A Time Series of GERB-CERES comparisons

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Background and aims

- Study the relative calibration of the GERB and CERES SW measurements over the life of GERB missions for the different GERB products.
  - Part of a project to understand changes to the GERB SW response

- Quantify differences as a function of scene type / spectral characteristics

- First step reported here: angular matched radiance comparison between GERB 2 HR and CERES SSF Ed 3 data utilizing special 'GERB mode' FM2 PAPS observations made twice yearly by CERES and FM1 data as a reference (results for June scans) .

Data and methods

- GERB 2 HR (enhanced resolution 9km @ nadir) 15 minute time resolution (Shortwave update applied)

- Temporal restriction of 5 minutes between GERB and CERES measurements allowed

- Radiances matched for viewing angle and azimuth, with difference in viewing direction < 5° (<8° & <2° criteria tested)

- For a particular CERES point, all GERB HR pixels within the CERES PSF are averaged to give the corresponding GERB measurement

- Relative calibration studied in terms of ratio (gain difference) between instruments rather than absolute difference.

CERES footprint level comparison

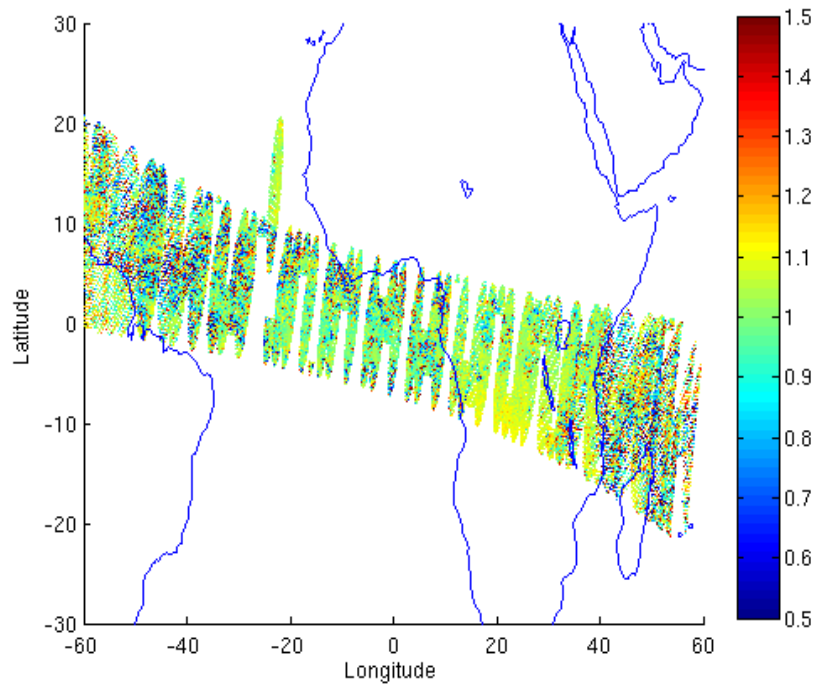GERB 2 vs angularly & temporally matched CERES SSF Ed 3 radiances
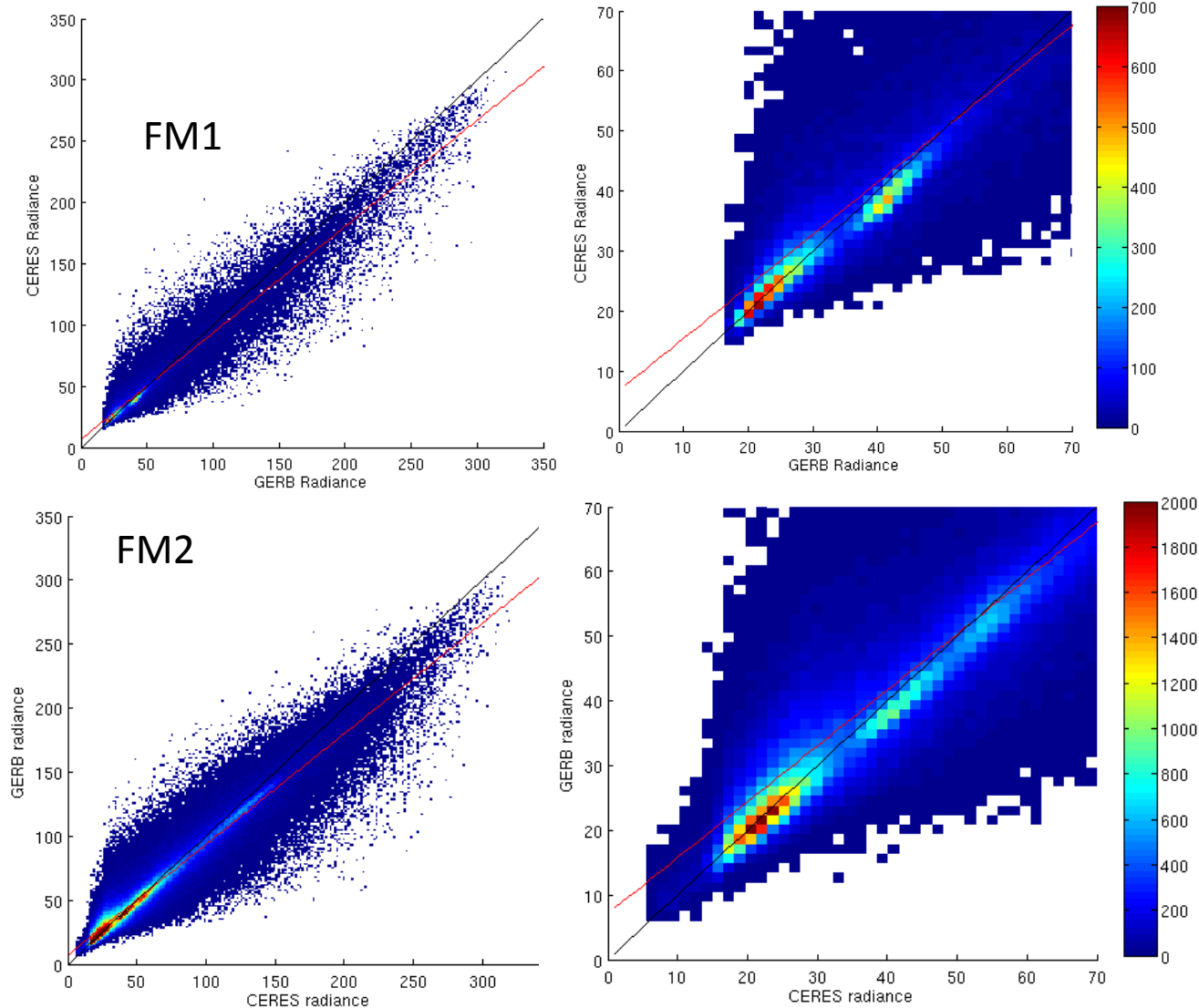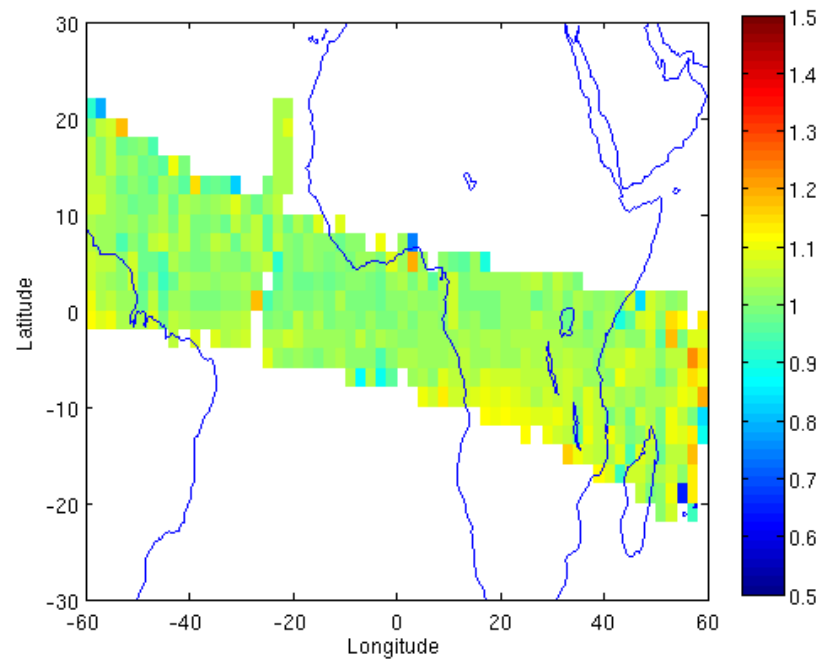
Spatial structure in ratio
GERB 2 HR (SW update)/CERES SSF Ed 3 radiance ratios

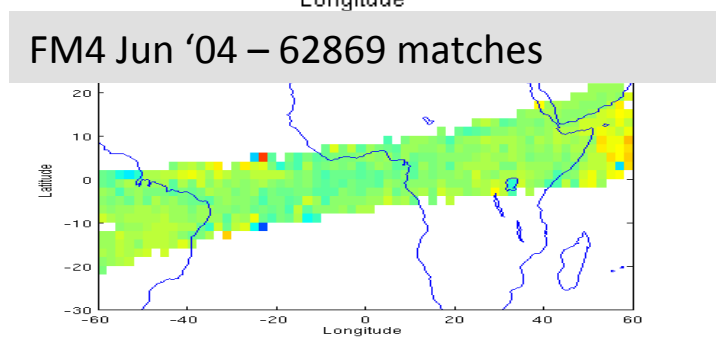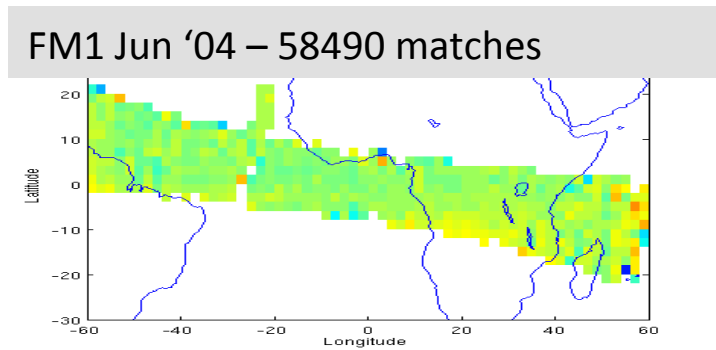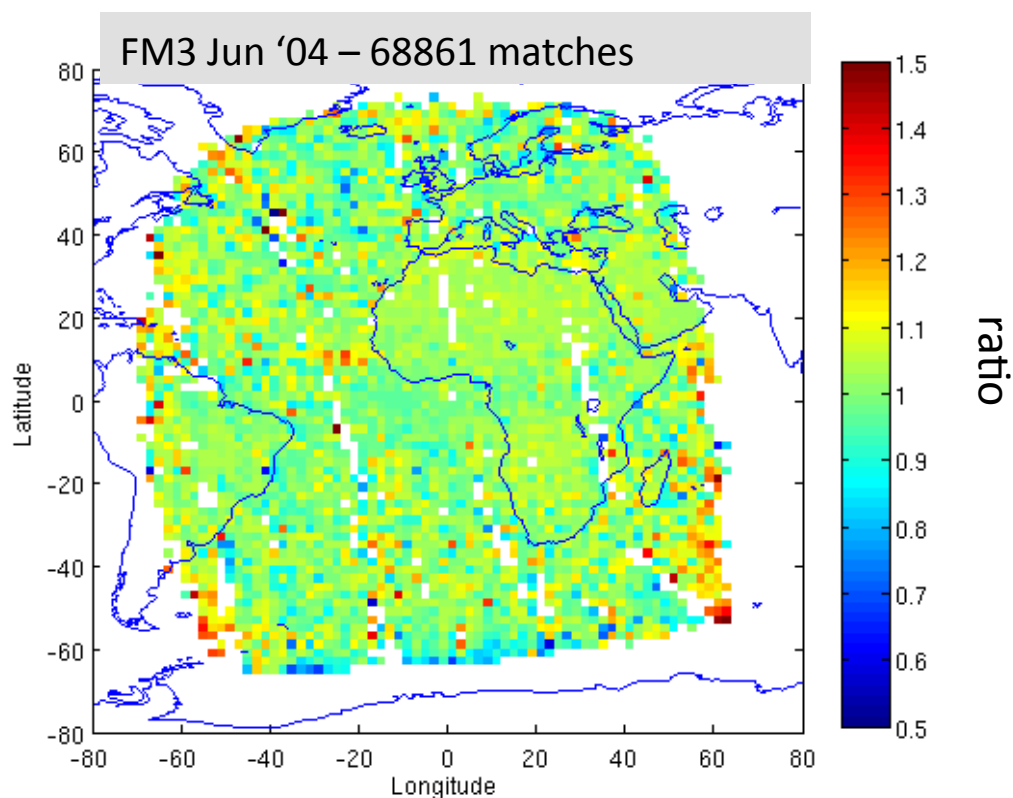FM1 June 2004 (96 missing GERB files – 58490 points
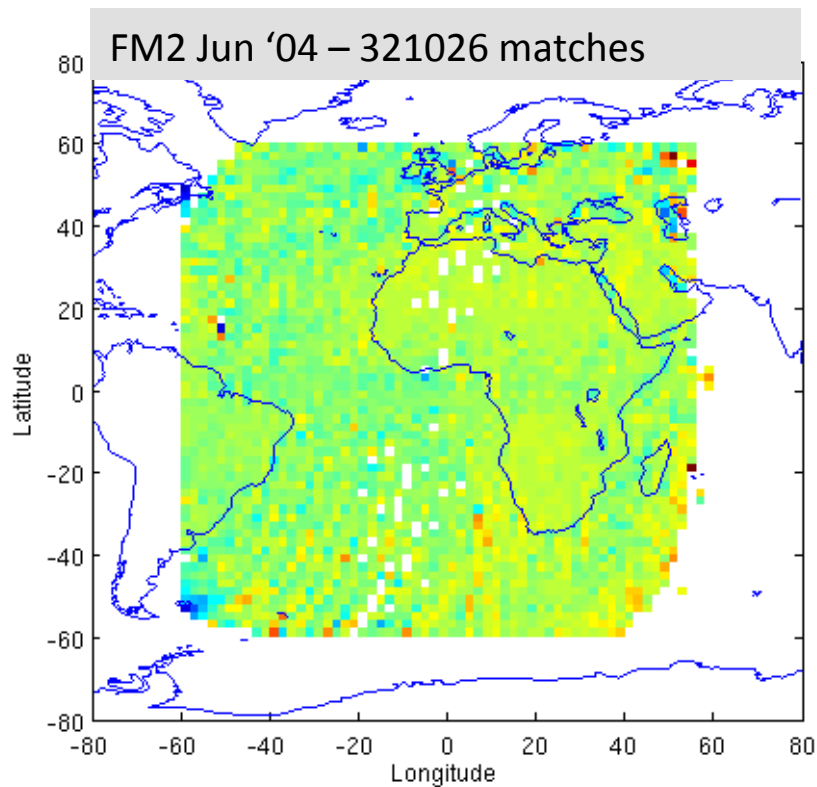
Per CERES SSF footprint

2 deg binned data

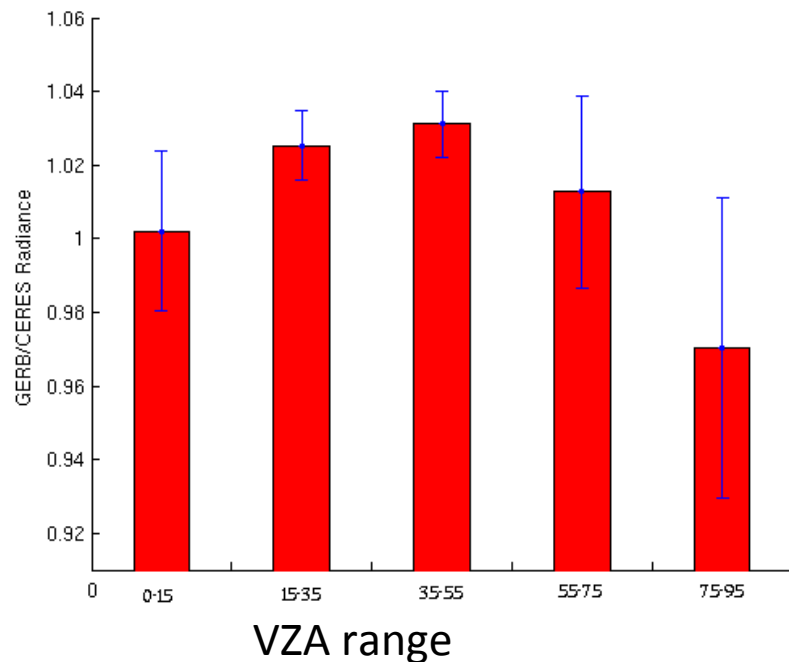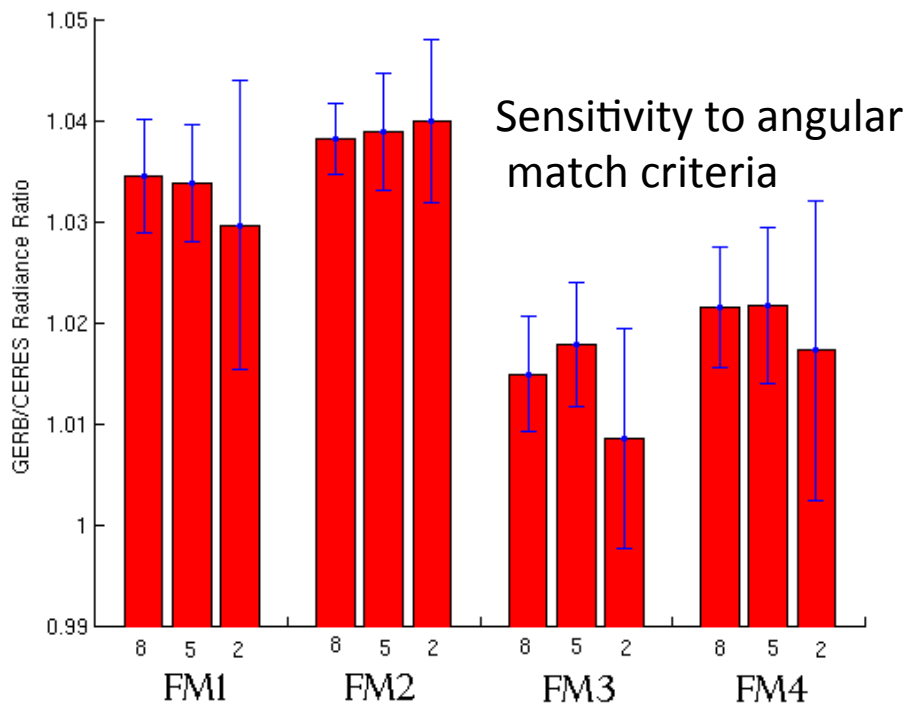Ratios in range 0.25 to 3.5

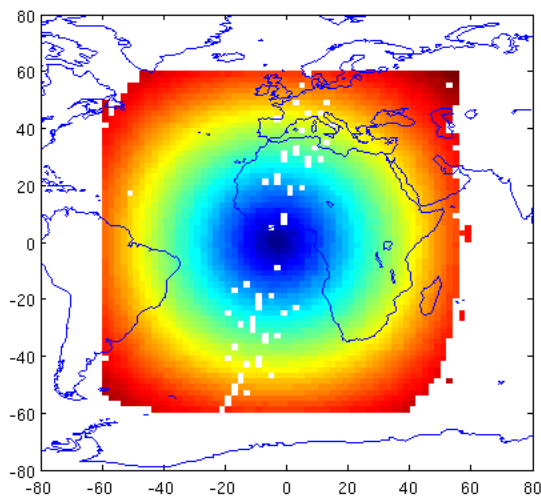# GERB 2 HR (SW update)/CERES SSF Ed 3 radiance ratios

Matched GERB and CERES points are averaged into 2°x2° lon/lat regions. Ratio calculate for each region from the <GERB> / <CERES> for that region.

Sensitivity to match criteria

Sensitivity to angular match criteria

Uncertainty is 3σ/ sqrt(N-1)
(σ of daily ratio
 N days = 30)
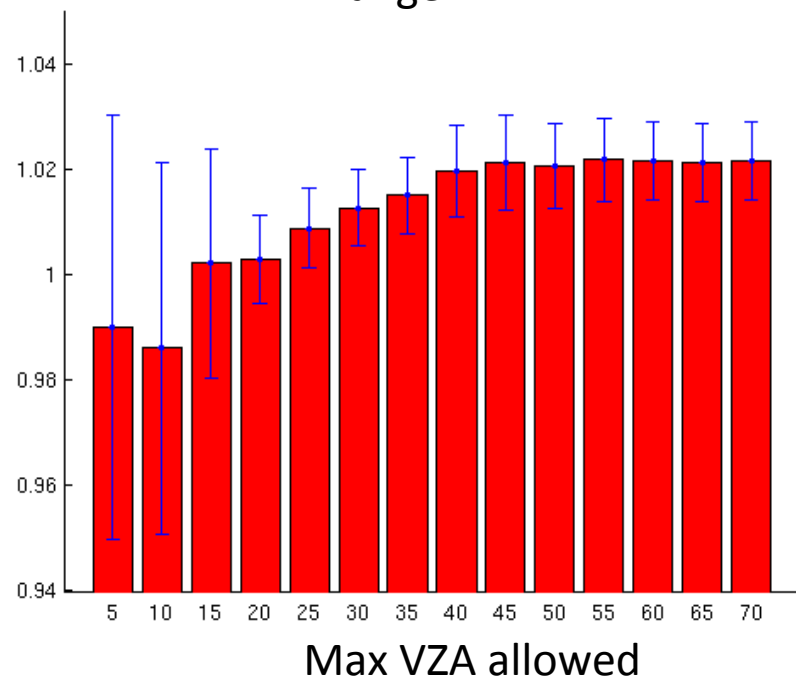
Results compared to previous Ed 2 rev 1 analysis GERB 2 HR / CERES SSF June 2004

α<5°   VZA <60°
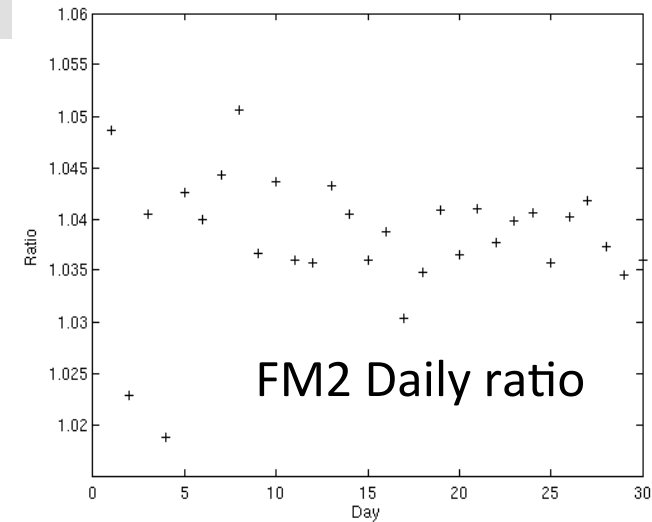

Ed 2 rev1 - Ed 3	
FM1	negligible
FM2	-0.37%
FM3	-1.39%
FM4	-1.55%

Uncertainty is 3σ/ sqrt(N-1) (σ of daily ratio N days = 30)
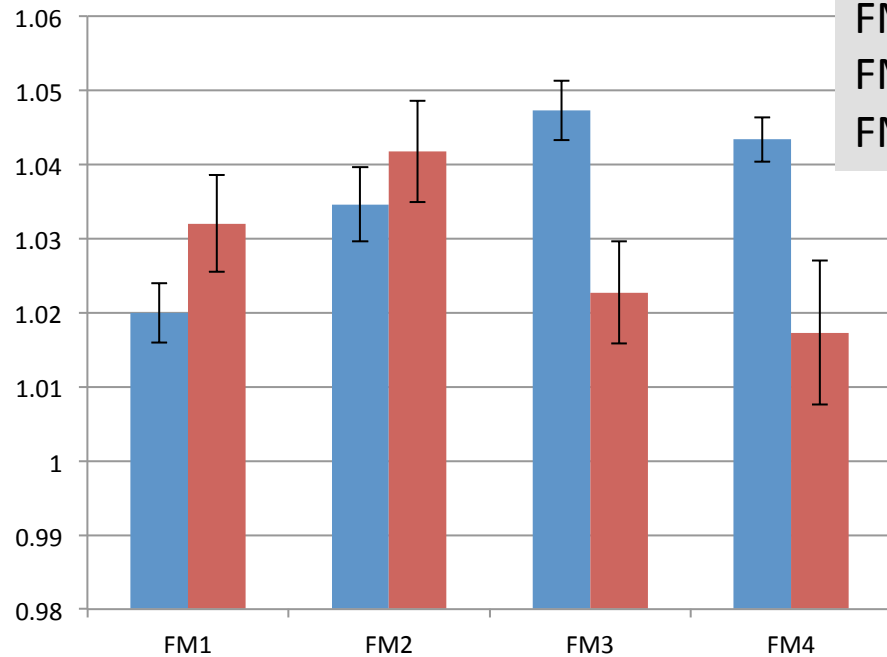
GERB 2 Swupdate / CERES ED 2 rev1 SSF

GERB 2 Swupdate / CERES ED 3 SSF

FM2 Daily ratio

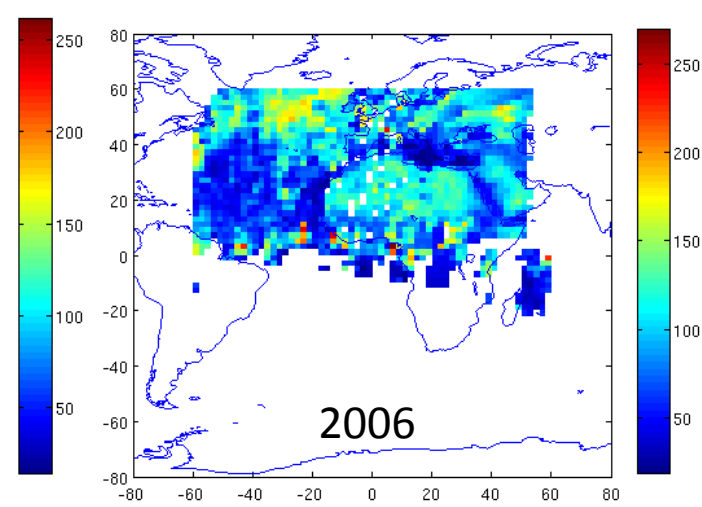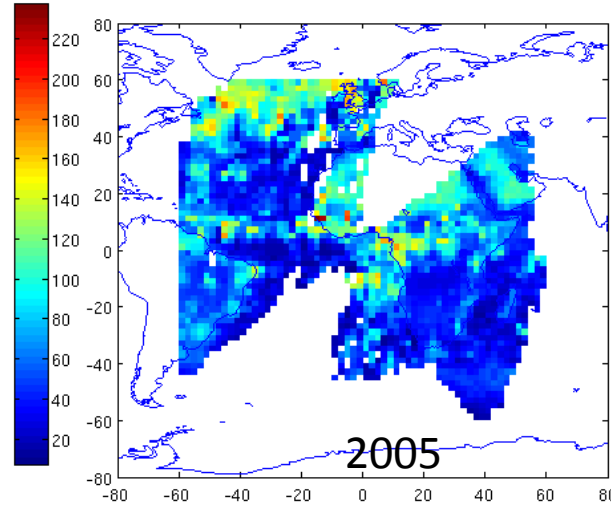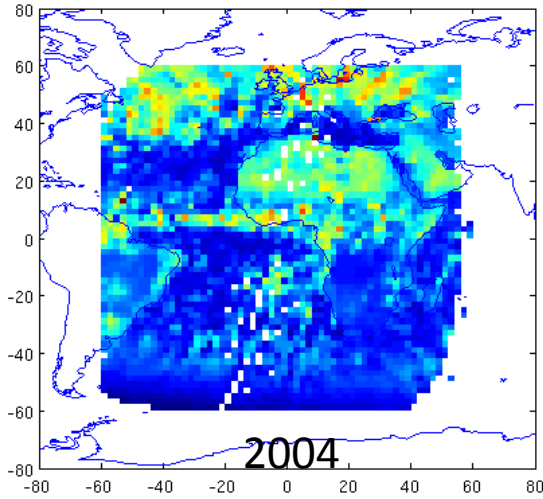| Analysis	FM1	FM2	FM3	FM4
Clerbaux	1.018±0.004	1.032±0.005	1.045±0.004	1.041±0.003
Parfitt	1.0324±0.0065	1.0417±0.0068	1.0227±0.0069*	1.0173±0.0097

June PAPS data 2004-2006
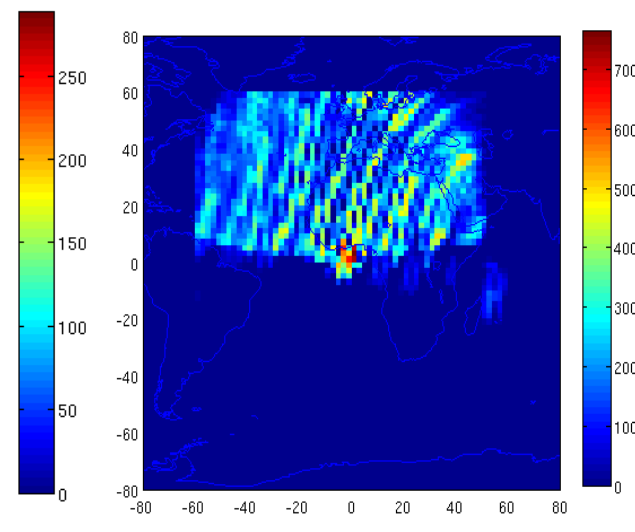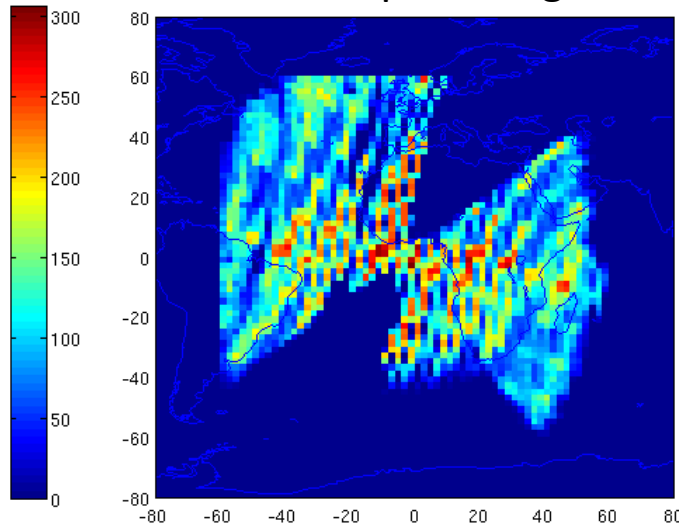## FM2 2 degree plots for angularly matched points

Radiance

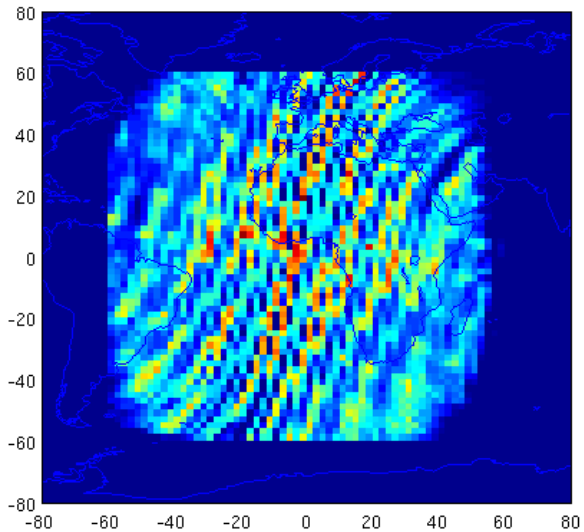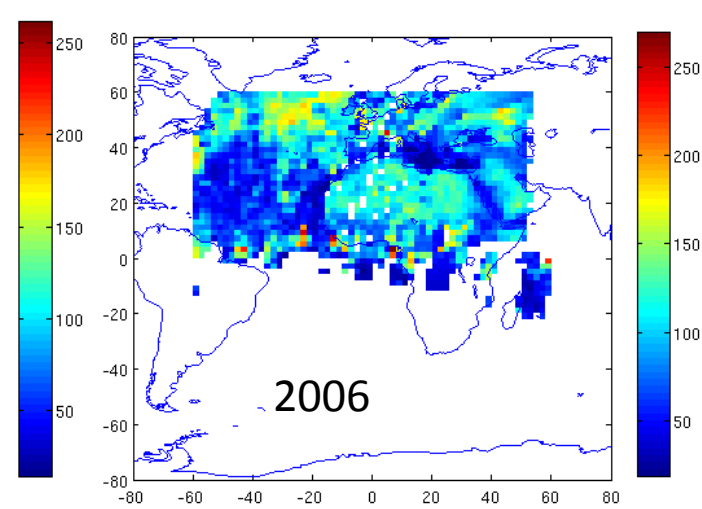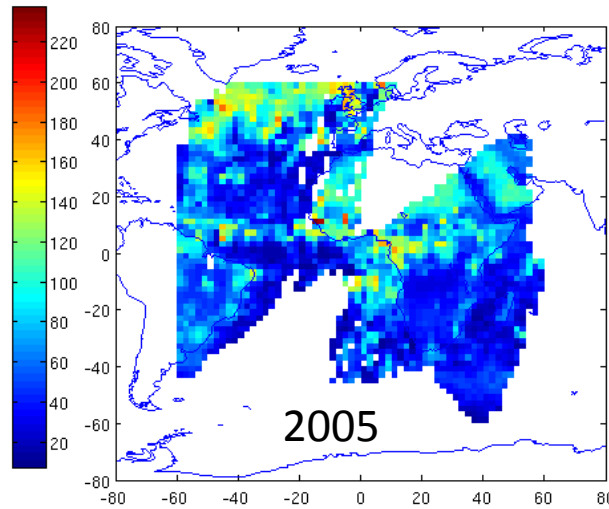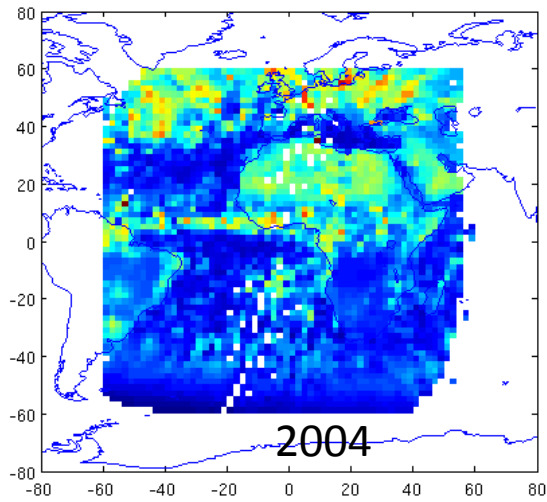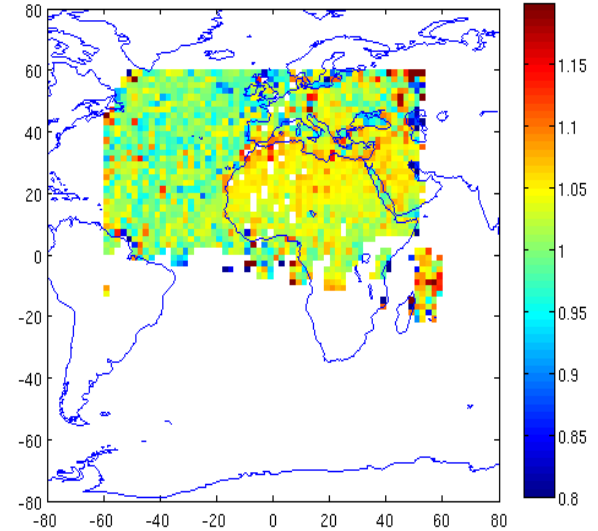Number of matches per 2 degree box

June PAPS data 2004-2006
FM2 2 degree plots for angularly matched points
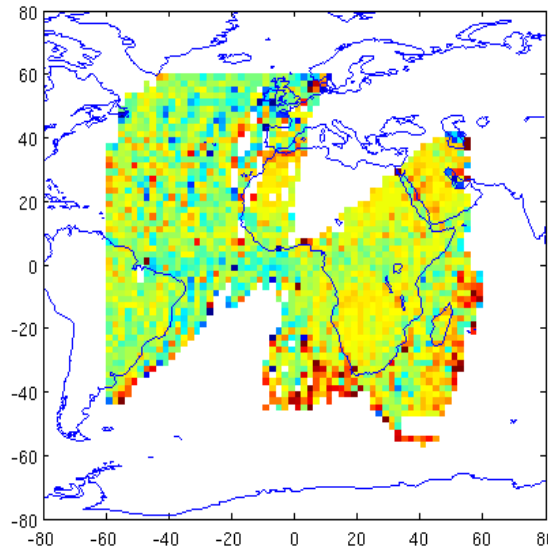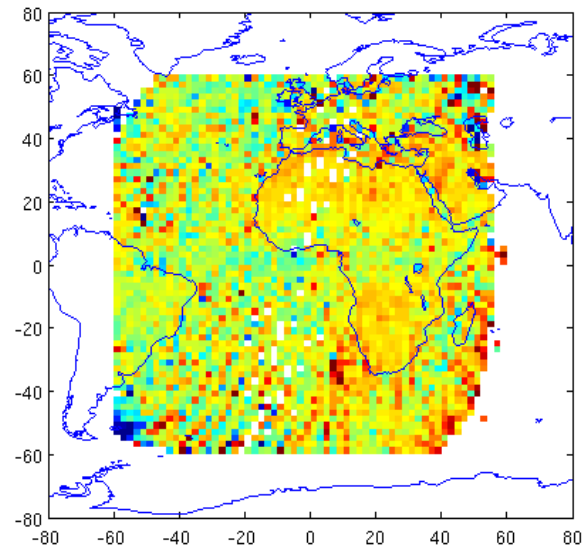
Year to year changes in ratio
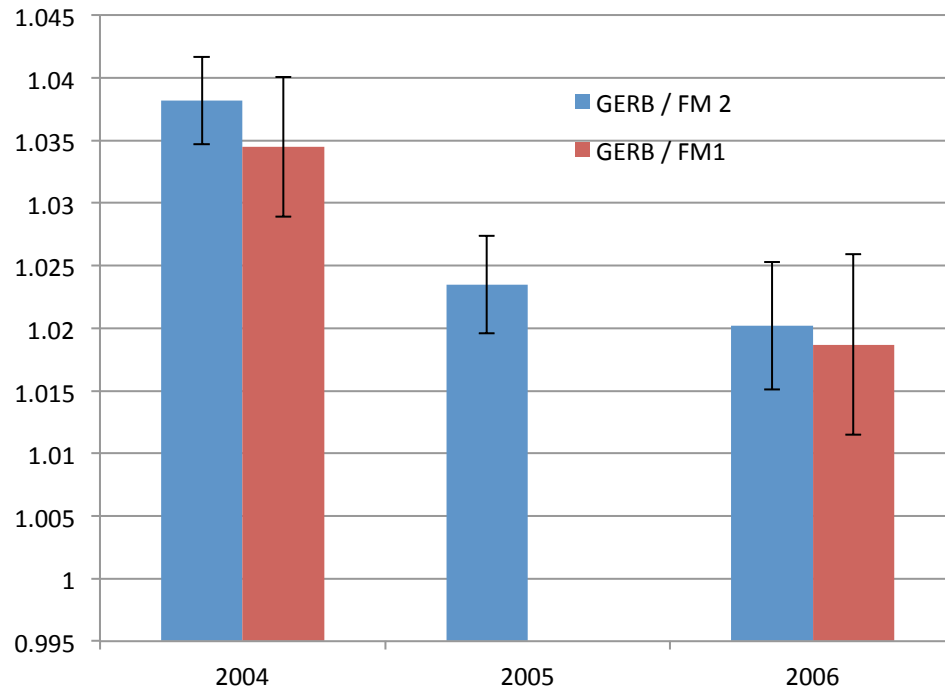
Distribution of 2deg gridded ratios
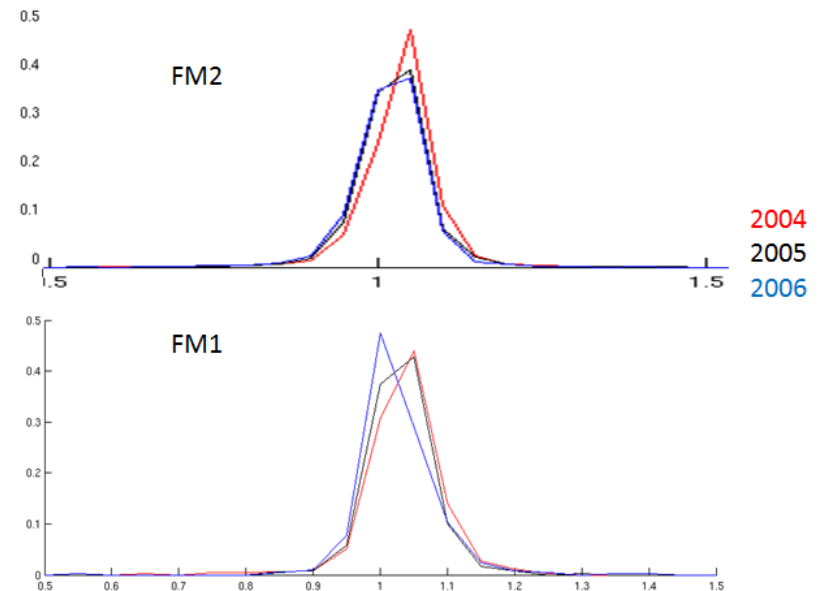
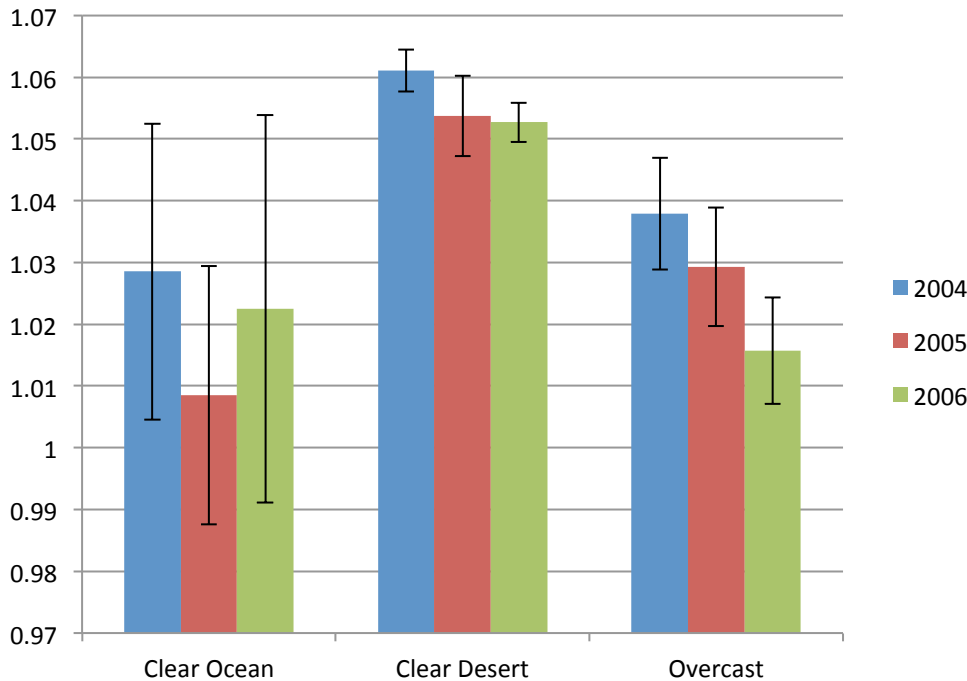|	FM1	FM2
June 2004	1.0345±0.0056	1.0382±0.0035
June 2005		1.0235±0.0039
June 2006	1.0187±0.0072	1.0202±0.0051

GERB/FM2: -1.5% 2004 to 2005
-1.8% 2004 to 2006
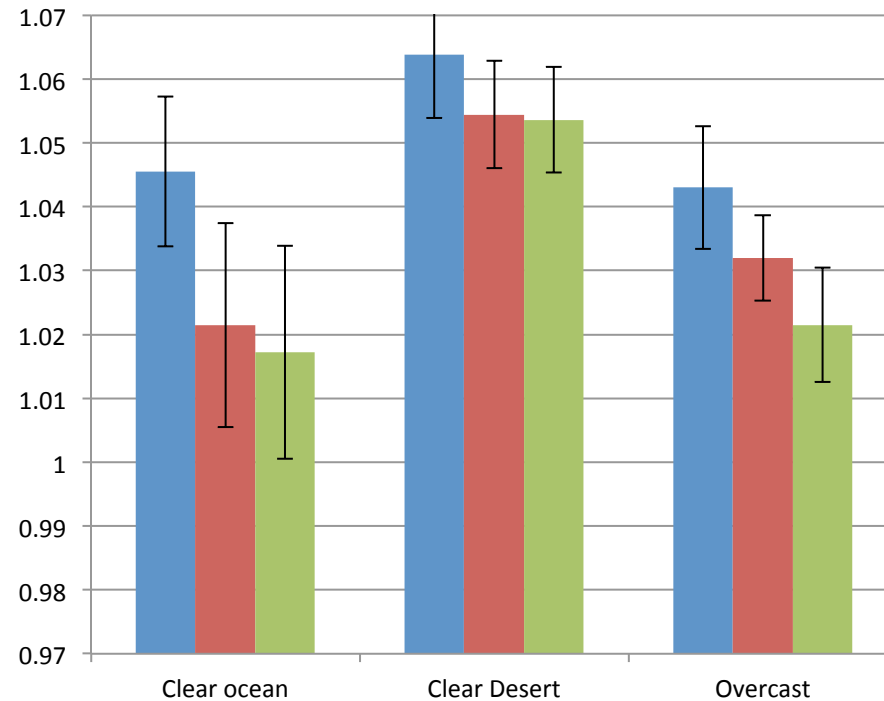GERB/FM1 -1.6% 2004 to 2006

Year to year changes in ratio by scene type

Scene classification from CERES product dominant surface type and cloud information

Overcast 100% cloud

Overcast 100% τ > 5

Ratio calculated as mean of daily ratio

Ratio calculated from mean of 2 deg boxes

	2004 to 2005	2005 to 2006		2004 to 2005	2005 to 2006
Desert	0.7%	0.8%	Desert	0.9%	1.0%
Overcast	0.9%	2.0%	Overcast	1.0%	2.0%

Summary

- Look at sources of noise
  - Spatial and temporal homogeneity
  - PSF effects
- More detailed analysis of changes
  - Changes as a function spectral character of scene
  - GERB pixel to pixel differences
- Extend comparison period and products
  - Dec PAPS scan & xtrack data for comparison between times
  - GERB 1 period
  - Other GERB products