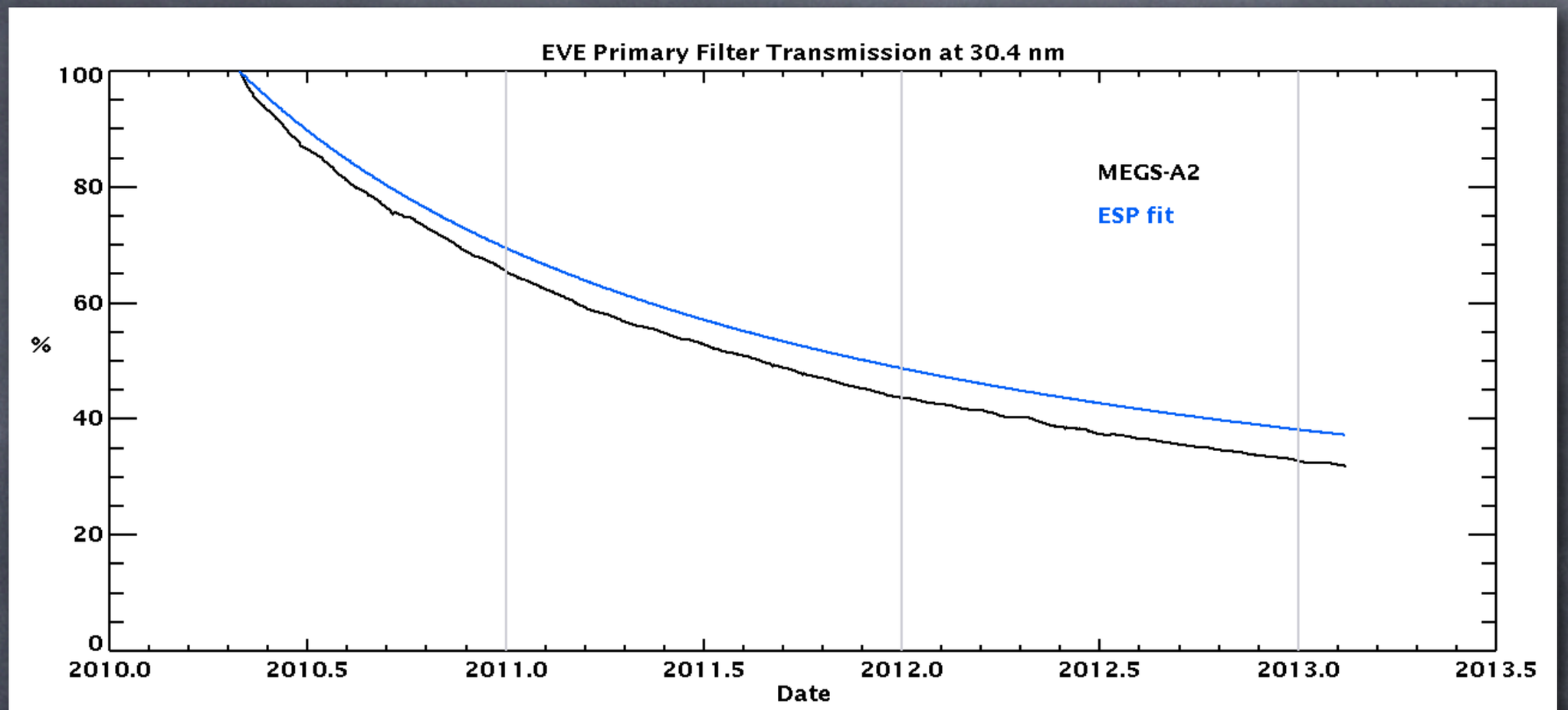
Degradation Tracking

- MEGS-A1 3 × Zr Filters: Full time, Daily and Weekly (5min)
- MEGS-A2 3 × Al Filters: Full time, Daily and Weekly (5min)
- ESP 3 × Al Filters: Full time, Daily and Weekly (5min)
- SAM Stray-light filters
- MEGS A & B Detector flat-fields: blue and violet LEDs
- Long-term tracking with calibrated sounding rocket instrument.

Problems After 3 Years

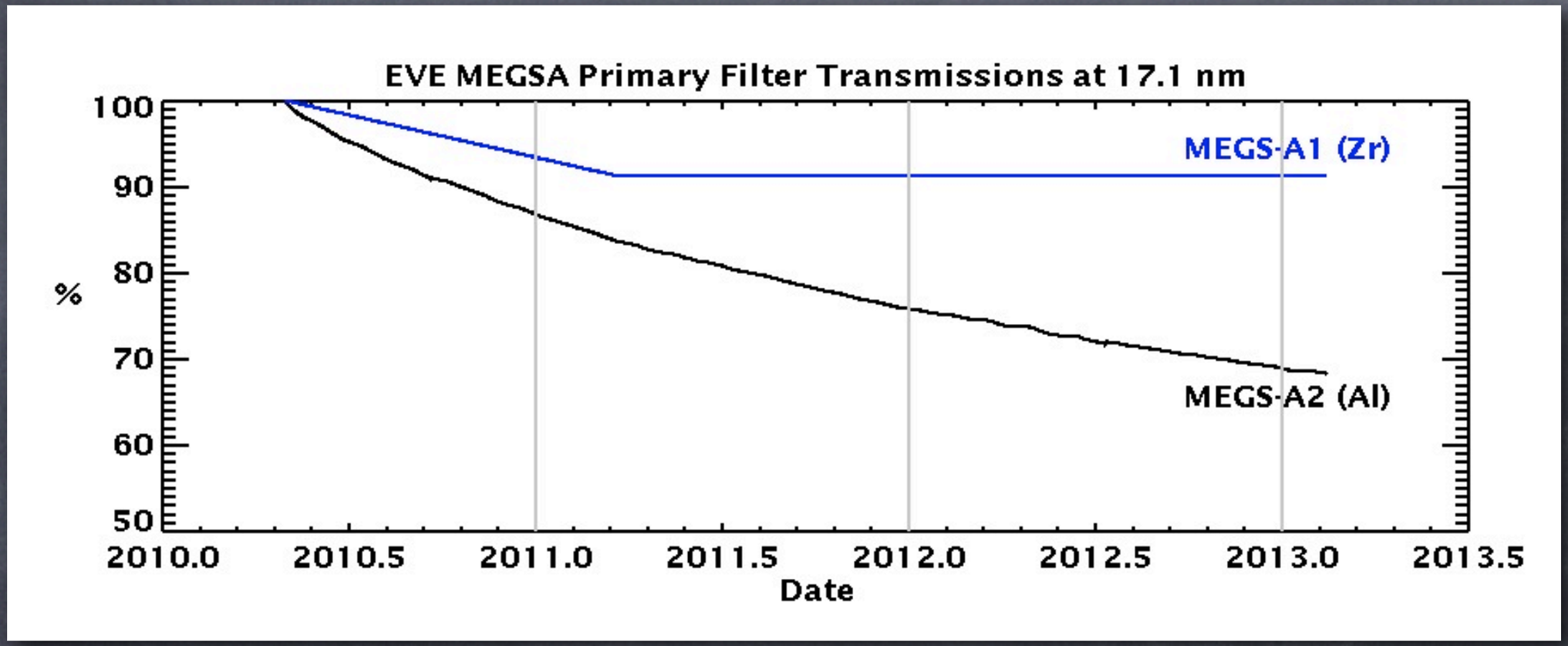
- On Orbit:
  - S/C Thermistor loss: Use backup—**No Impact on EVE**
  - MEGS-A Filter degradation: Track and correct
  - CCD degradation: Modified MEGS-B operations, improved analysis procedures and correct
- Ground:
  - Ground processing: Various H/W problems... fix as needed
  - GSE Rocket Calibration H/W: Fix and replace as needed

MEGS-A Filter Degradation



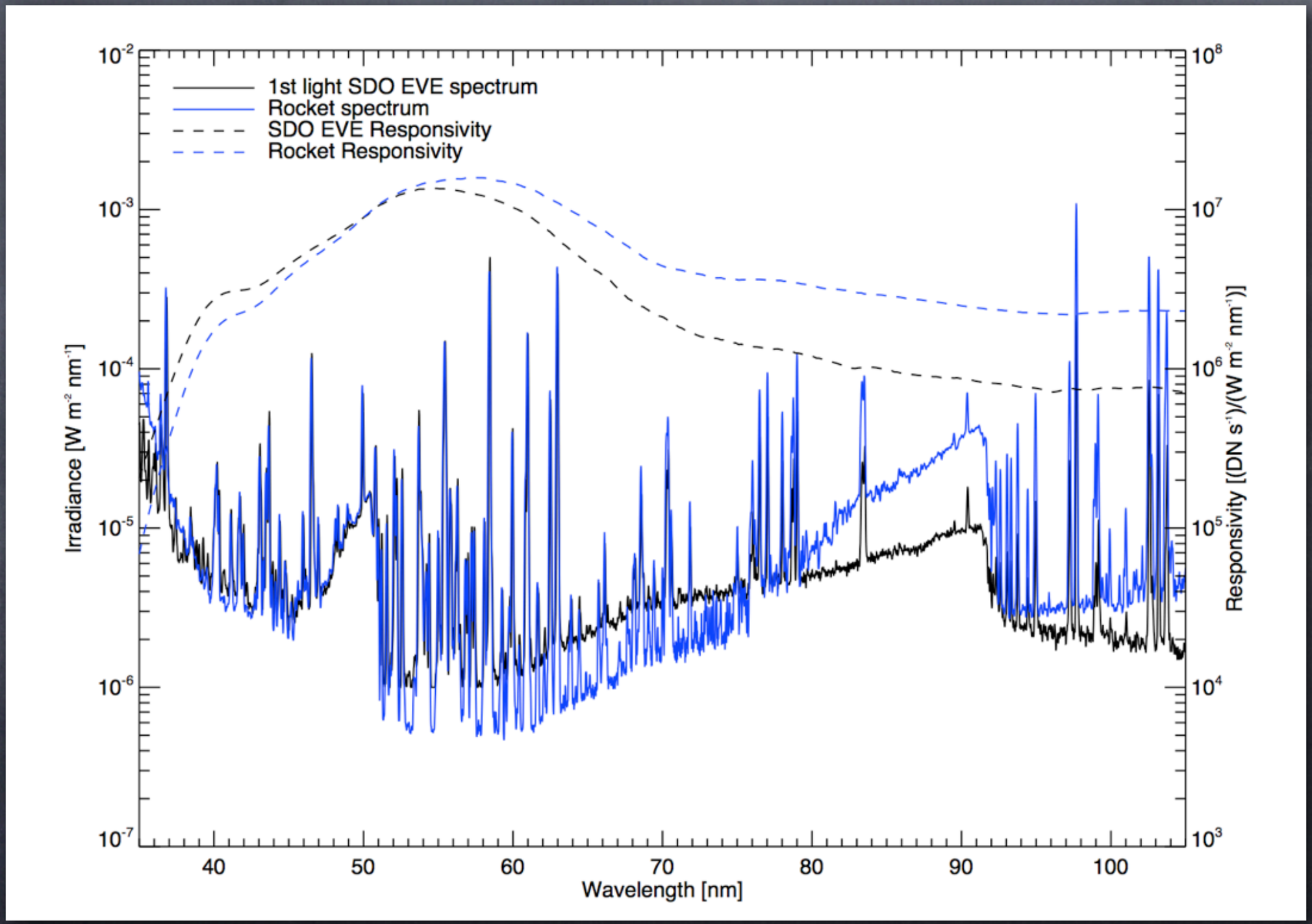
- Degradation is exposure related
  - Track degradation with Daily and Weekly calibrations with secondary and tertiary filters
  - Rockets track any residual degradation

MEGS-A1 -A2 Filter Degradation Comparison

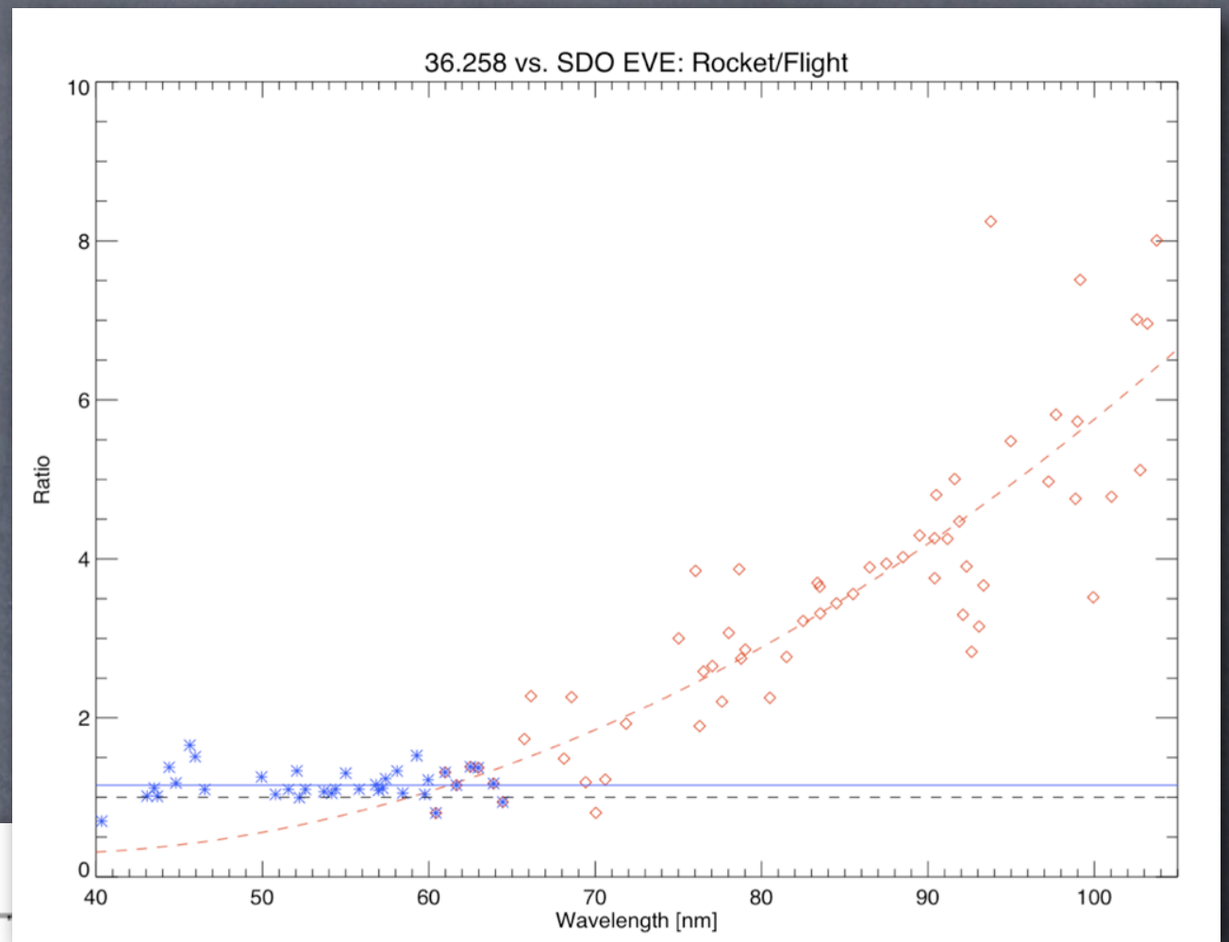


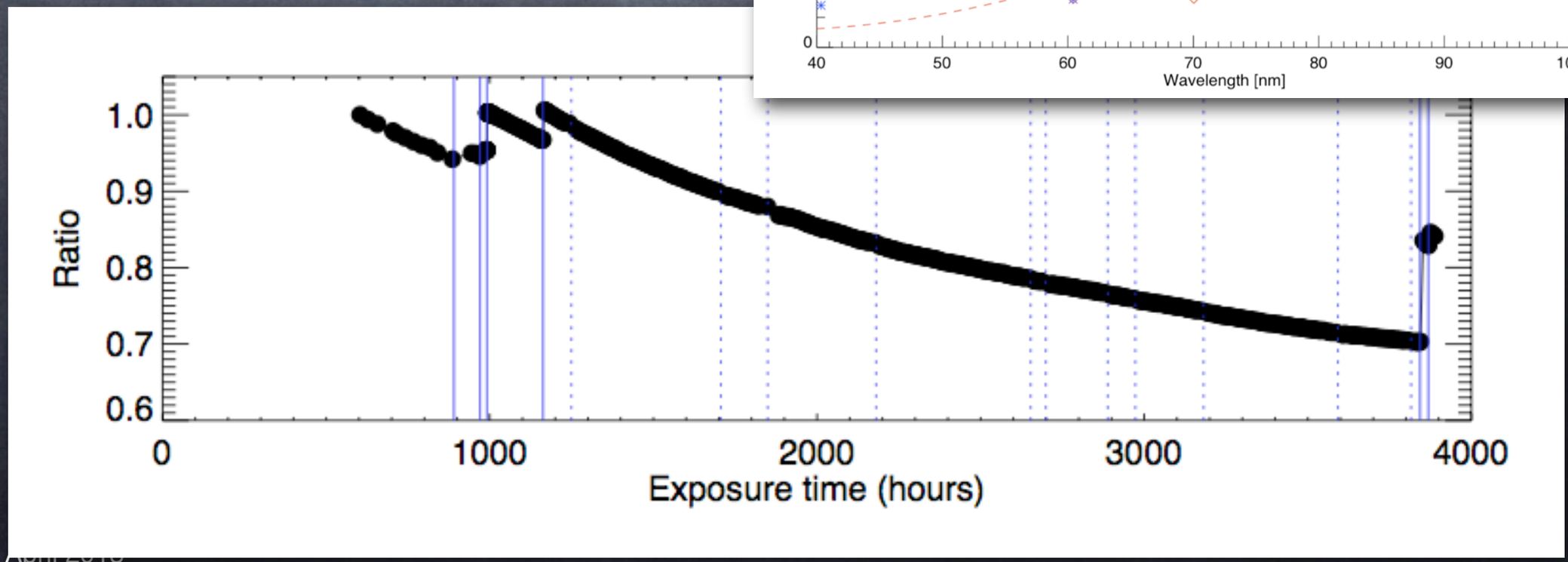
- Why are Al and Zr filter degradations so different ?
  - Thermal / Charging / ???
  - Is this the same as we see on LYRA?

MEGS-B First Light

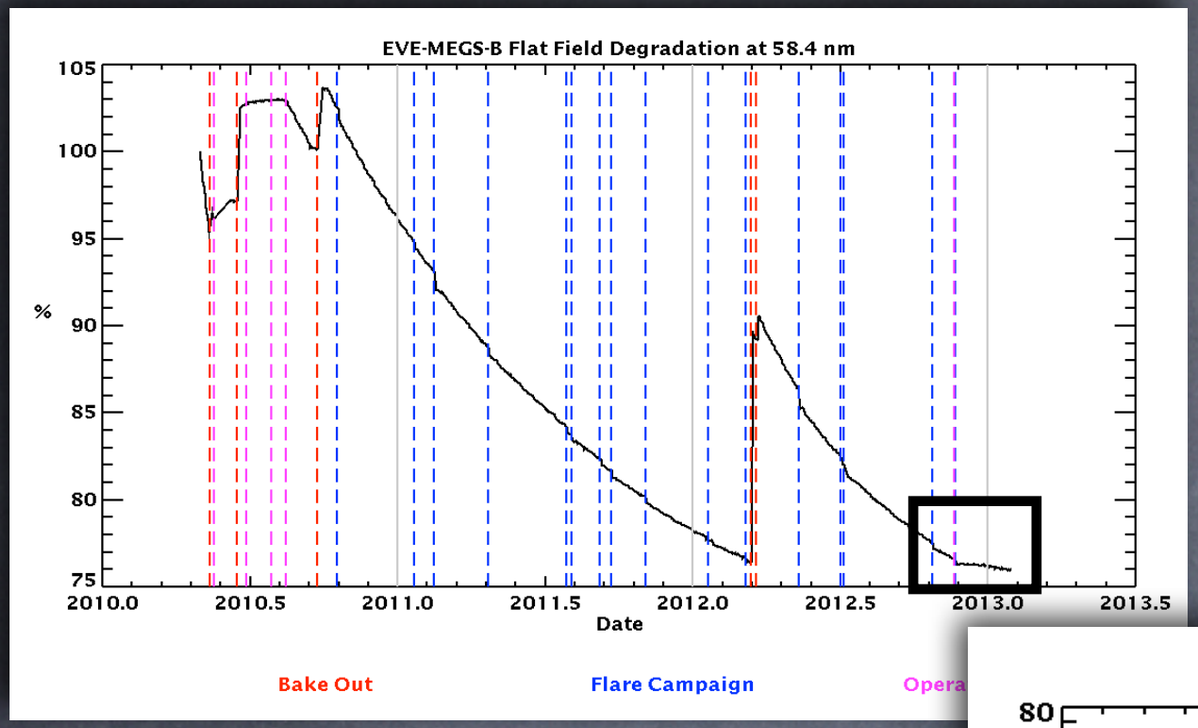


MEGS-B Degrdation





MEGS-B Degradation



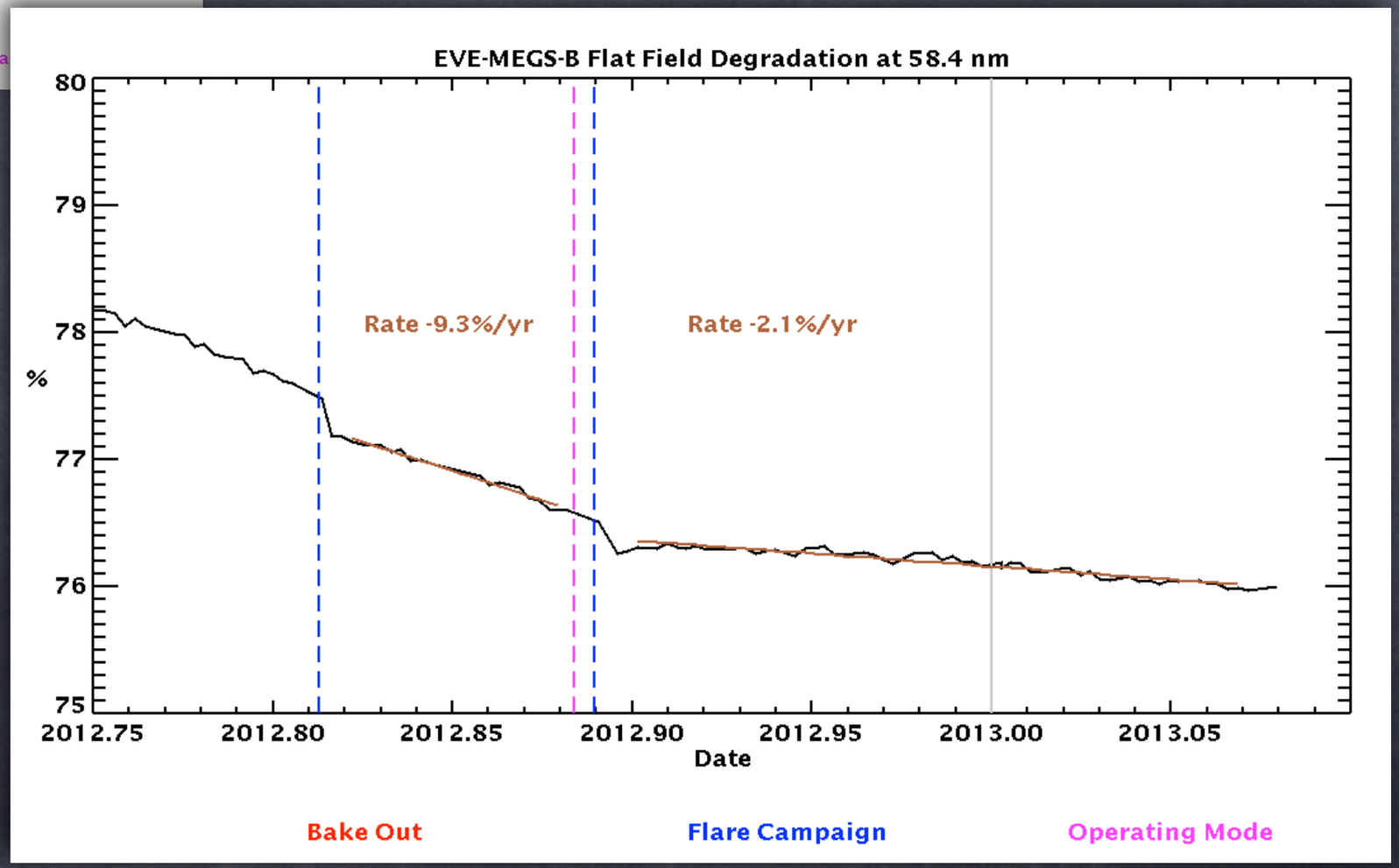
Changed Operating Mode

Nov. 19th. 2012 (d324)

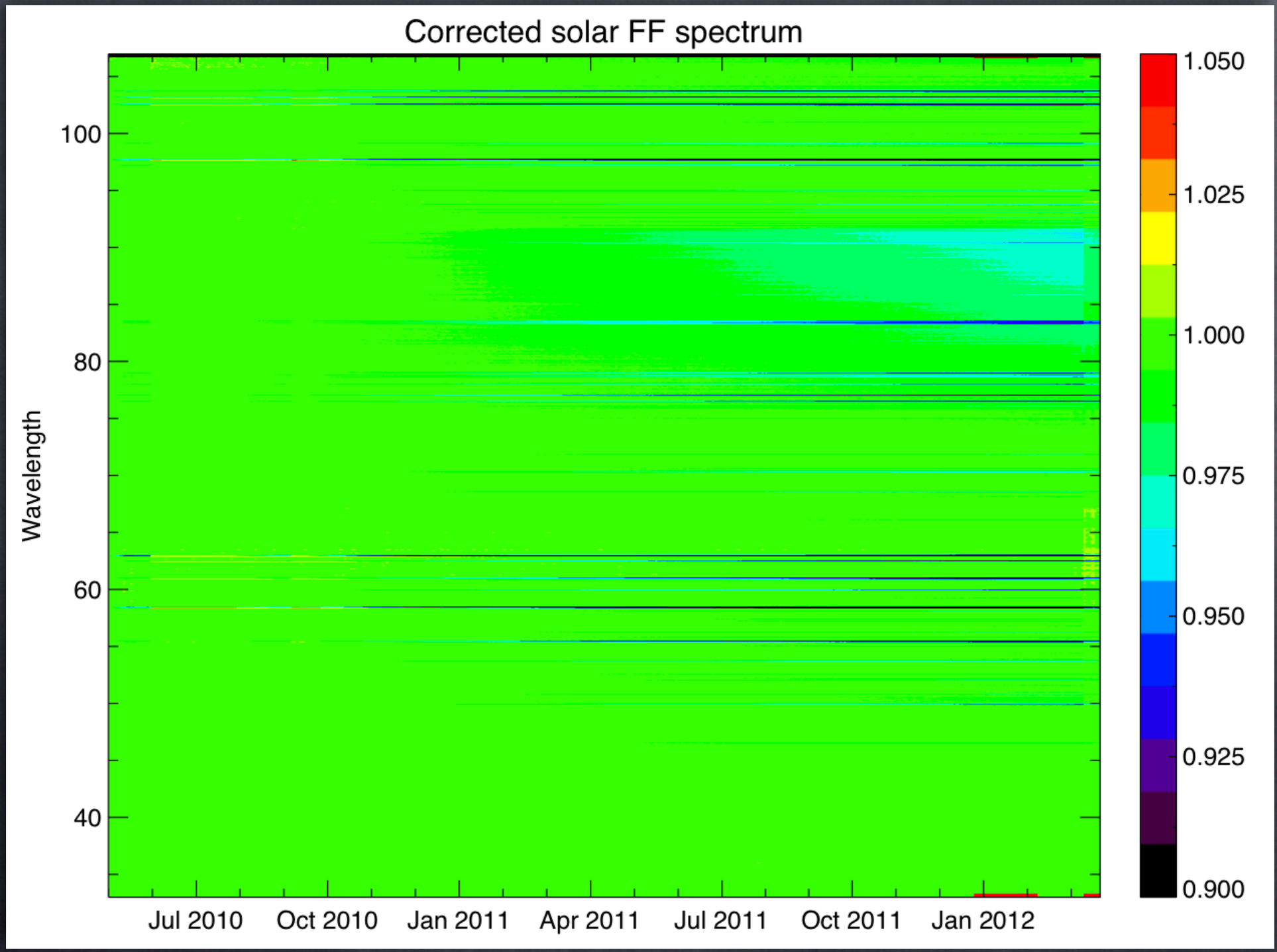
Was: 5 hrs./day

Now: 2 hrs./day

- Degradation is exposure and wavelength dependent
- He I 58.4 nm is worst case



MEGS-B Flat FieldDegradation



Why Change MEGS-B Operations?

- Reduce degradation while still providing required data to atmospheric community
- Don't want more bakeouts
  - Not as much signal recovery as hoped
  - Very difficult to correct
  - Affects MEGS-A as well
- Flare Campaigns and Joint Observations will continue

EVE Data and Products

- Version 3 data (release March 8th.) lasp.colorado.edu/home/eve/data/data-access/
  - Improved degradation correction
  - Improved spectral uncertainties (still a work in progress)
- Space Weather Products lasp.colorado.edu/home/eve/data/eve-spaceweather-data/
  - L0C Spectra available with Version 3
  - Improved XRS-Long proxy
  - SOHO-SEM proxy
  - Working on XRS-Short proxy
- SolarSoft EVE routines available

Soft X-Ray Spectrum

- Modify Rocket-SAM:

Transmission Grating

Ti/Al filter Pinhole CCD

- Fly commercial Amptek X123-SDD and PINSpectrometer

Progress on LYRA Inter-Comparisons

Andrew Jones and Don McMullin

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LYRA Inter-Comparisons

- Don McMullin & I worked here last week
- GOAL 1: Determine LYRA Degradation (λ , t)
- GOAL 2: Determine absolute calibrations of LYRA
- With lots of help from Marie, Ingolf and the LYRA team:
  - Use only Al and Zr channels (to start with)
  - Started with TIMED-SEE data to look at LYRA degradation early in the mission
  - Use 2 separate, but related methods

EVE, TIMED, SEM, LYRA Inter-Comparisons

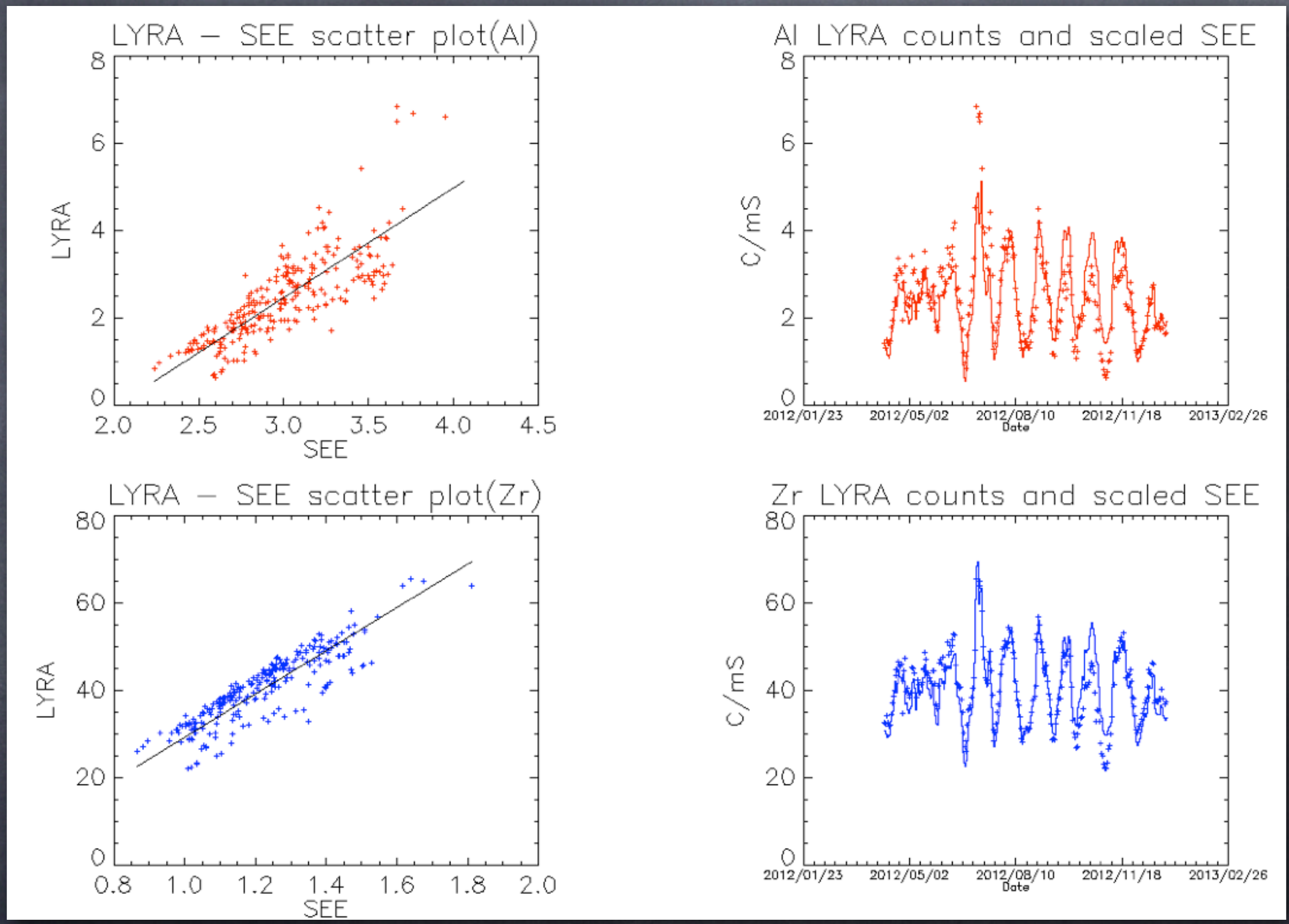
- 2-Pronged approach:
  - Understand the Instruments and degradations
    - Correct for degradation
  - Use the time-dependant specra
    - Correct for degradation

- Use LYRA level 1 counts, corrected for dark and 1AU
  - L.A.R. data removed automatically
  - Median the whole day
- Use SEE V11 L3 Daily averages, summed to LYRA channels
- When available EVE V3 L3-merged 1nm, summed to LYRA channels

Instrument Inter-Comparisons

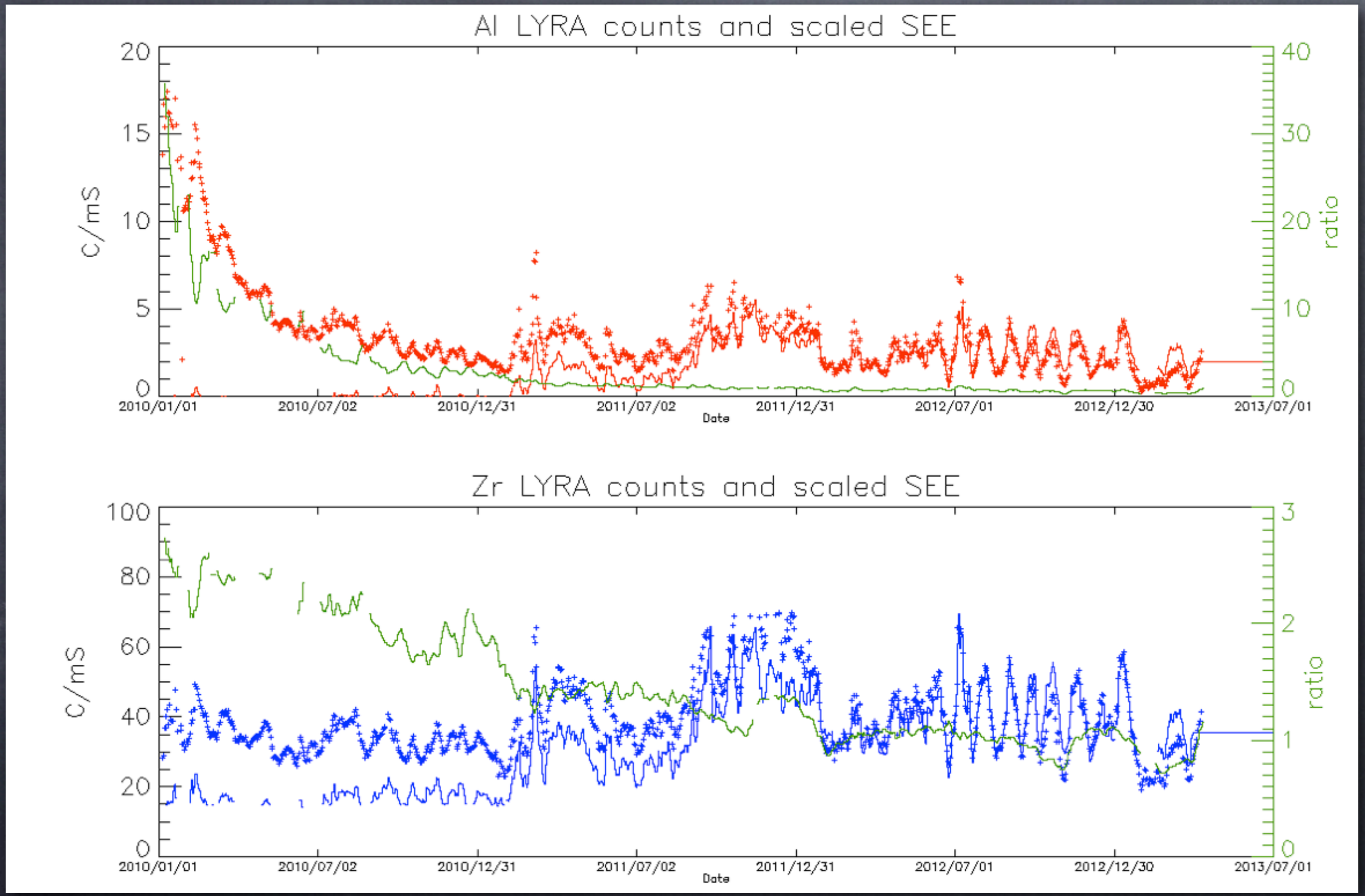
- Counts = $\alpha \times \int \xi(\lambda) \times \phi_{\odot}(\lambda) \times D(\lambda)\, d\lambda$
  - α = Area × R_{fb} / G_{vfc} and $\xi(\lambda)$: Have been measured
  - Select pairs of days with nearly the same solar activity (check for the same spectrum $\phi_{\odot}(\lambda)$)
  - Result should be the same counts, with difference due to degradation: $D(\lambda, \Delta t)$
  - Looks good for LYRA-Al Channel
  - LYRA-Zr channel shows residuals that look like solar soft X-ray signal

TIME-DEPENDENT SPECTRA



- Match 27d rotations
  - 27 day rotation shape is a good start to get the spectral content

TIME-DEPENDENT SPECRA (2)



Then look at the rest of the time series

Conclusions So Far

- Identified possible contaminants responsible of LYRA degradation, as the Silicone RTV566 and Epoxy AV138 / HV 998, both in the front door mechanism
- Both approaches look promising, need to continue on and get to the ‘iterate’ part of the work

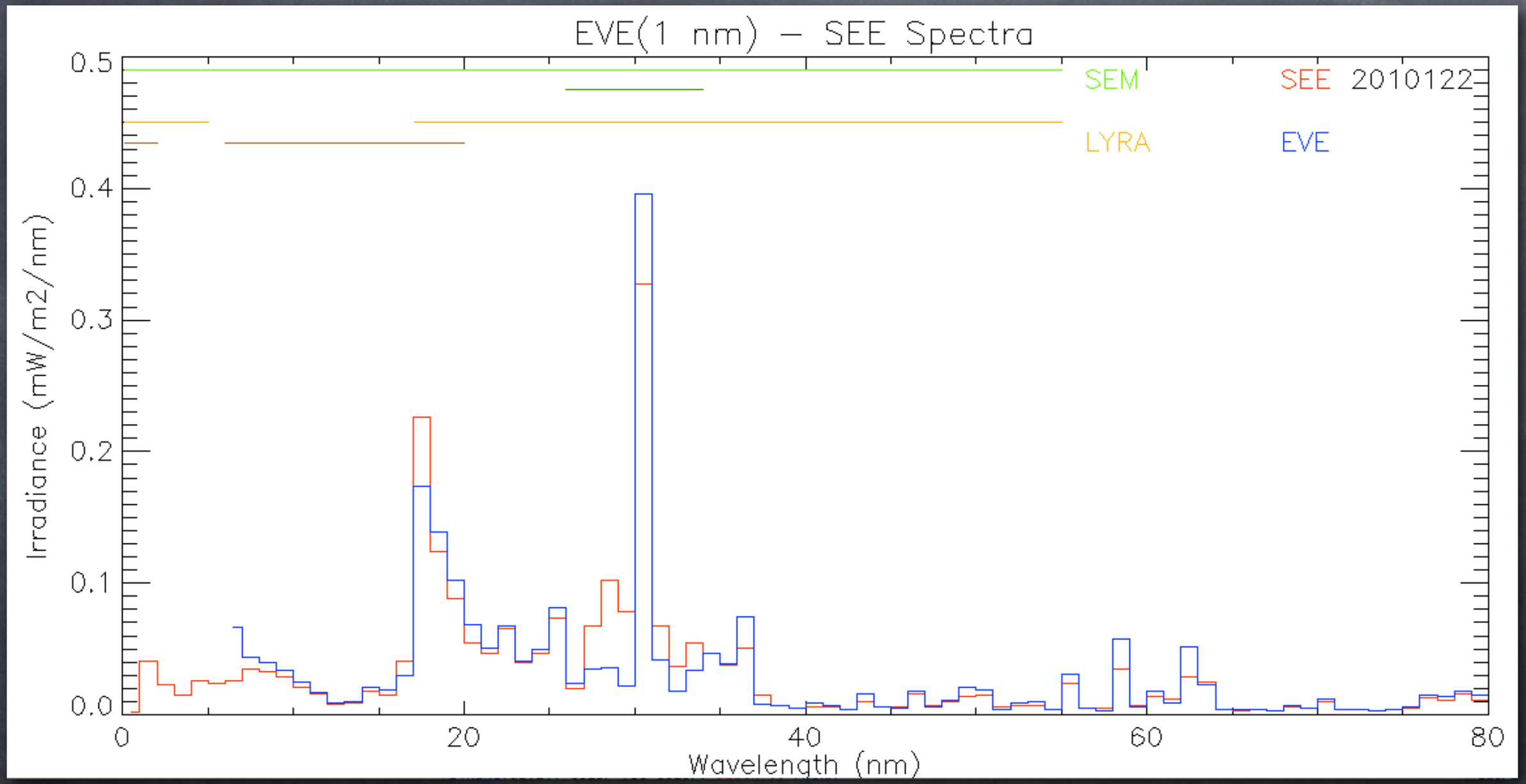
EVE Level Definitions

Level	Description	Components	Wavelength Coverage	Wavelength Sampling	Temporal Sampling	Time Span of Data File	Daily size (GB)	Latency of Availability
L0C	Space Weather Product: Crudely calibrated irradiances* (from Ka-Band data)	ESP bands + quad (flare location)	0.1-7, 18.2, 25.6, 30.4, 36.6 nm	broadband ~4-nm	1-min	Latest 15-min and current 1-day (growing file)	0.004	<15 min
		MEGS-P	121-122 nm	1-nm				
		MEGS-A, B	6-106 nm	1-nm	1-min		0.005	
		MEGS-A, B, proxies	Select lines and bands**	Varies by band	1-min		0.01	
L0CS	Fastest Space Weather Product: Crudely calibrated irradiances* with least latency (from S-Band)	ESP bands + quad (flare location)	0.1-7, 18.2, 25.6, 30.4, 36.6 nm	broadband ~4-nm	1-min	Latest 15-min and current 1-day (growing file)	0.005	< 1 min
		MEGS-P	121-122 nm	1-nm				
		XRS & SEM proxies	Proxies	Varies by band				
L1	Photometer Data: fully calibrated and corrected photometer irradiances	ESP	0.1-7, 18.2, 25.6, 30.4, 36.6 nm	~4-nm	1/4-sec	1-hour	0.03	1 Day
		SAM	0.1-7 nm	7-nm	1- & 5-min		varies	
		MEGS-P	121-122 nm	~1-nm	1/4-sec		0.006	
L2-S	Spectra: fully calibrated and corrected spectral irradiances at instrument resolution	MEGS-A, B	6-106 nm	0.02 nm	10-sec	1-hour	1.2	1-2 Day
L2-L	Lines & Broadband irradiances: fully calibrated and corrected photometer irradiances and extracted spectral lines and bands	MEGS-A, B, P, ESP	select lines & bands	Varies by band	10-sec	1-hour	0.01	1-2 Day
L3	Merged Spectra: fully calibrated, corrected, and merged spectral irradiances	ESP, SAM, MEGS-A, MEGS-B, MEGS-P	0.1-106 nm	0.02, 0.1 & 1 nm	1-day	1-day	<0.001	1-2 Day

Data Sets:

- **LYRA**: Since Jan 2010: Look at Al and Zr bands
- **SEM**: ~17 year record.
  - Degradation rate is now very slow and measured with rockets
  - 0.1-- 50 nm (just like LYRA Al) and 26--34 nm
- **TIMED-SEE**: ~10 year record
  - Degradation rate is now very slow and measured with backup channels and rockets
  - 1nm spectra, but models below 27 nm, and LEO orbit does not give very good solar viewing
- **EVE**: since May 2010
  - 0.02 nm spectra at 10 s cadence
  - CCD problems mean spectra > 36 nm are not as frequent
  - Nothing short of 5.5 nm

Typical Quiet-Day Spectra



- SEE Version 11 Level 3
- EVE Version 3 Level 3 (from merged data set)