CERES/GERB Shortwave Radiance Comparisons

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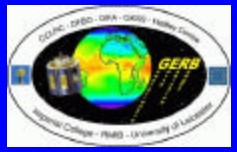


Objectives

- To date, we have conducted studies of four major campaigns when CERES was viewing scenes that were aligned with GERB's view.
- In this study, we compare CERES and GERB by matching pixel measurements, thereby getting comparisons on each of GERB's 256 detectors.
- We will look at the GERB V998 – pre-release version. With minor modifications, this will be Edition 1 GERB data.

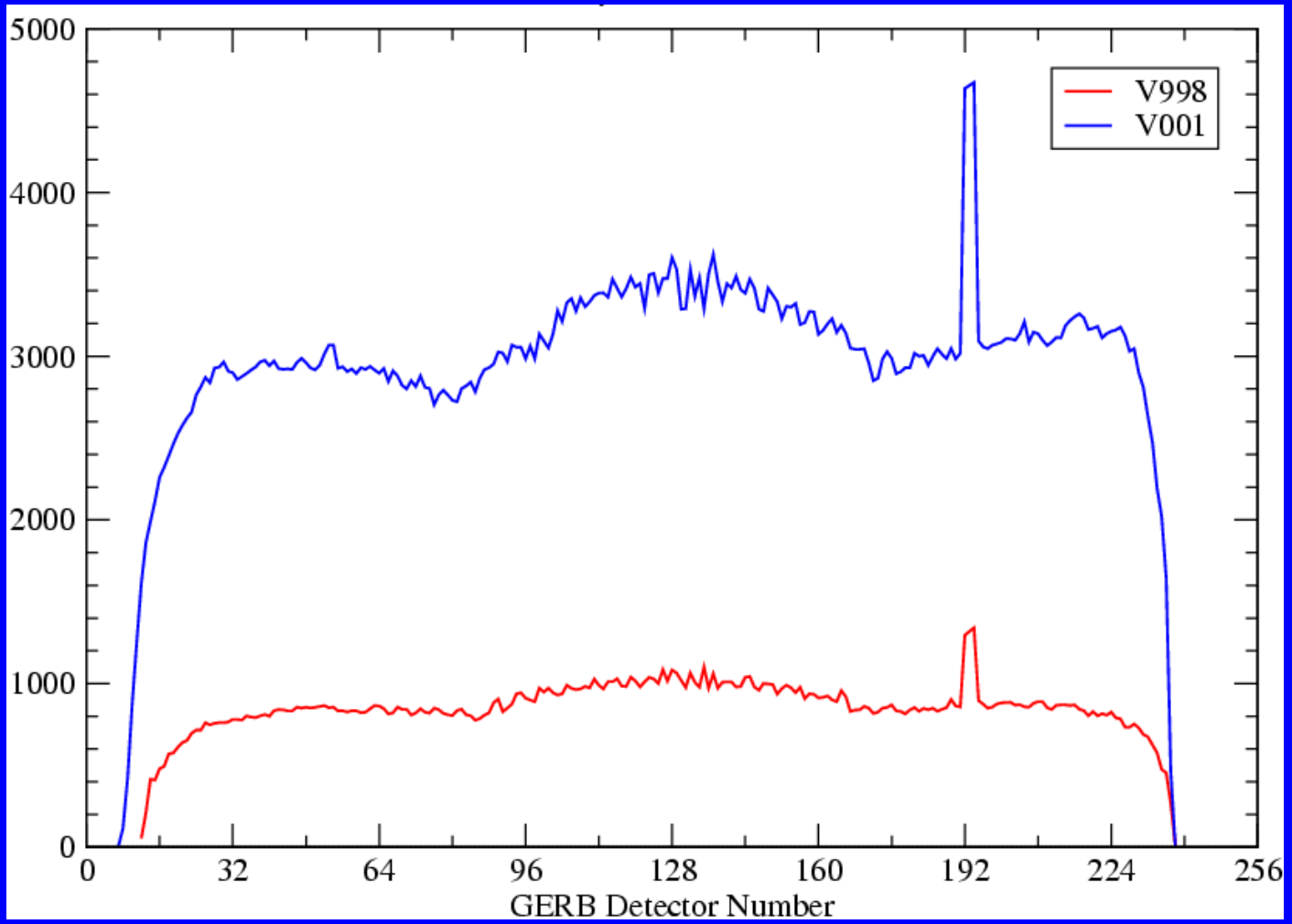
GERB/CERES Special Operations

- December 2003/January 2004 15 days
- June/July 2004 27 days
- December 2004/January 2005 26 days
- June 2005 21 days
- GERB Version 998 available for:
  June 21-27, 2004 & December 11-17, 2004

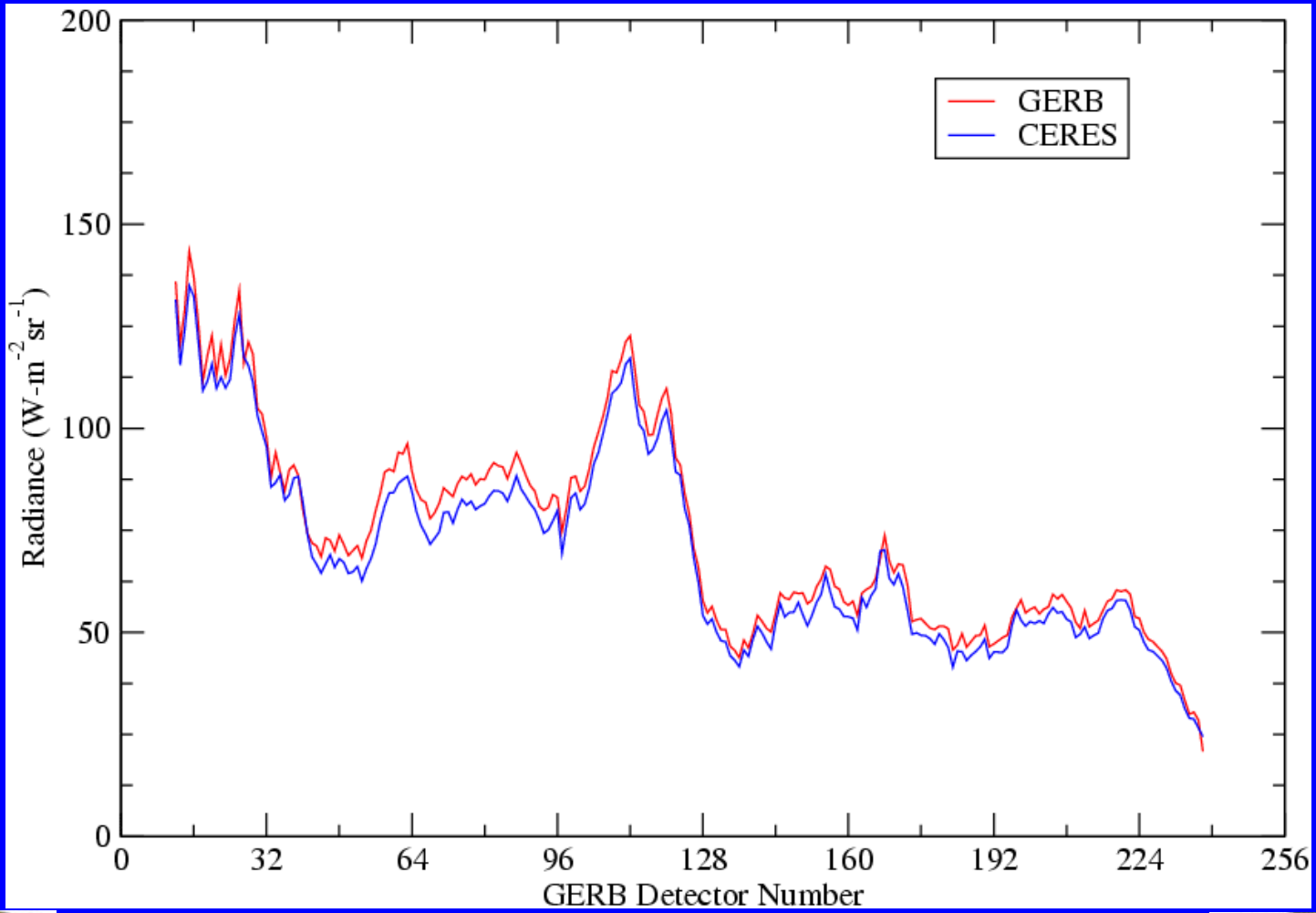
Criteria for SW Matches – Detector-Based Comparison

- Use GERB L1.5 NANRGs (non-averaged but geolocated data) for time and spacecraft location.
- Use RMIB's unfiltered SW radiances, angles, and geolocations for GERB.
- Use CERES Edition 2 Revision 1 ES8s.
- View zenith and relative azimuth angles within 5°. View zenith angle less than 70°.
- Near GERB subsatellite point, accept matches within 10° angle between GERB & CERES rays.

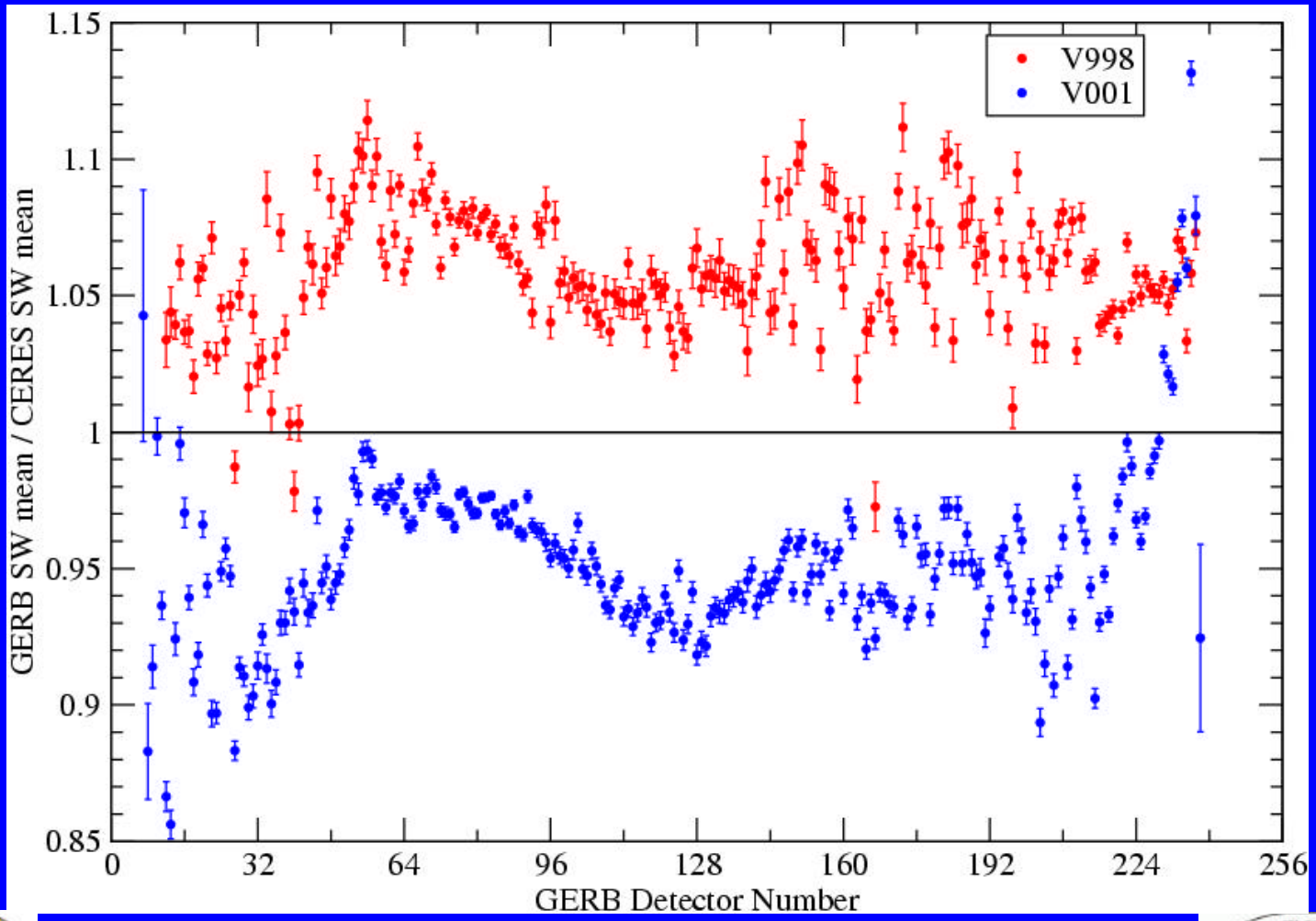
Number of Matches for Each Detector June 2004



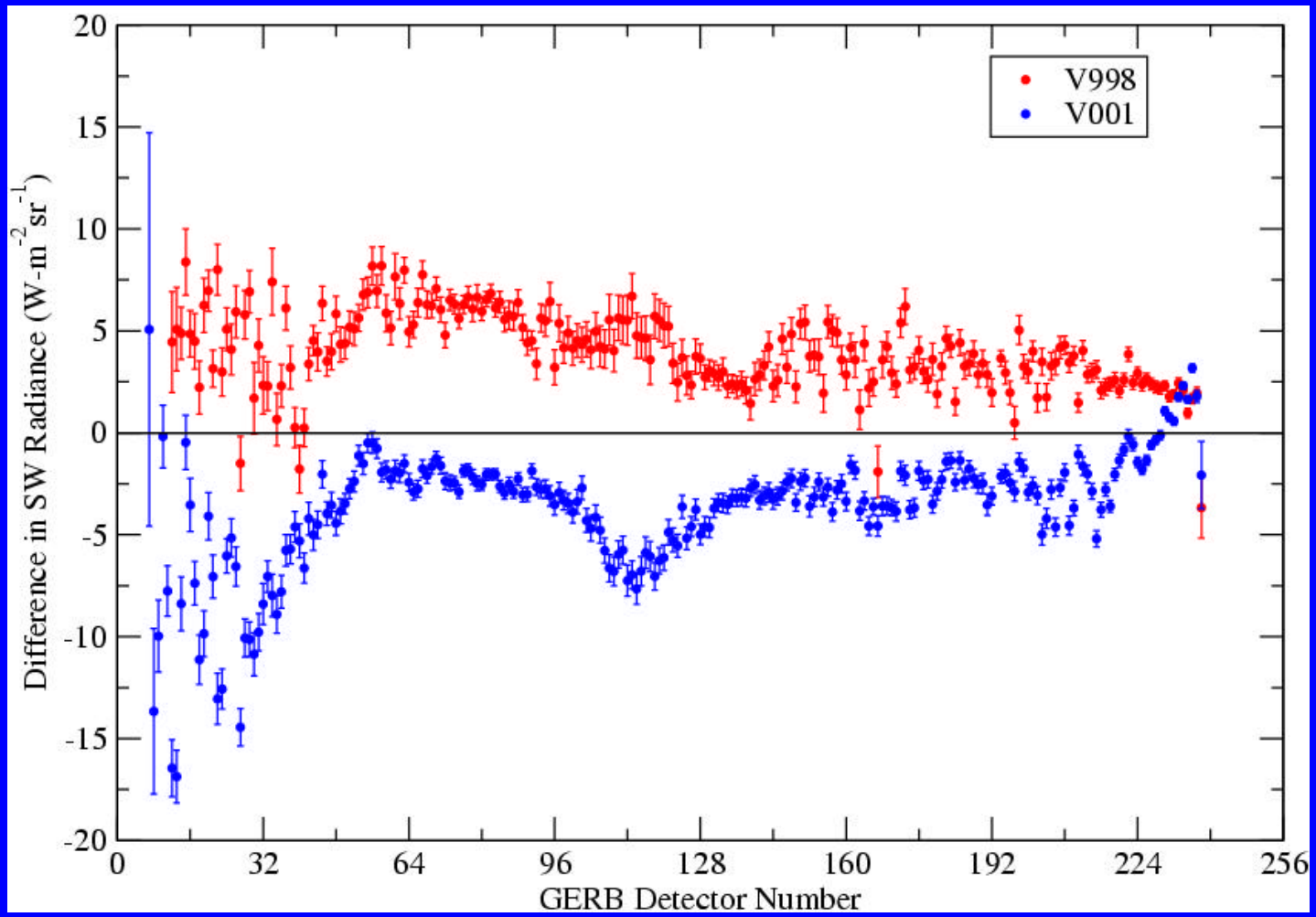
Mean Unfiltered SW Radiance June 2004



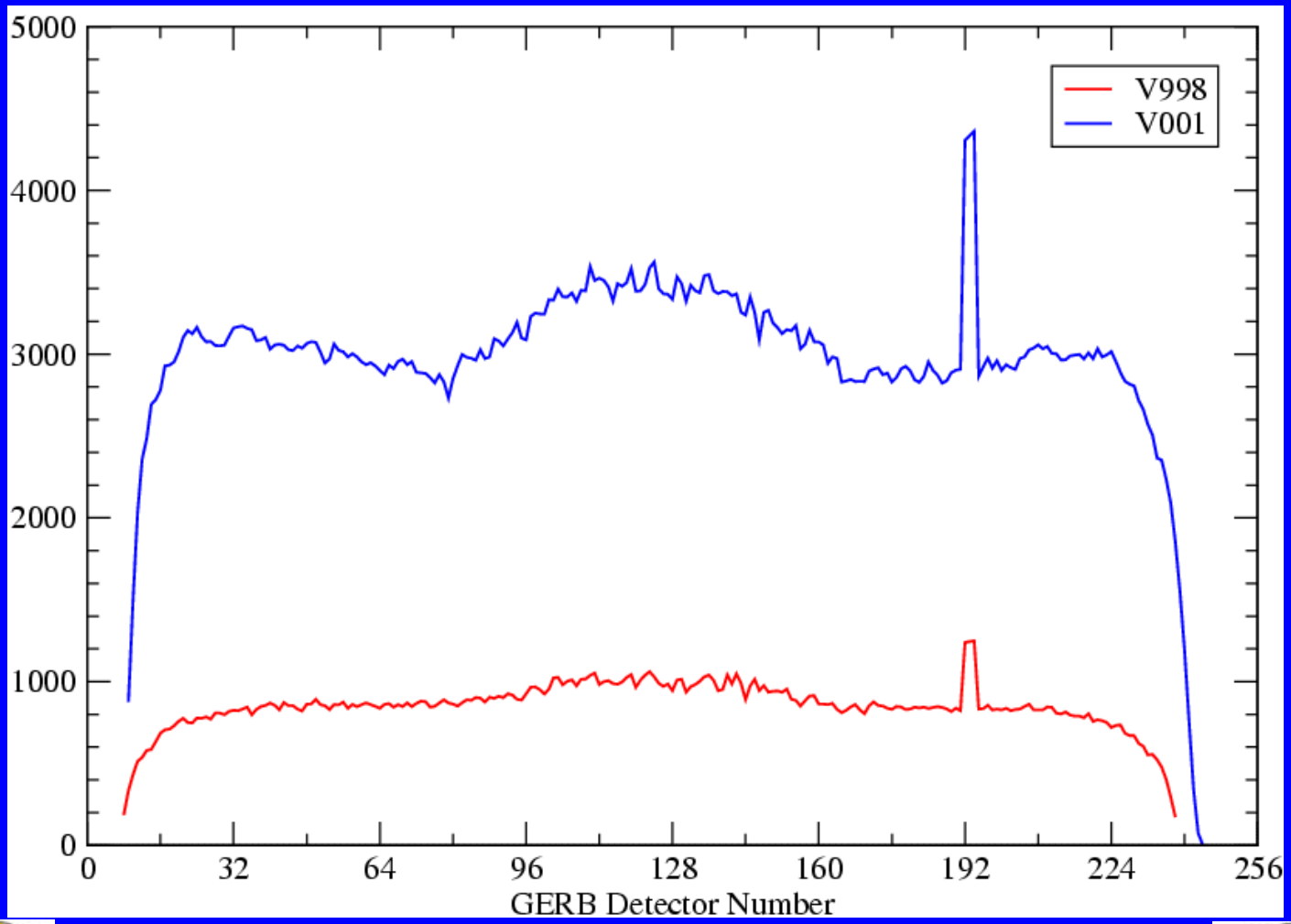
GERB SW Mean/CERES SW Mean
June 2004



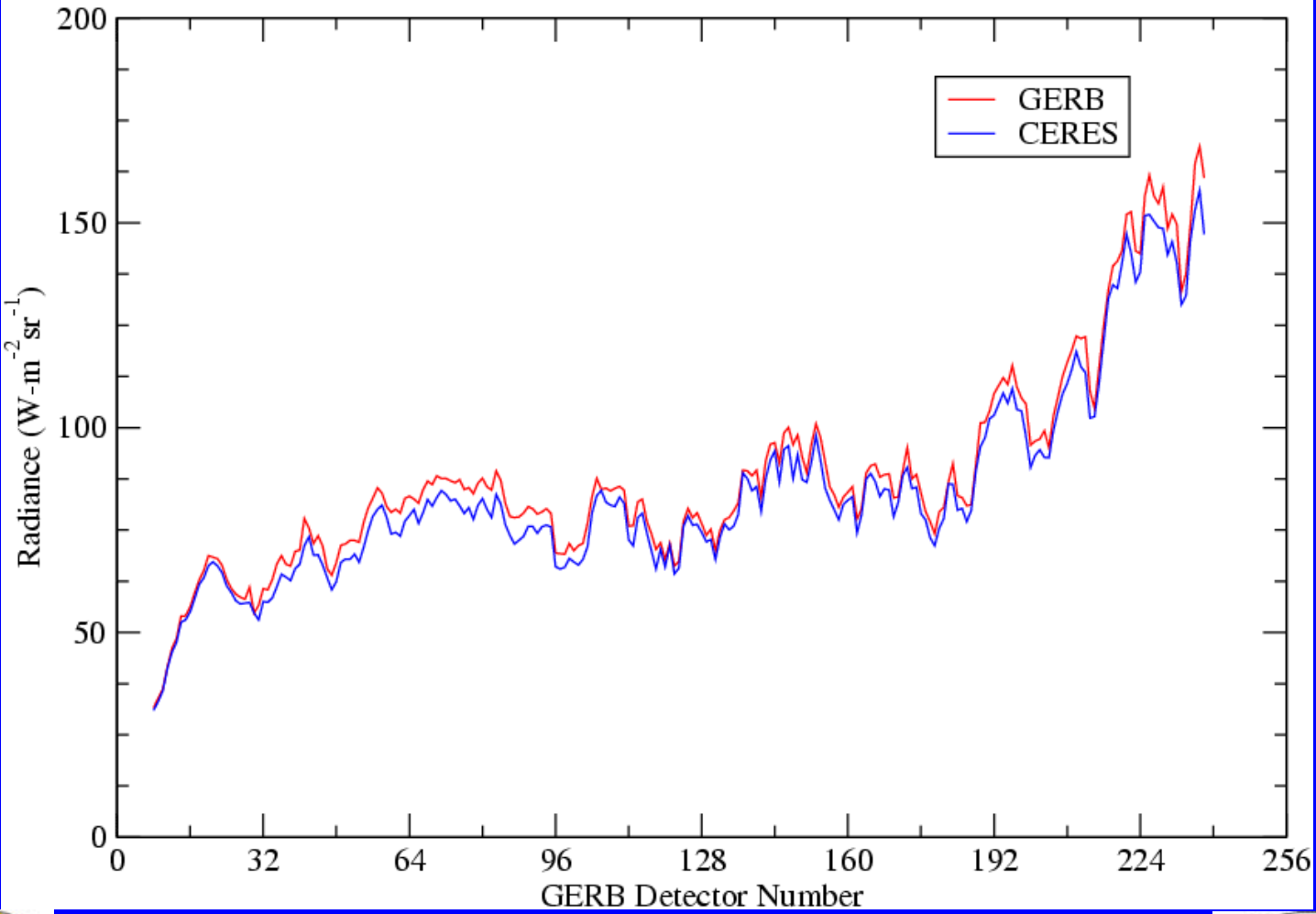
Mean Difference in SW Radiance GERB – CERES June 2004



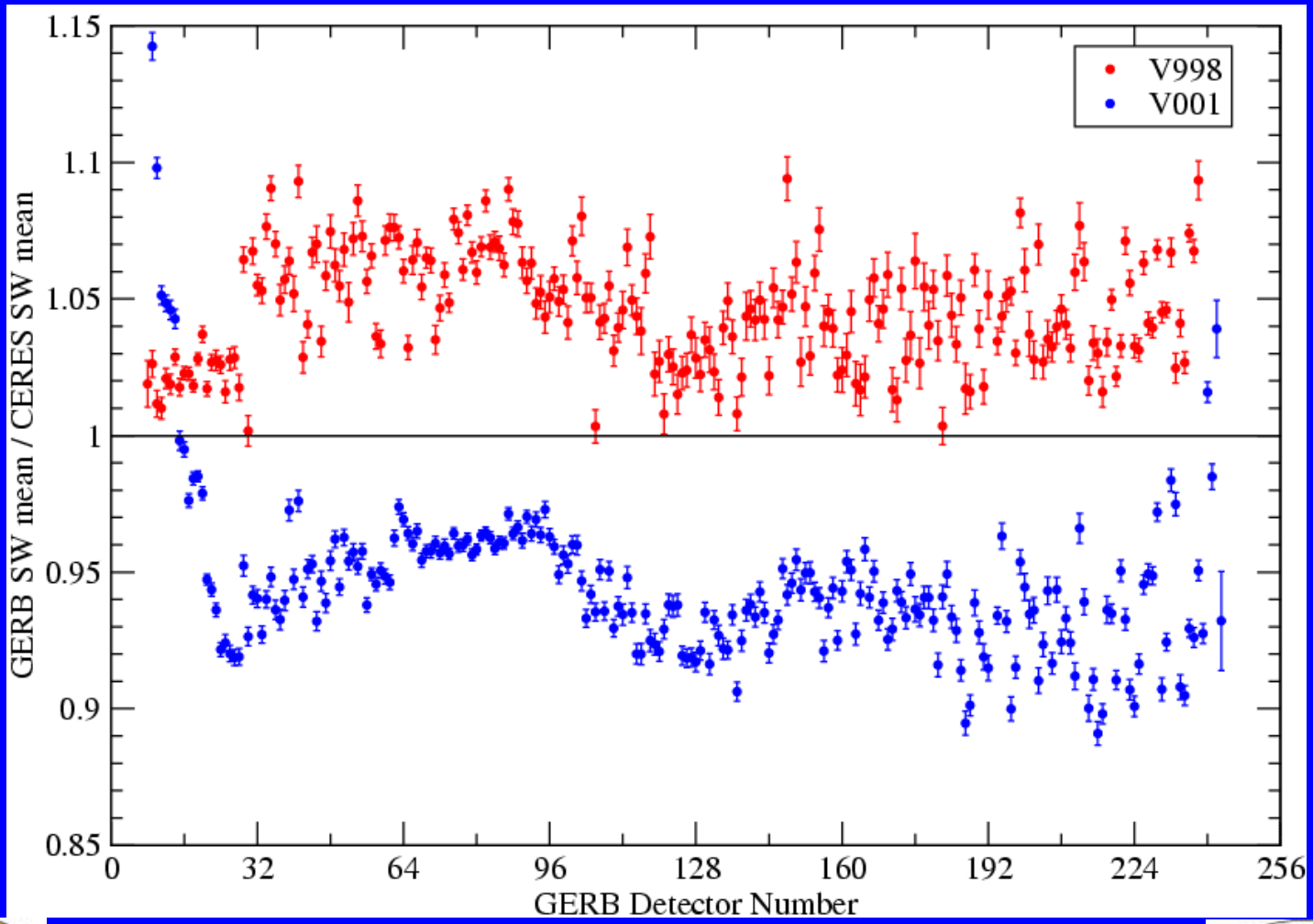
Number of Matches for Each Detector December 2004



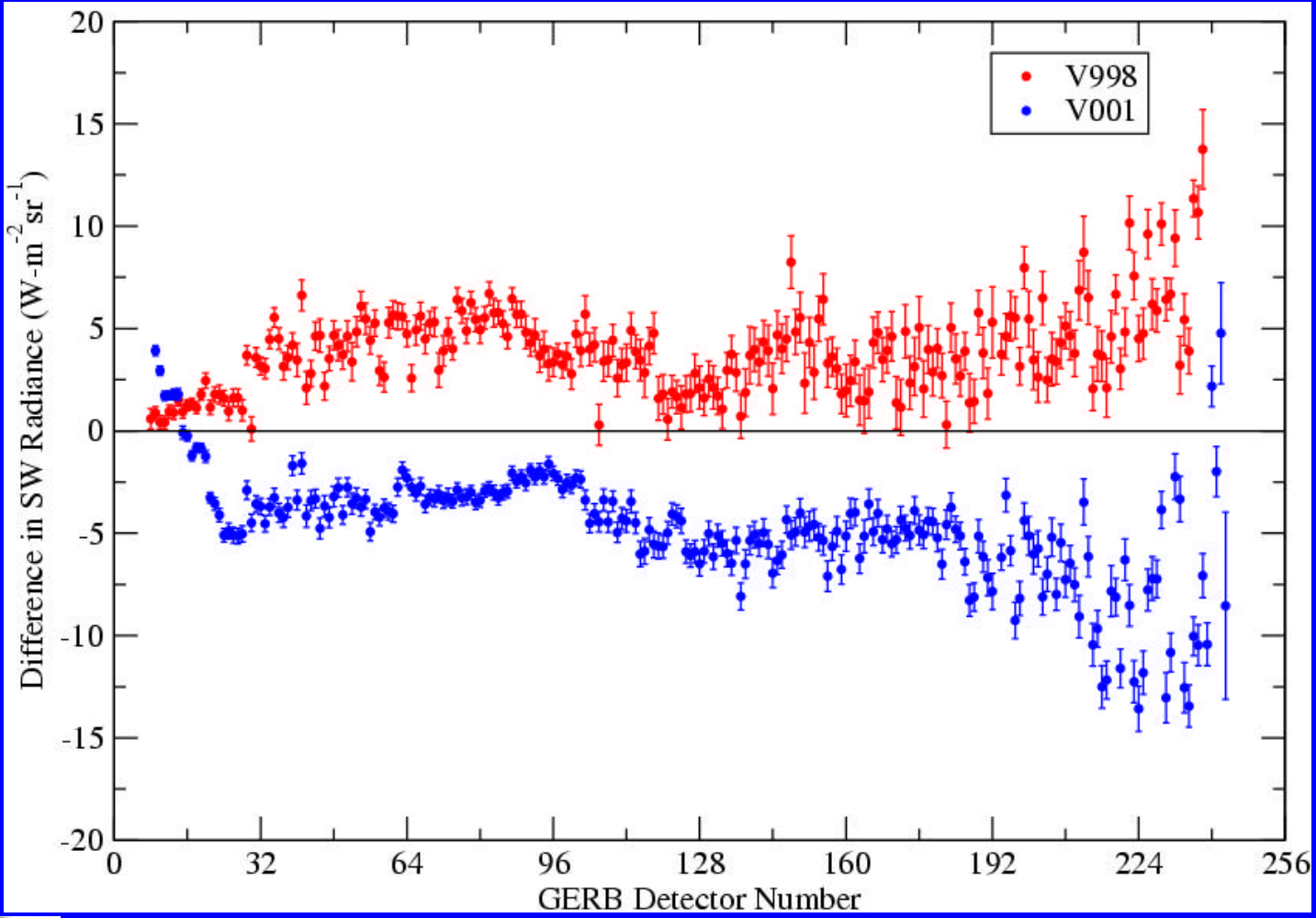
Mean Unfiltered SW Radiance December 2004



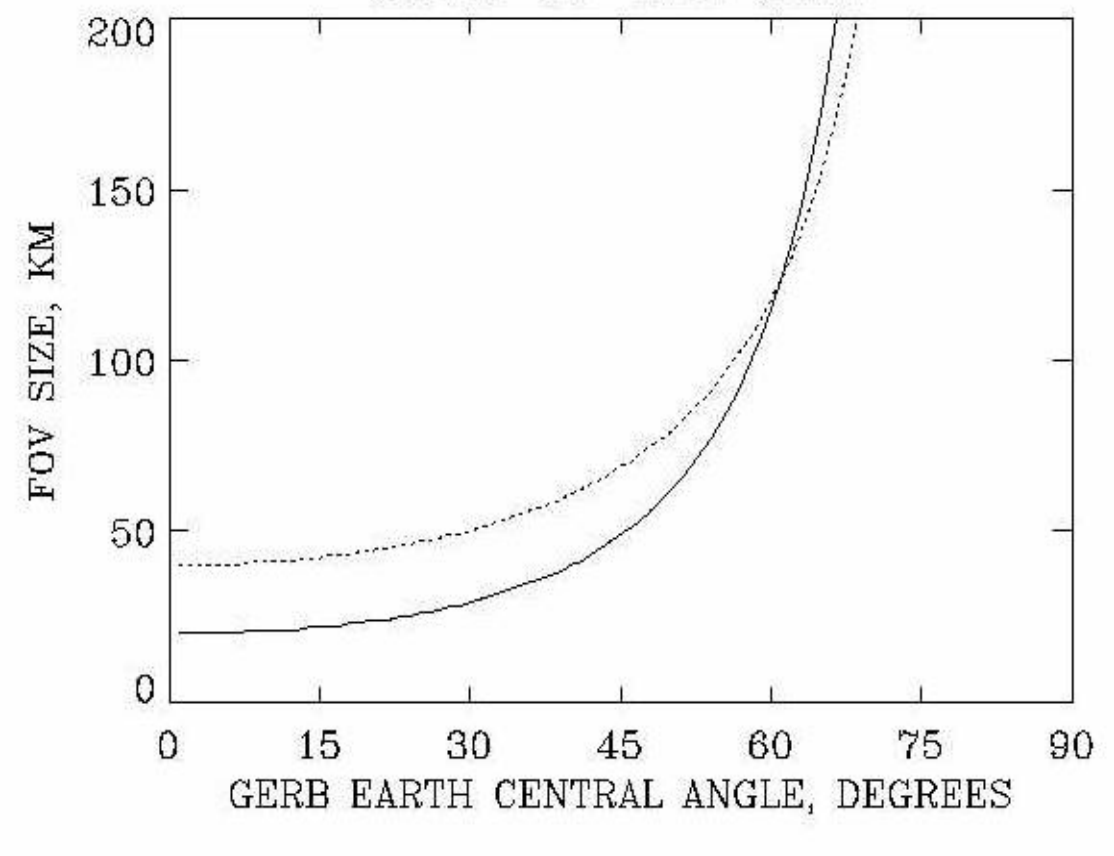
GERB SW Mean/CERES SW Mean
December 2004



Mean Difference in SW Radiance GERB – CERES December 2004



Footprint Sizes of CERES and GERB



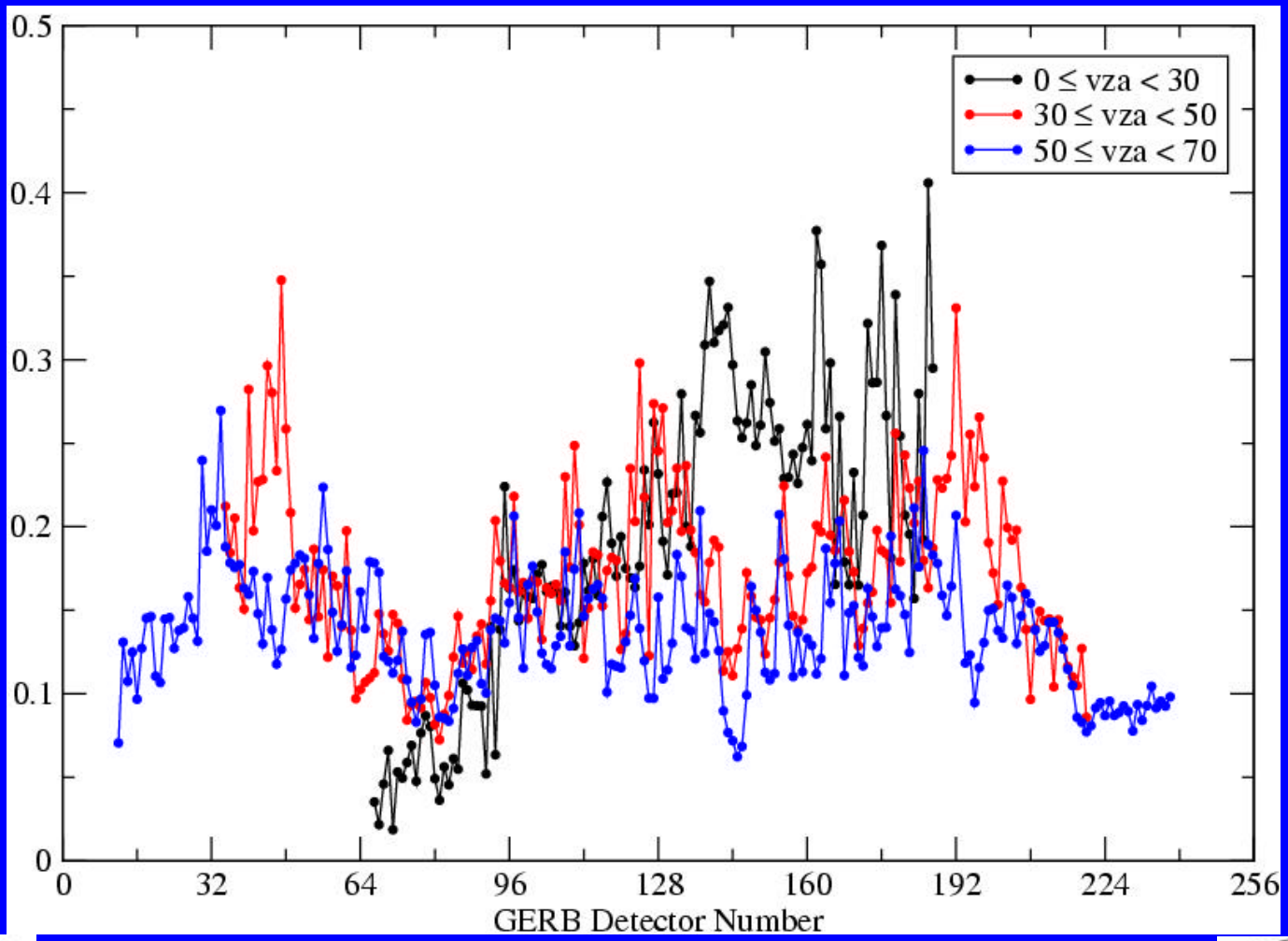
CERES solid

GERB dotted

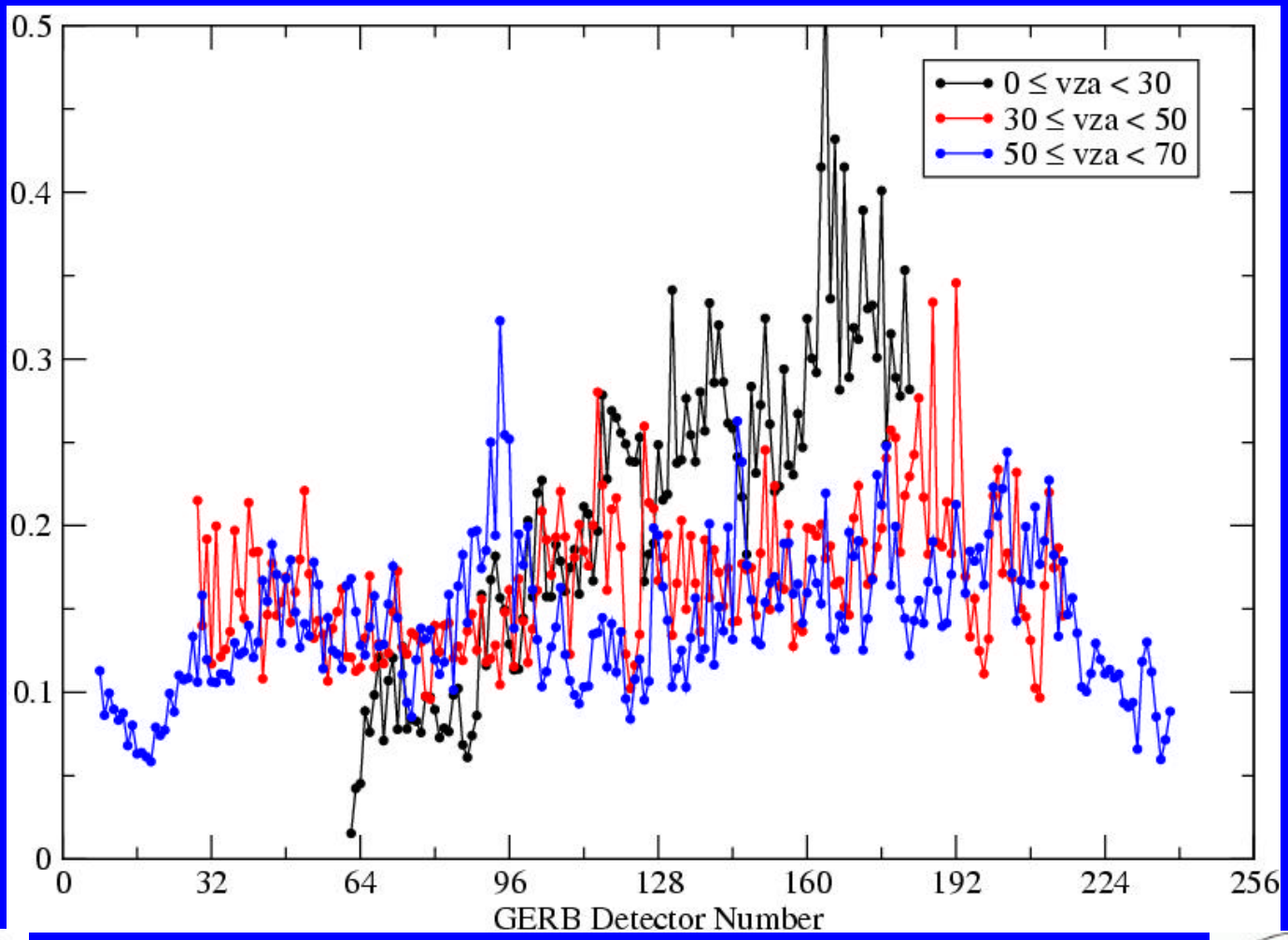
Effect of View Zenith Angle on GERB-CERES Agreement at Pixel Level

- For small VZA, the CERES pixel is much smaller than the GERB pixel; thus the CERES pixels respond to variations of the scene which are smoothed over by the GERB pixel.
- For VZAs >> 60°, the CERES pixel is larger than the GERB pixel, so it averages over a larger scene, and GERB responds to smaller features.
- The pixels are the same size at 60°, so the agreement between pixels is best here.
- The agreement between GERB and CERES pixels is measured by the standard deviation of their differences.

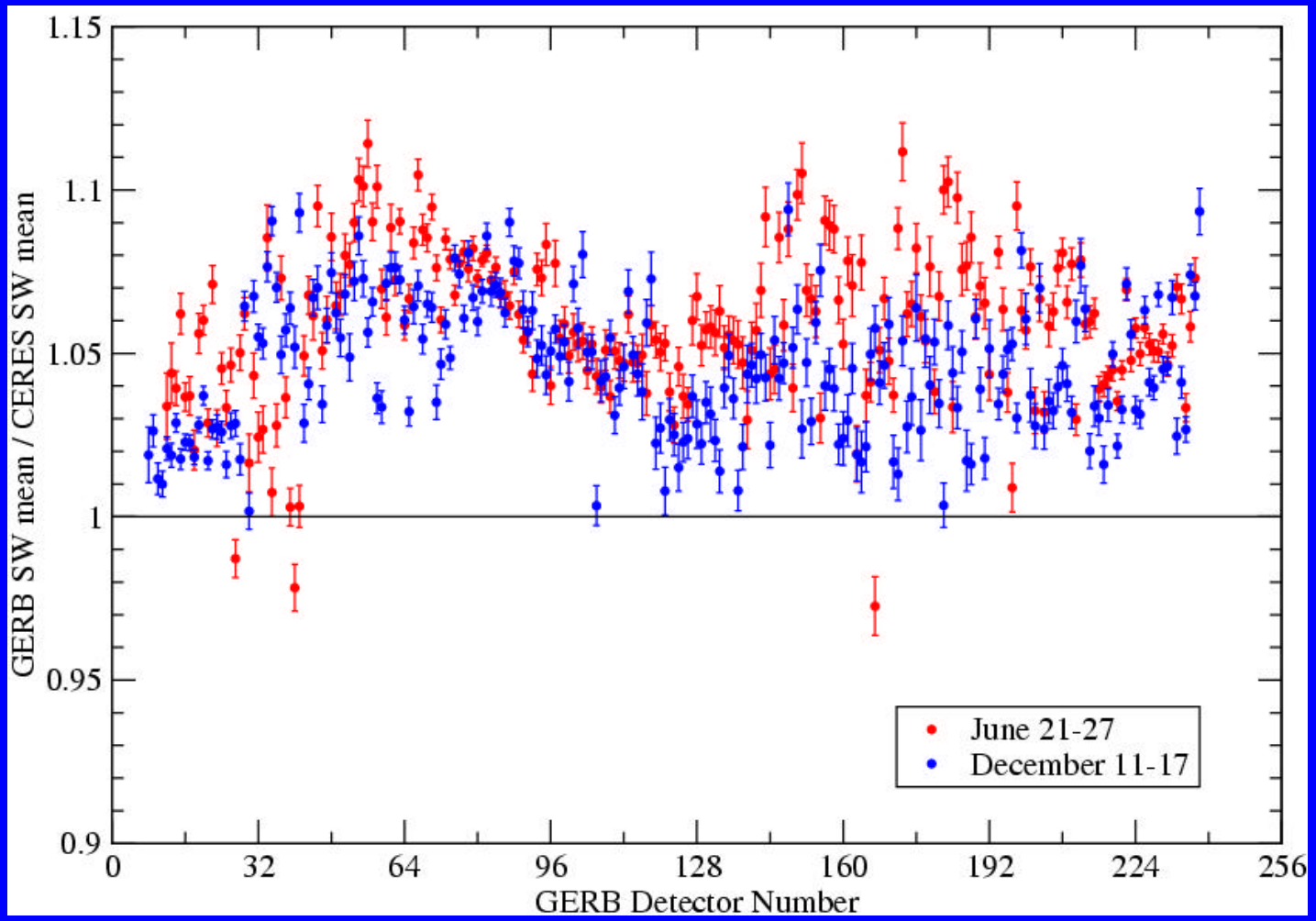
Normalized standard deviation of GERB – CERES June 2004



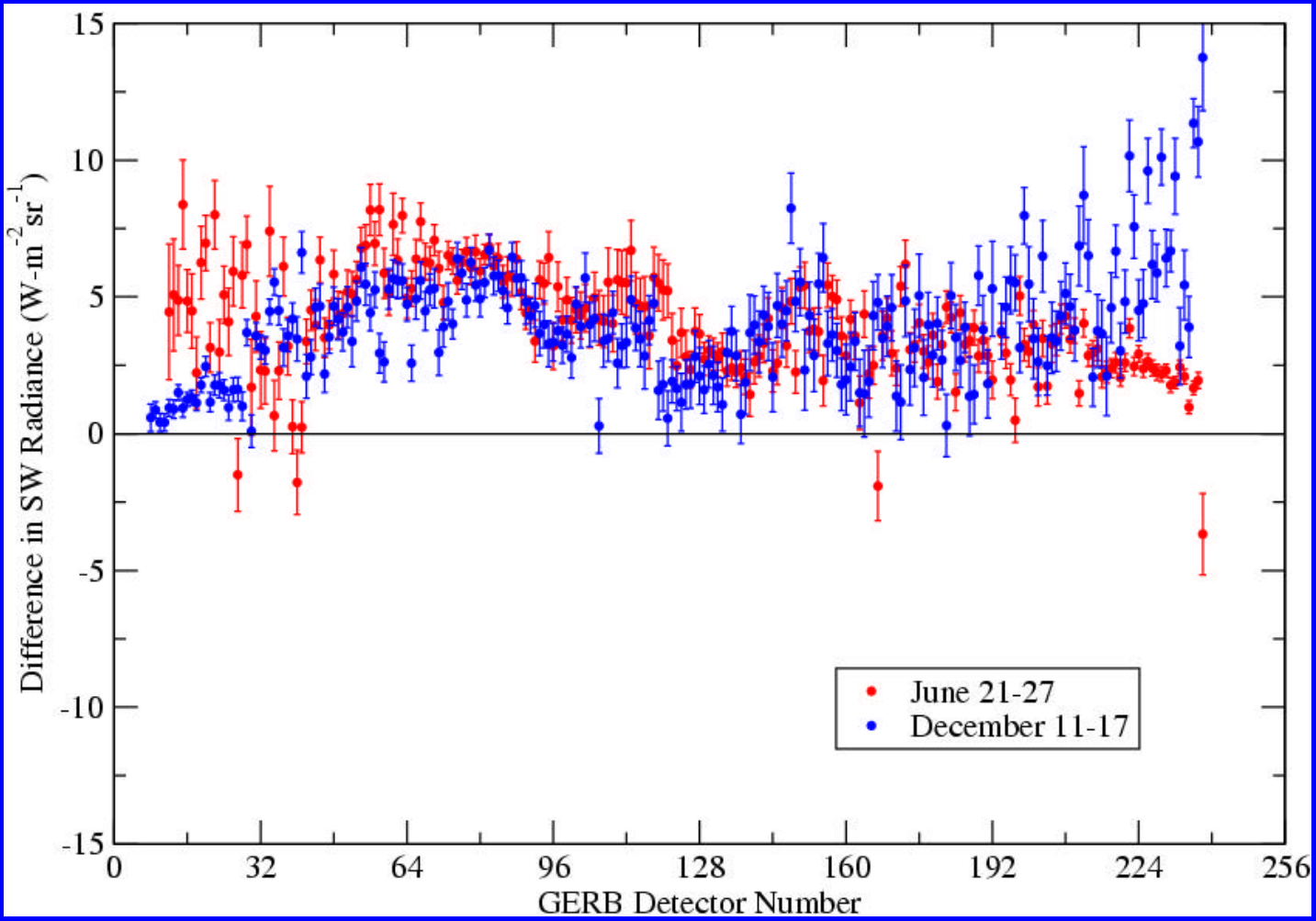
Normalized standard deviation of GERB – CERES December 2004



GERB SW Mean/CERES SW Mean
GERB V998



Mean Difference in SW Radiance GERB V998



Conclusions

- CERES has been operated in 4 campaigns (2 NH winters & 2 NH summers) to measure radiances which are aligned with GERB .
- CERES serves as a transfer radiometer in comparing the 256 GERB detectors.
  - Conclusions apply to detectors 49-174. For detectors 1-48 and 175-256, the sampling is insufficient.
  - GERB detectors vary by ±2% among themselves.
  - Between adjacent detectors for SW, there is a random uncorrelated change of ~½% and a long range structure (over a score or more) of ±2%.

Conclusions (cont.)

- GERB/CERES ratio is in range of 1.03 to 1.08 for V998.
- The difference is in range of $4 \pm 3 W\text{-}m^{-2}\ sr^{-1}$.
- Scatter for individual pixel measurements is smallest for VZA ~ 60°.
- For LW radiances, GERB/CERES ratio is in range of 1.00 ± 0.01.
- Comparisons are reproducible within ±2% between the June and December 2004 campaigns.