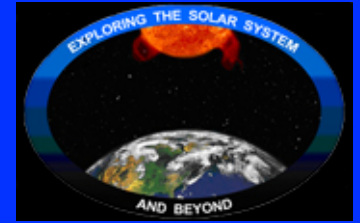


# MEGS – ESP Comparison through August 2012

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EVE Calibration Workshop  
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Tuesday, Oct. 30, 2012

# Instruments



**MEGS** – Multiple EUV grating Spectrograph:

**MEGS-A:** grazing incidence grating spectrograph for 5 nm to 37 nm range

**MEGS-B:** double normal-incidence grating spectrograph for 35 nm to 105 nm

**ESP** – EUV Spectrophotometer has 9 Si photodiodes behind a transmission grating:

**ESP#1:** 33.3-40.04 nm bandpass

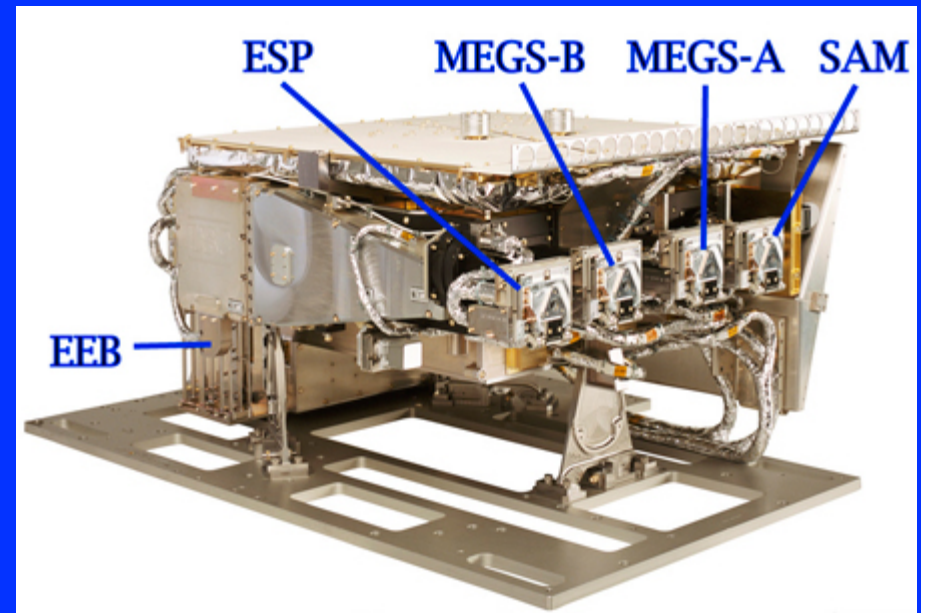
**ESP#2:** 22.28-28.78 nm bandpass

**ESP#3:** dark photometer to measure particle background

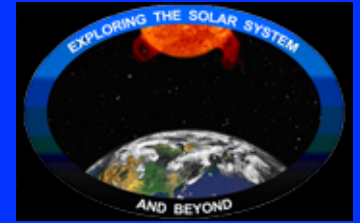
**ESP#4, 5, 6, & 7:** 0.1-7 nm bandpass

**ESP#8:** 16.64-21.5 nm bandpass

**ESP#9:** 27.16-33.8 nm bandpass

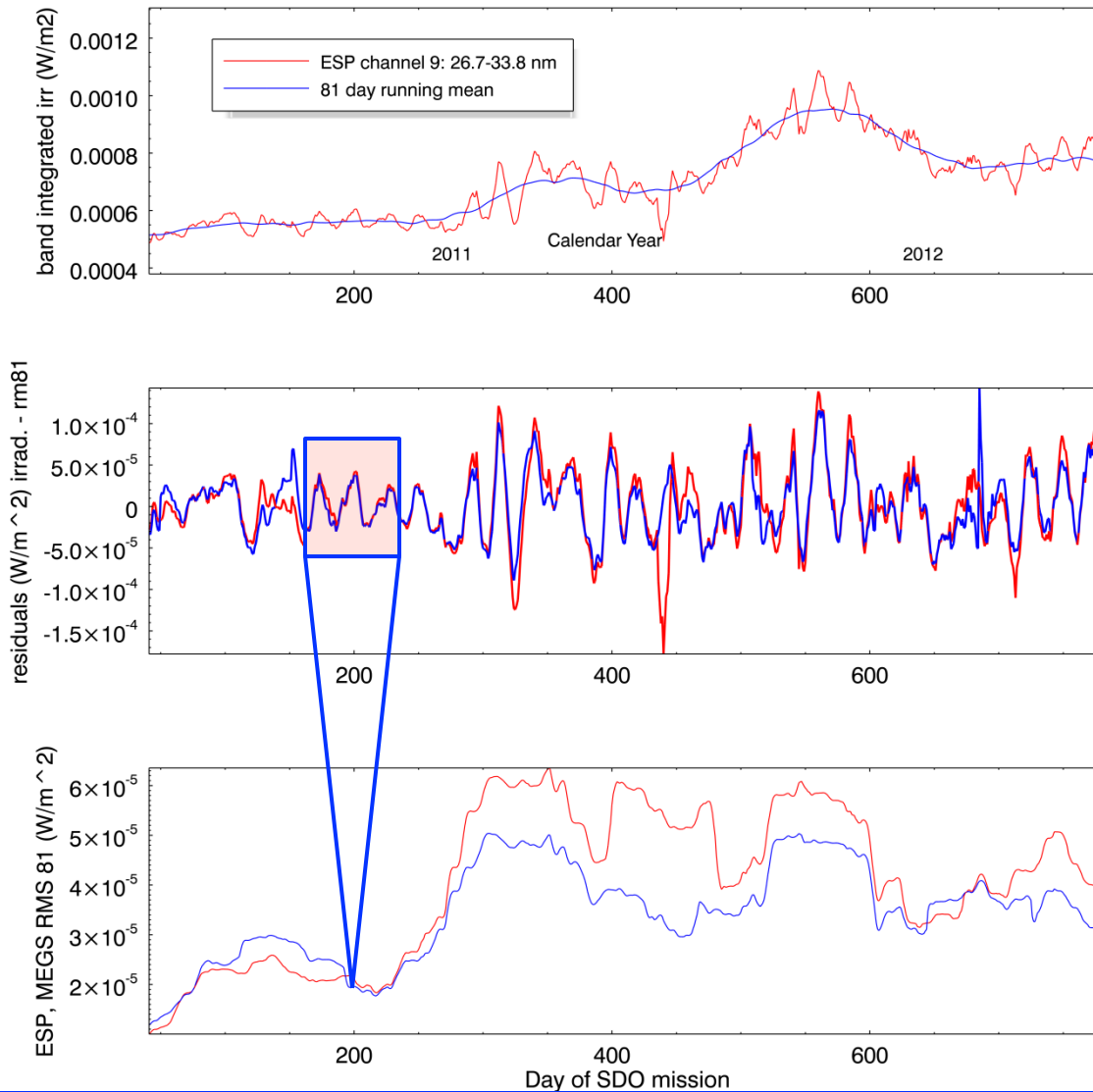


# Comparisons



1. Daily average irradiance ratios: ESP band/  
integrated EVE spectra
2. Comparison of solar rotation variability: RMS  
of irradiance time series minus 81 day  
smoothed irradiance shown on slide
3. Long term trends of 1. and 2. based on linear  
fit to ratio time series
4. ESP/MEGS irradiance ratios for solar flare  
conditions

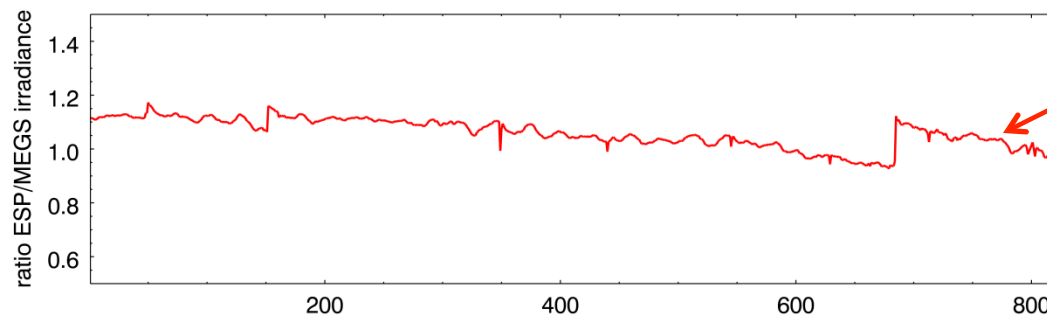
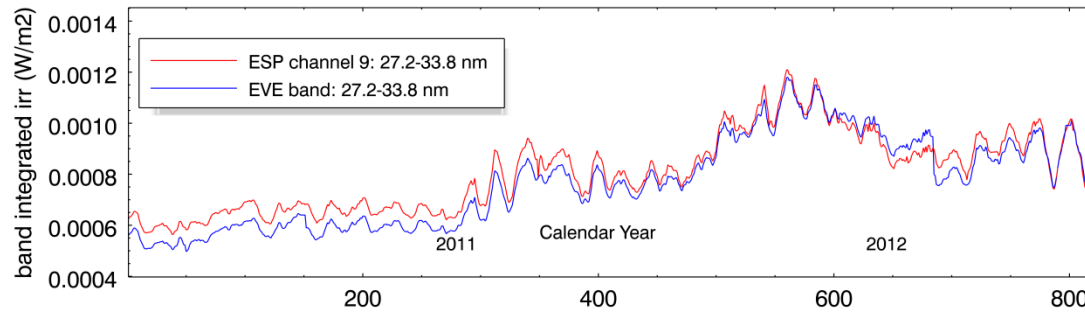
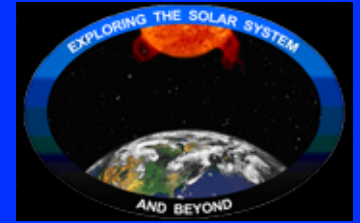
# Solar rotation variability - example



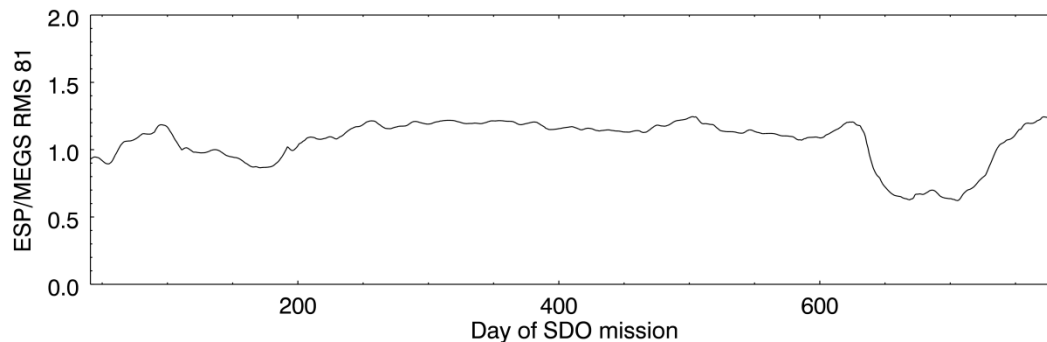
Plots show how the ESP and MEGS solar rotation variability is compared:  
 Top: 81 day rm (blue) is subtracted from daily average irradiance time series (red - only ESP is shown here)  
 Middle: Residuals from above subtraction show modulation due to solar rotation for ESP (red) and MEGS (blue)  
 Bottom: RMS over an 81 day window is calculated and compared in the bottom plot on slides 5-8

# Channel 9: 27.16-33.8 nm

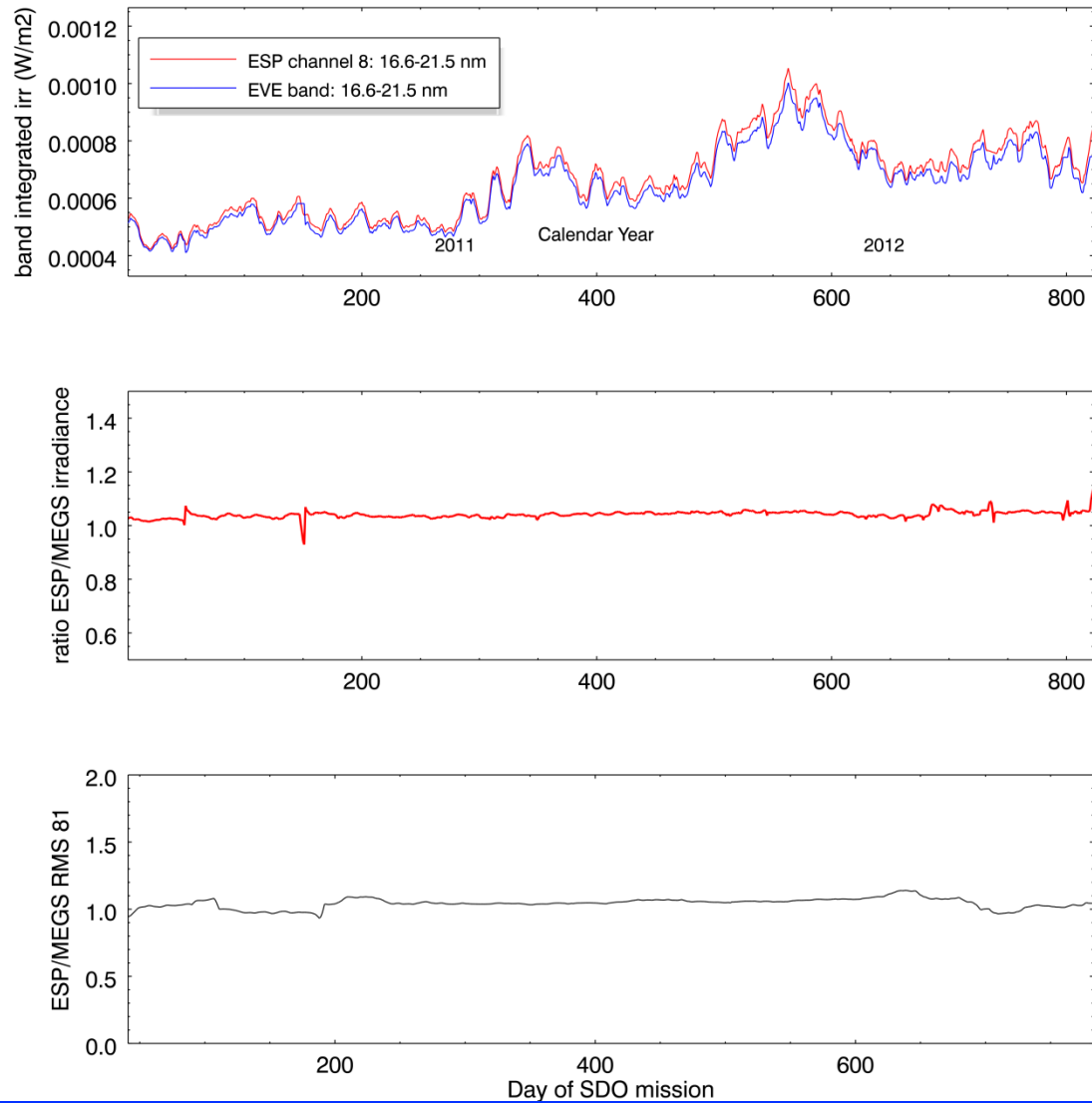
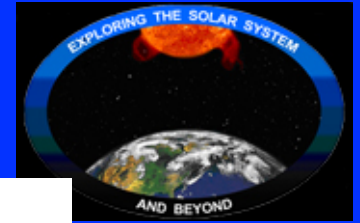
## EVE Version 3



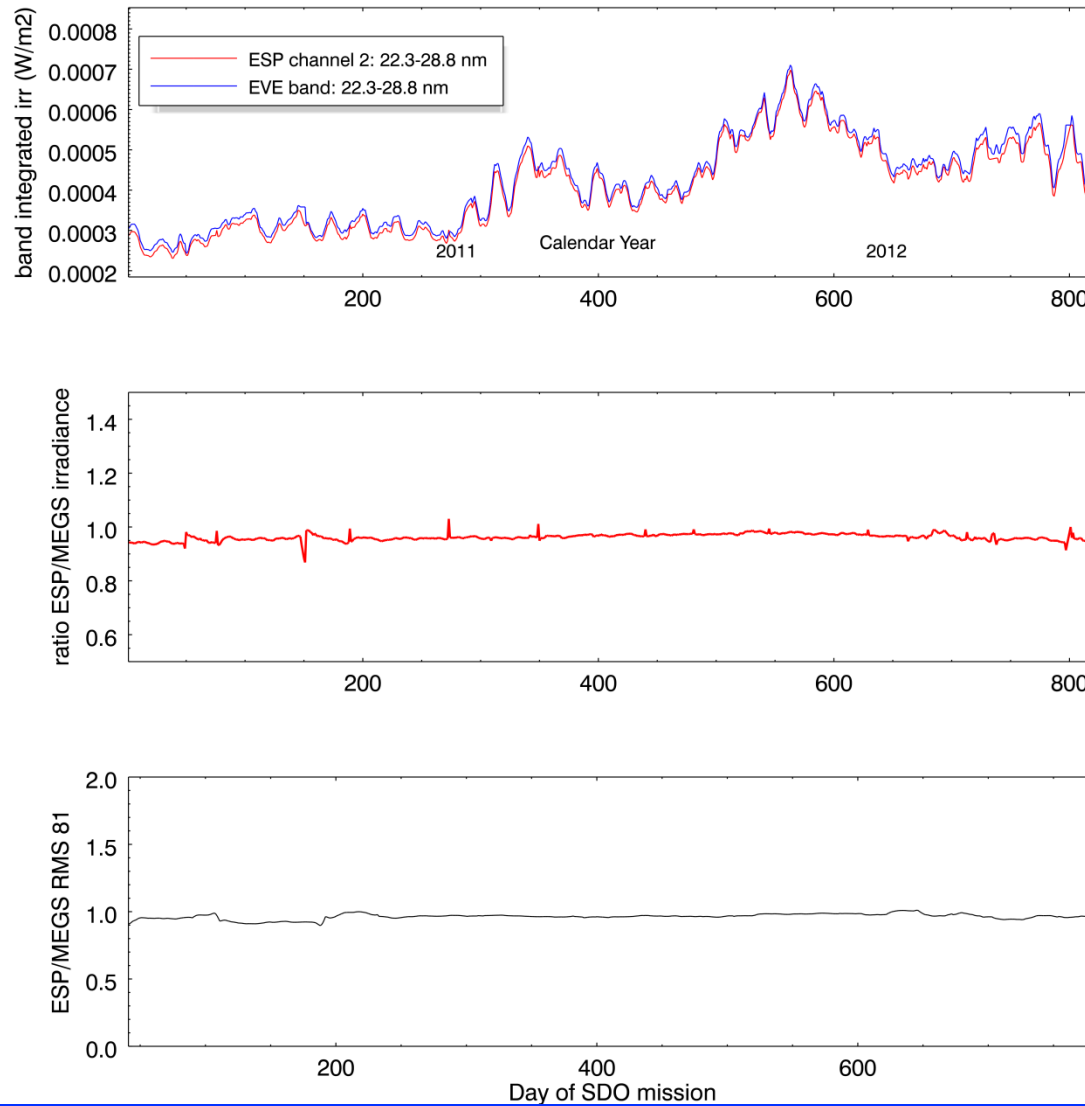
Some downward drift in the ESP/MEGS ratio for Channel 9



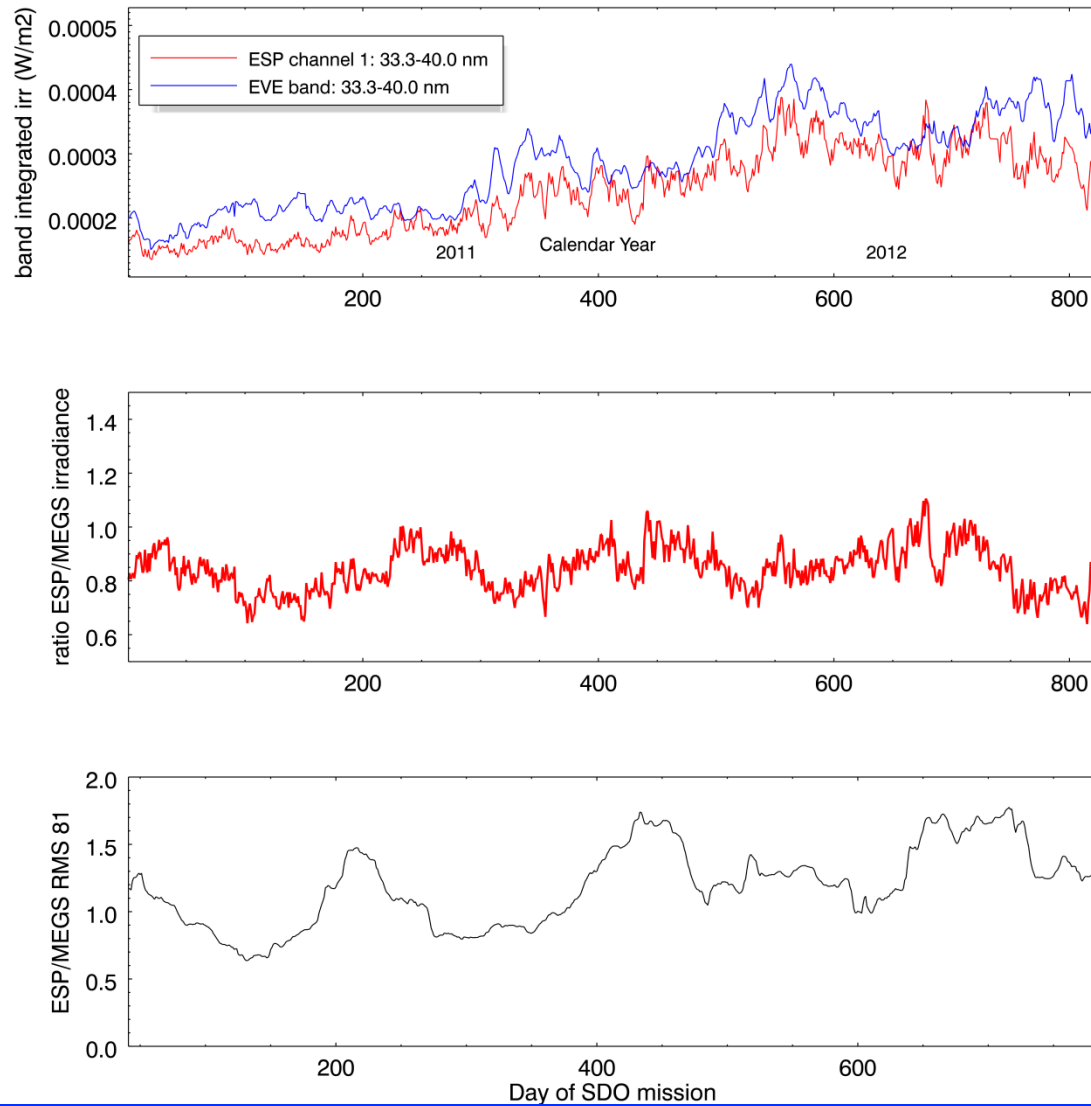
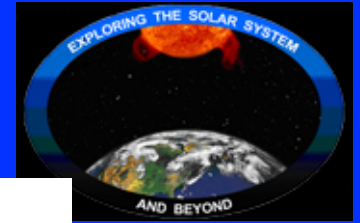
# Channel 8: 16.64-21.5 nm EVE Version 3



# Channel 2: 22.28-28.78 nm EVE Version 3

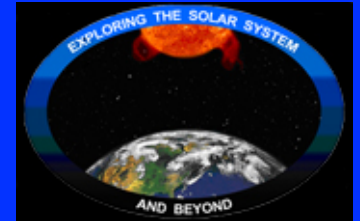


# Channel 1: 33.3-40.04 nm EVE Version 3





# Comparison Summary



Mean ratio

		Channel			
		1	2	8	9
EVE Version	2	0.445	0.965	1.061	1.009
	3	<b>0.844</b>	<b>0.963</b>	<b>1.041</b>	<b>1.059</b>

Slope (yr<sup>-1</sup>)

		1	2	8	9
EVE Version	2	-1.97E-01	-3.98E-02	-3.05E-03	4.43E-02
	3	<b>1.85E-02</b>	<b>7.71E-03</b>	<b>1.09E-02</b>	<b>-5.05E-02</b>

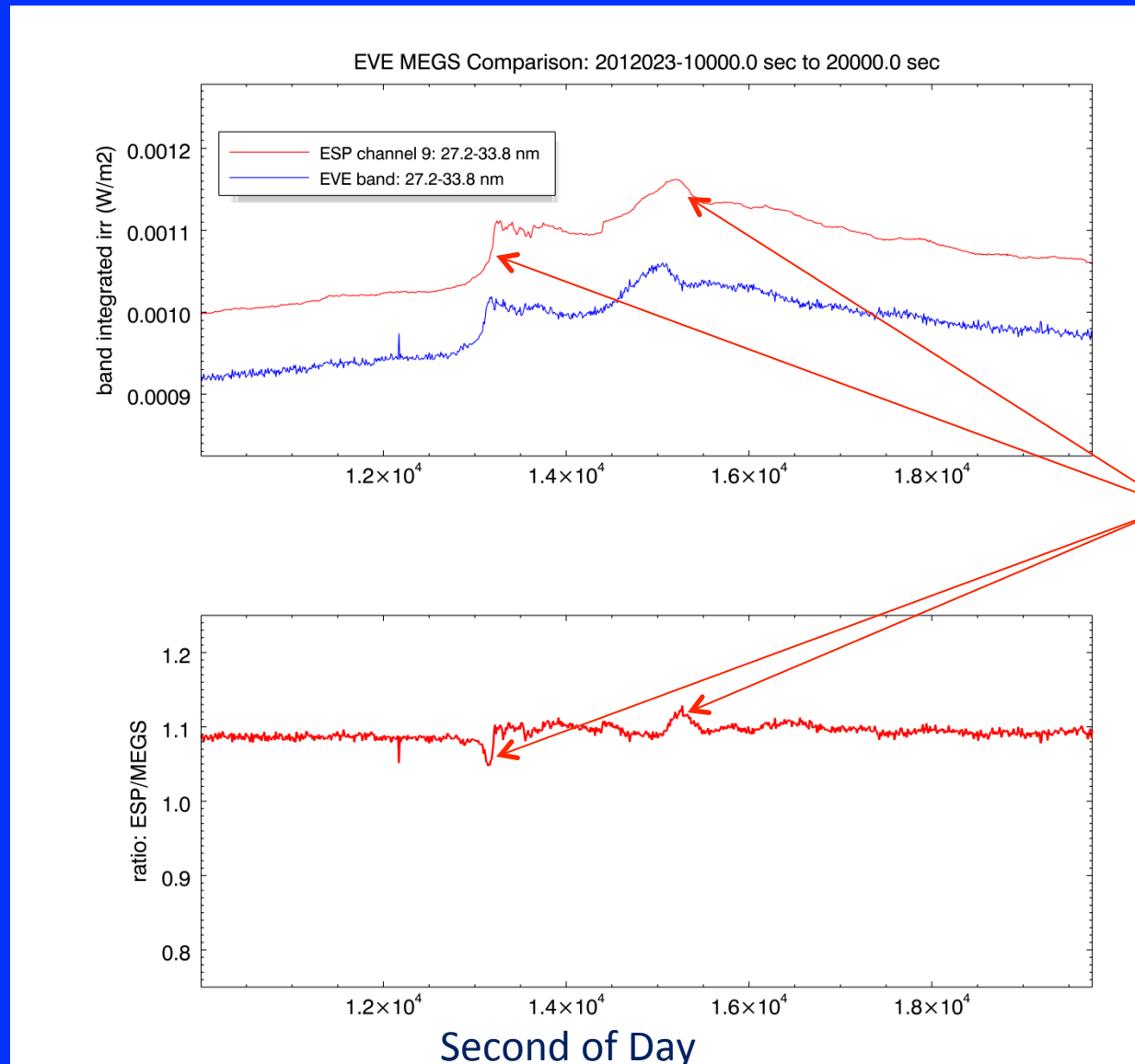
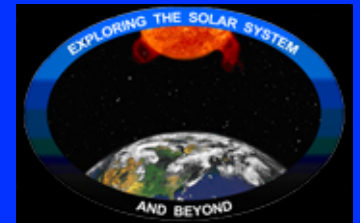
Mean RMS ratio

		Channel			
		1	2	8	9
EVE Version	2	1.368	0.948	1.102	1.149
	3	<b>1.188</b>	<b>0.964</b>	<b>1.043</b>	<b>1.065</b>

Slope (yr<sup>-1</sup>)

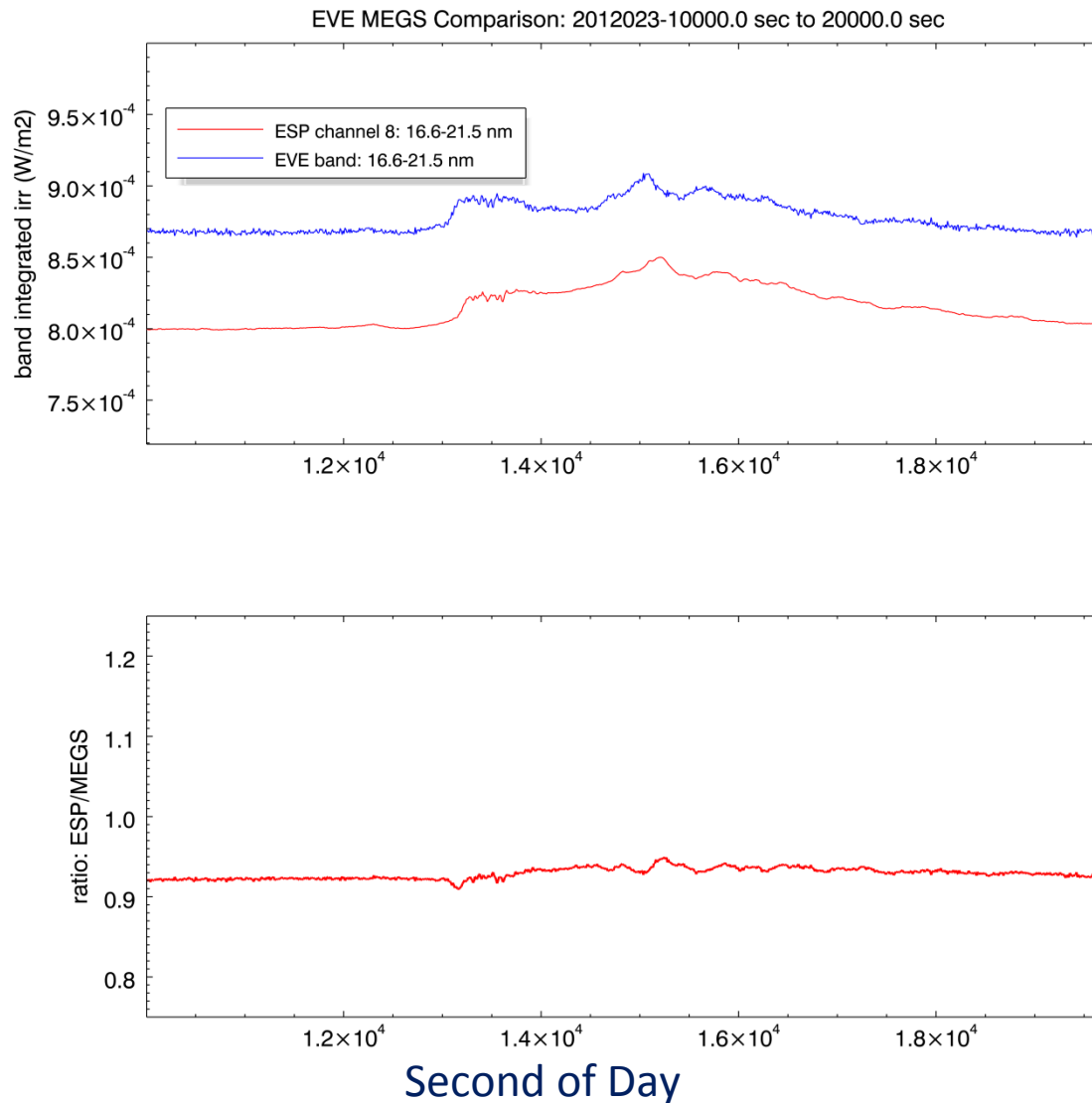
		1	2	8	9
EVE Version	2	6.01E-02	8.63E-03	-1.29E-02	1.45E-01
	3	<b>3.10E-01</b>	<b>1.63E-02</b>	<b>2.05E-02</b>	<b>-5.11E-02</b>

# ESP/MEGS ratios during flares Ch. 9

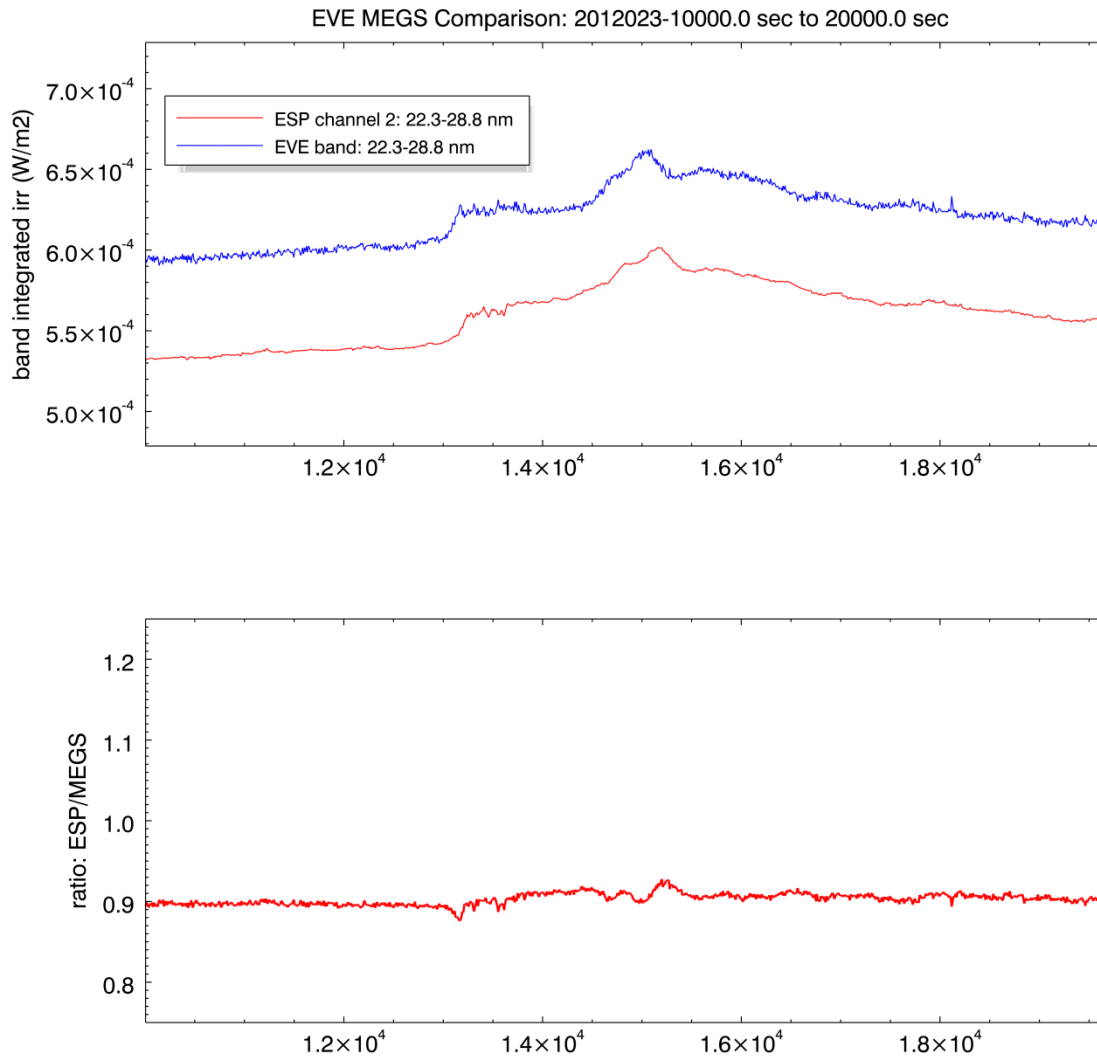
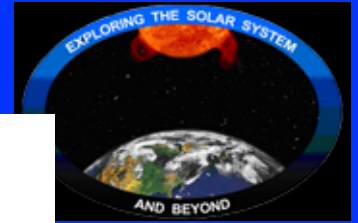


Flare peaks starts later and lasts longer in the ESP profile, indicating a possible difference between ESP bandpass and MEGS spectrum integration limits

# ESP/MEGS ratios during flares Ch. 8



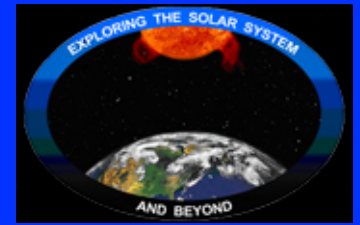
# ESP/MEGS ratios during flares Ch 2



# Conclusions

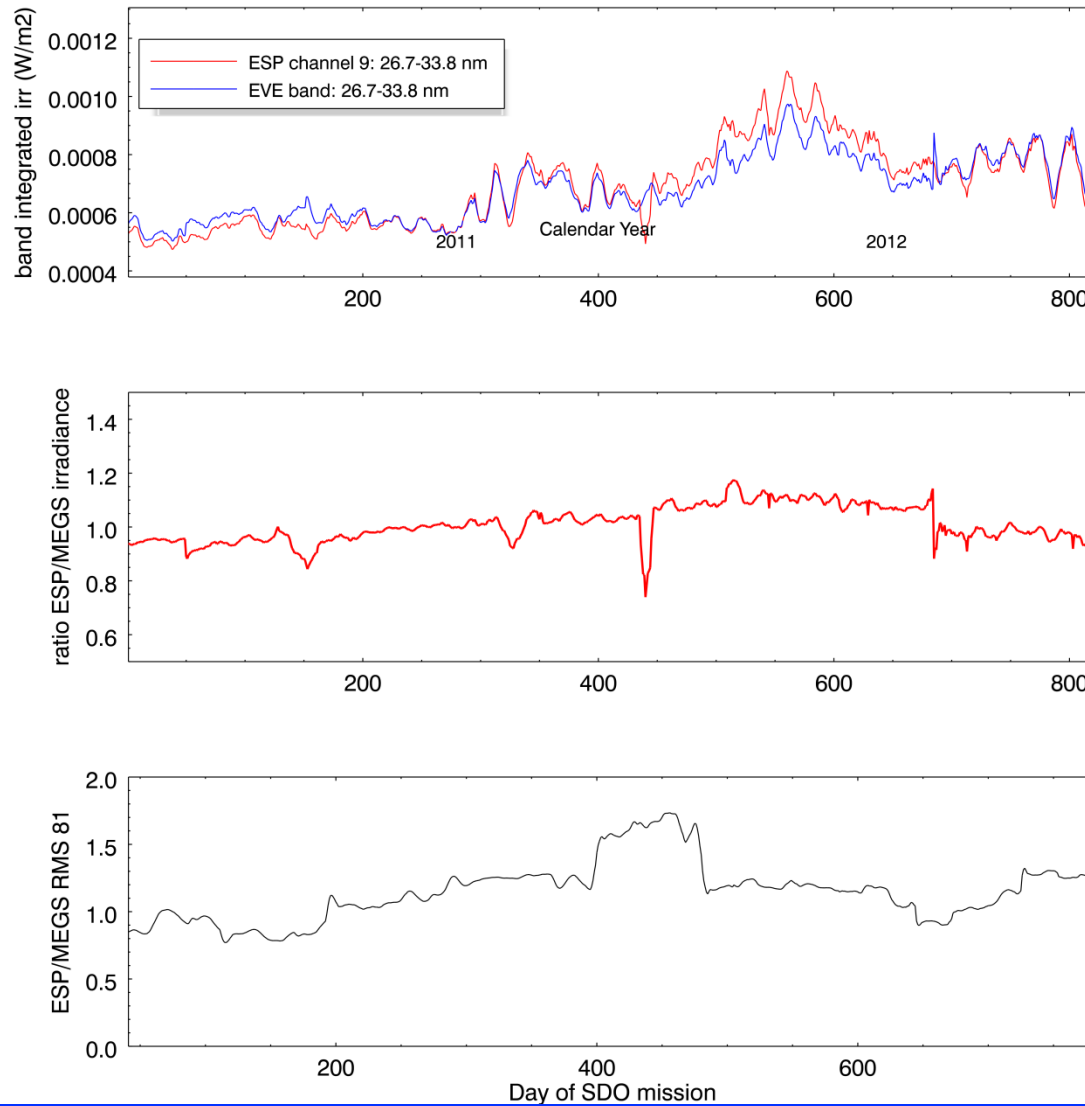


- ESP/MEGS daily average irradiance values agree within ~6% averaged over the SDO mission with the exception of the Ch1: 33.3-40.04 nm band for which ESP is known to have a substandard photodiode detector with large, temperature sensitive dark currents.
- Some minor (~5% year) divergence in ESP vs. MEGS sensitivity to solar rotation variability is apparent in the ESP Ch 9: 27.16-33.8 nm bandpass, probably correctable through updates of the degradation models used in data processing.
- EVE Version 3 has resulted in better general agreement and lower rate of divergence between ESP and MEGS compared to Version 2 with the exception of ESP Channel 9
- Greater than average ESP-MEGS discrepancies are seen during flares. Also, time difference in time profile peaks suggests possible need for further refinement of ESP bandpass definitions.

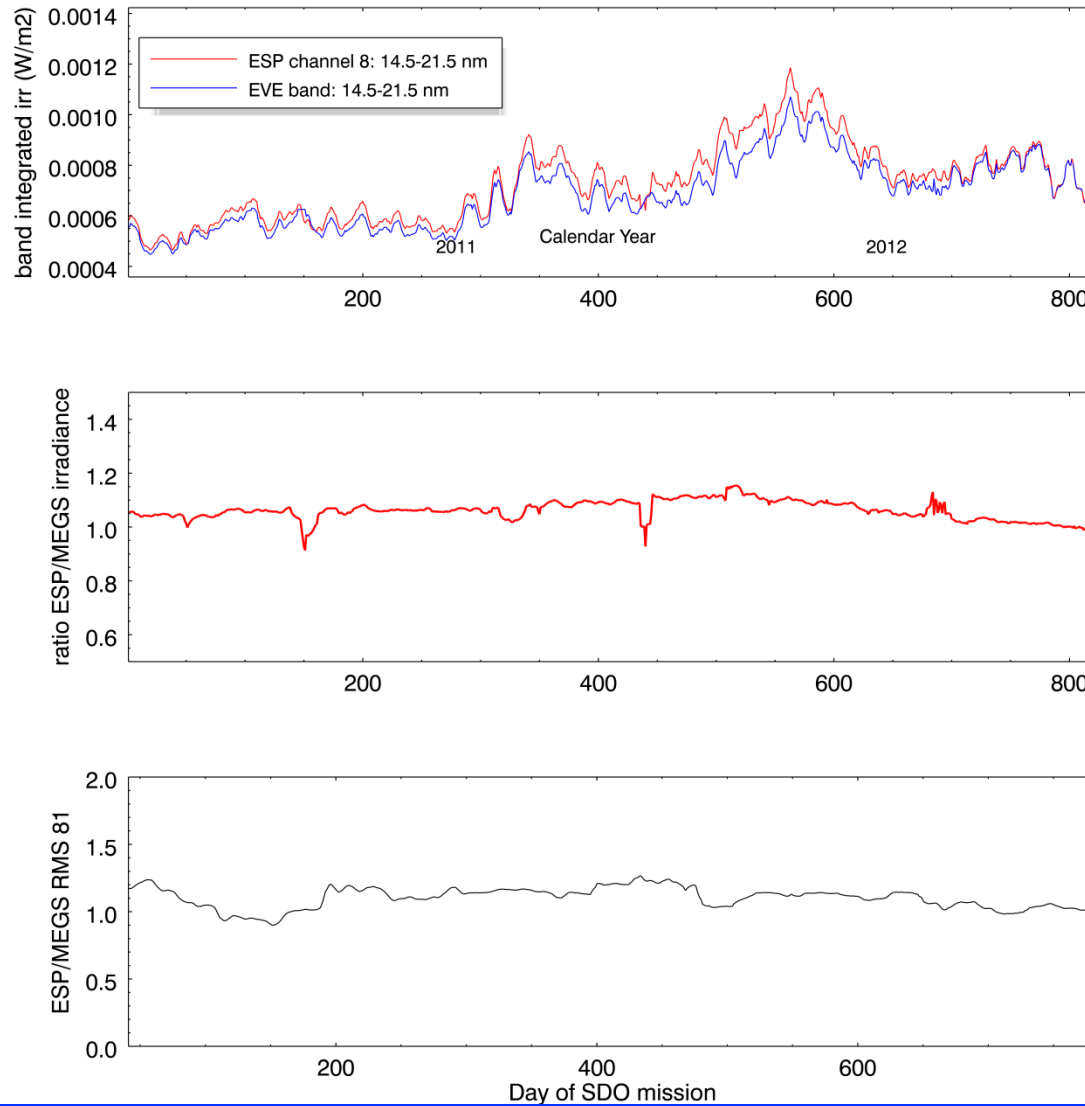
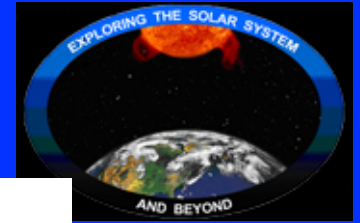


## Backup Slides

# Channel 9: 26.7-33.8 nm EVE Version 2

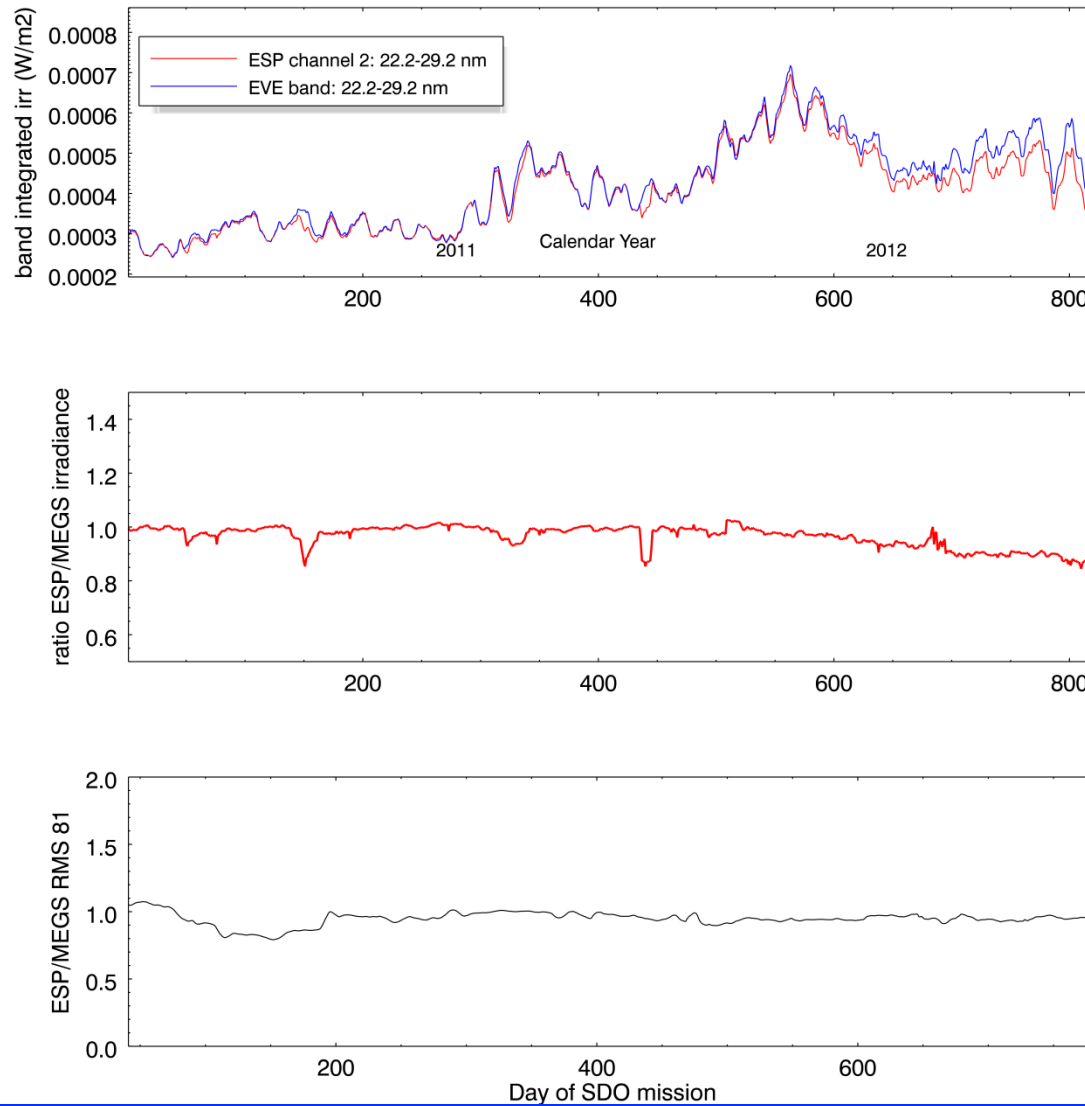
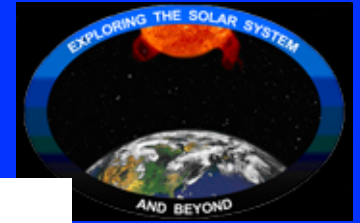


# Channel 8: 14.5-21.5 nm EVE Version 2





# Channel 2: 22.2-29.2 nm EVE Version 2



# Channel 1: 33.0-40.3 nm EVE Version 2

