MISR Narrowband to CERES Broadband Radiance Regressions

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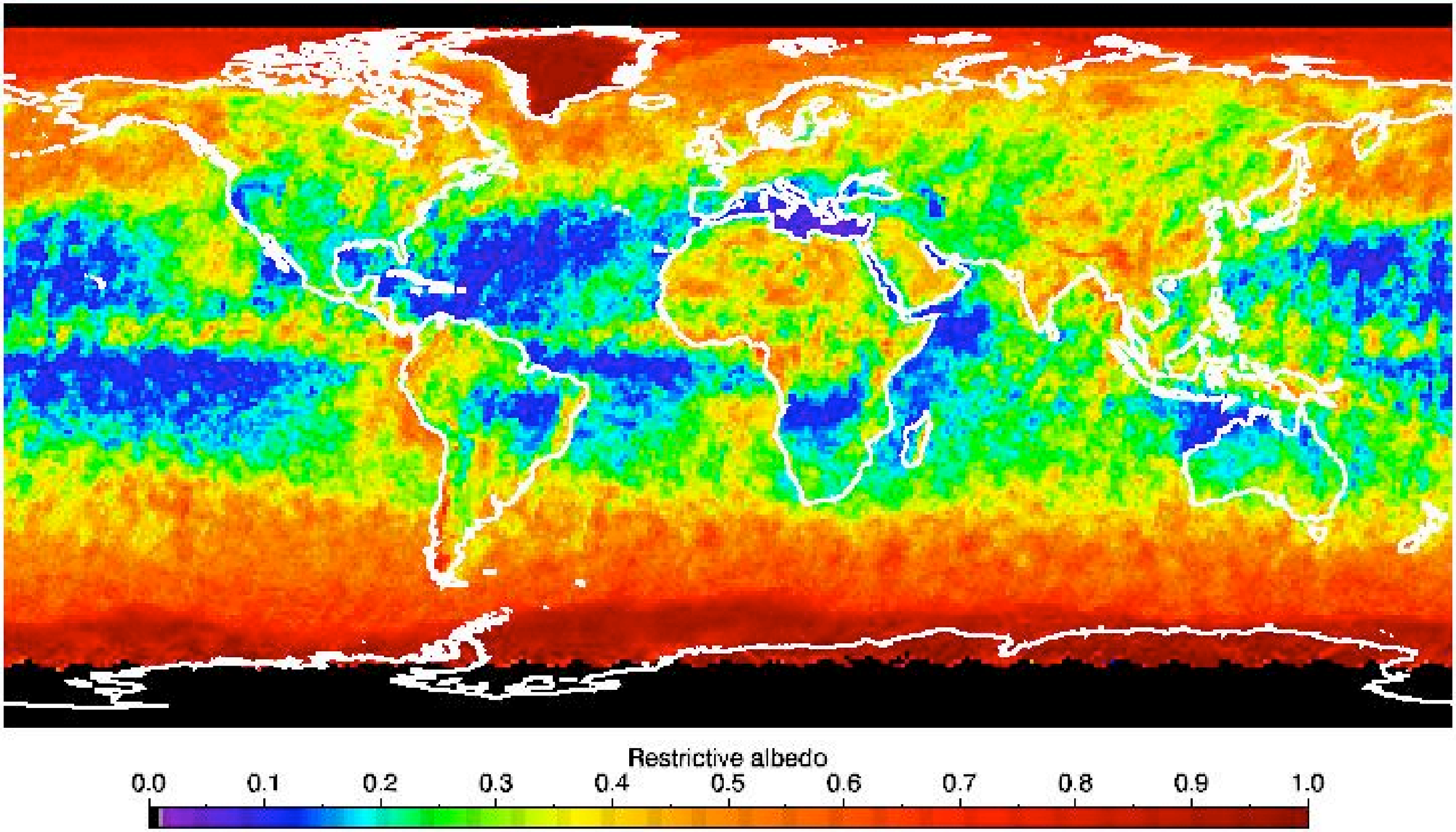
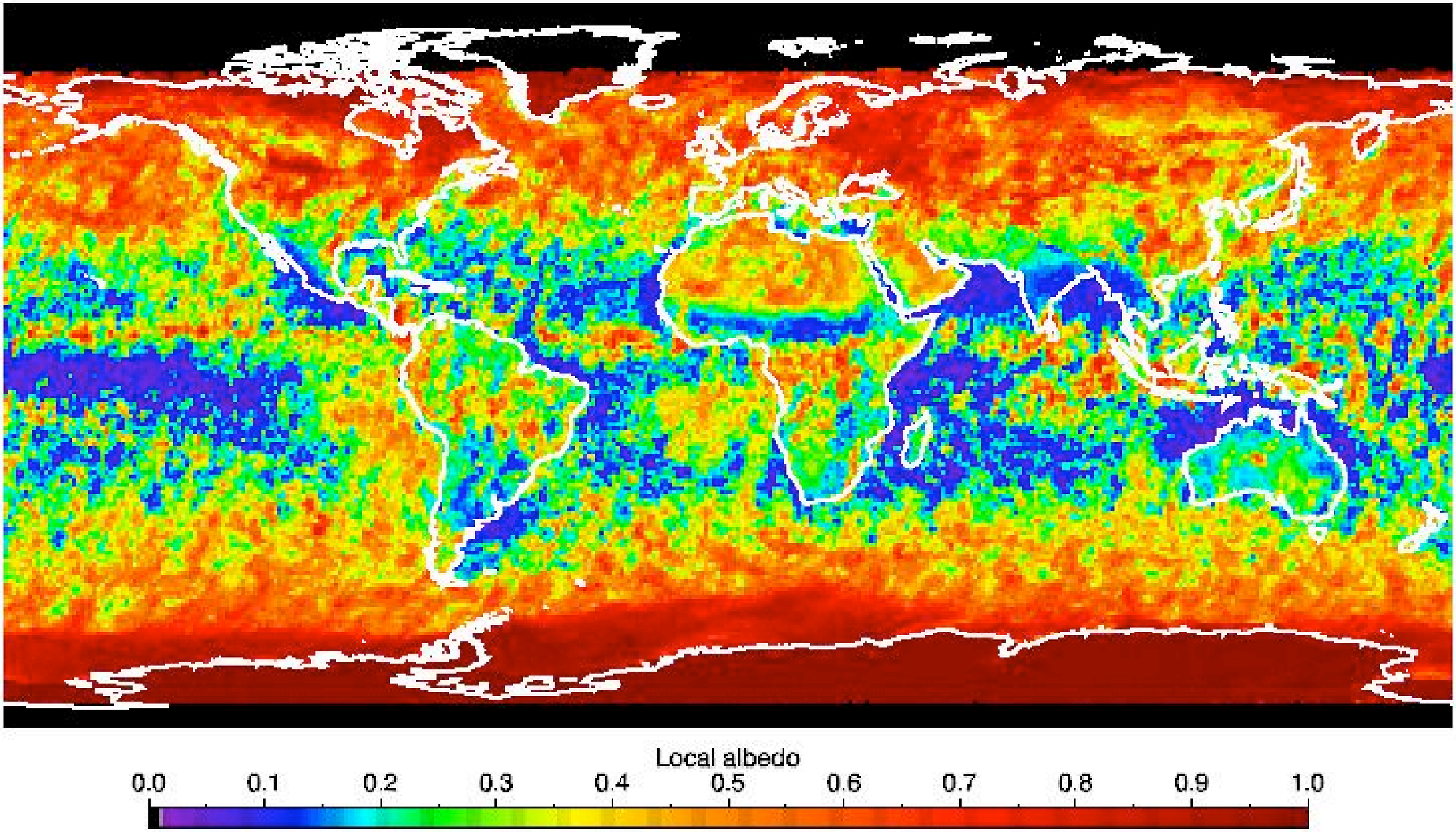
- Approach
  - coincident CERES SSF broadband SW, multiangle spectral MISR, and spectral MODIS analysis
- Goals
  - precision albedos
    - ADM's
    - radiometric calibration
  - cloud radiative forcing as function of cloud type
- Issues
  - effect of scene heterogeneity within SSF
  - dependence of ADM on spatial resolution
    - intersatellite transfer capability
  - quality assurance

- MISR albedos
  - spectral (blue, green, red, nir: 446, 558, 672, 866 nm)
  - restrictive albedos (CERES-like, at 35 km resolution)
    - cloud ht (cumulative frequency of cloud fraction <z)
  - expansive albedos (complete TOA)
  - local unobscured albedos (at 2.2 km)
    - cloud hts, texture, etc.
    - 9-angles, co-registered to cloud-top height
    - ≈10% of cases fit 1D deterministic model [Horváth and Davies, GRL 1/04]
- Extend these to broadband
  - direct comparison with CERES
  - more useful for modelers

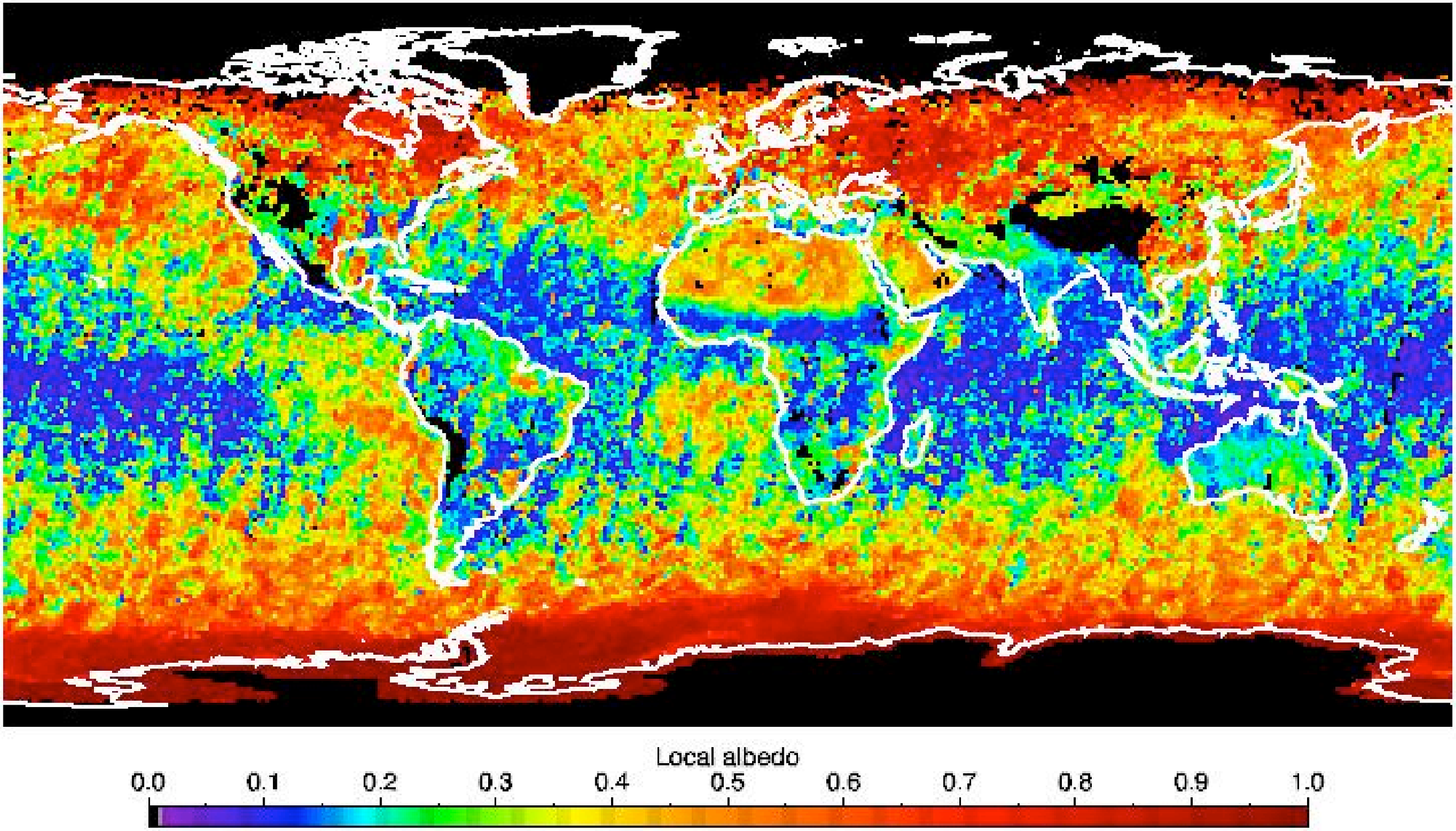
Restrictive albedo Summer 2000 F01_0005, All, Red band, 1 deg



Local albedo November 2003 F01_0005, All, Red band, 1 deg



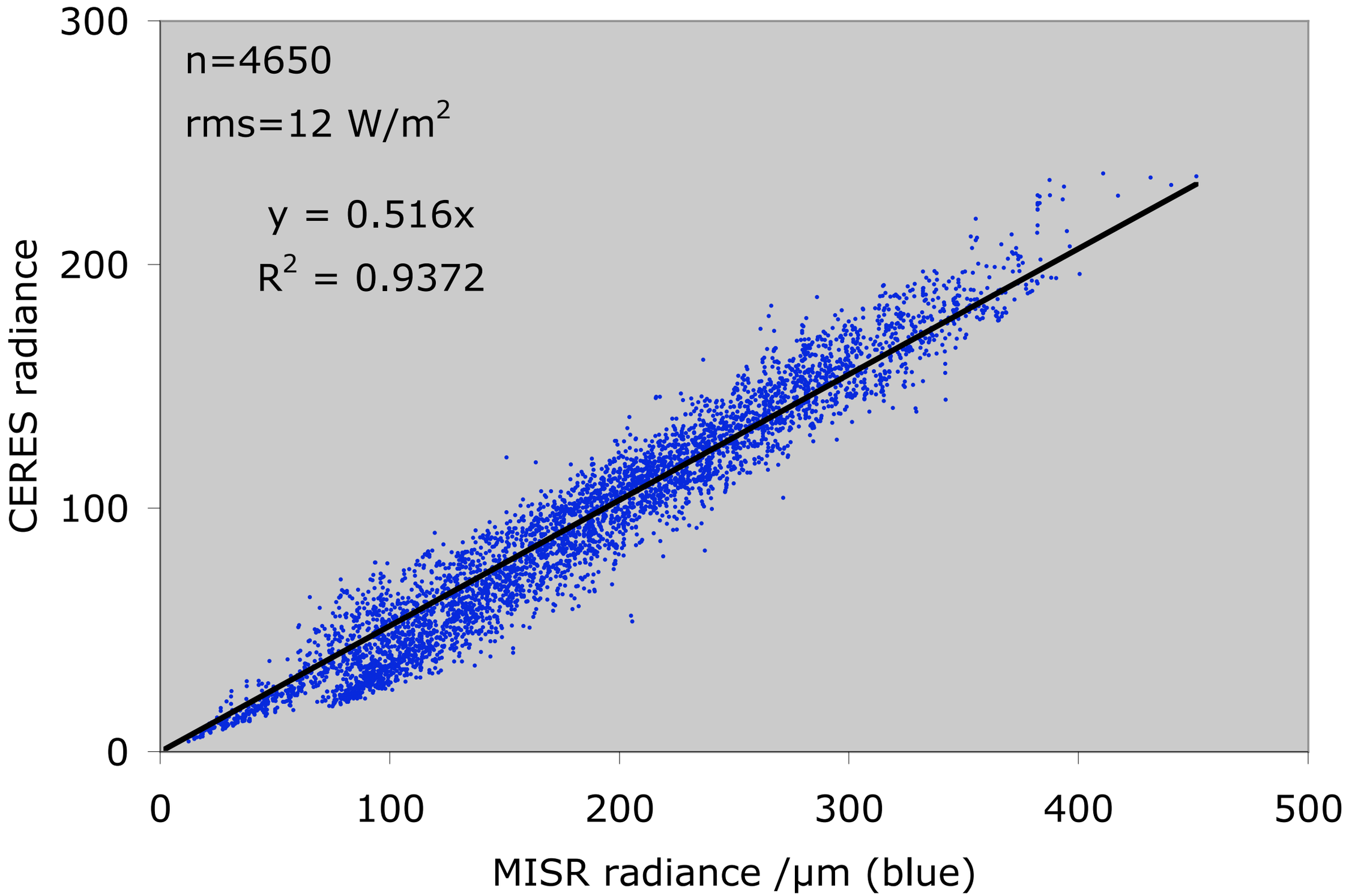
Local albedo November 2003 F01_0005, < 2 km, Red band, 1 deg

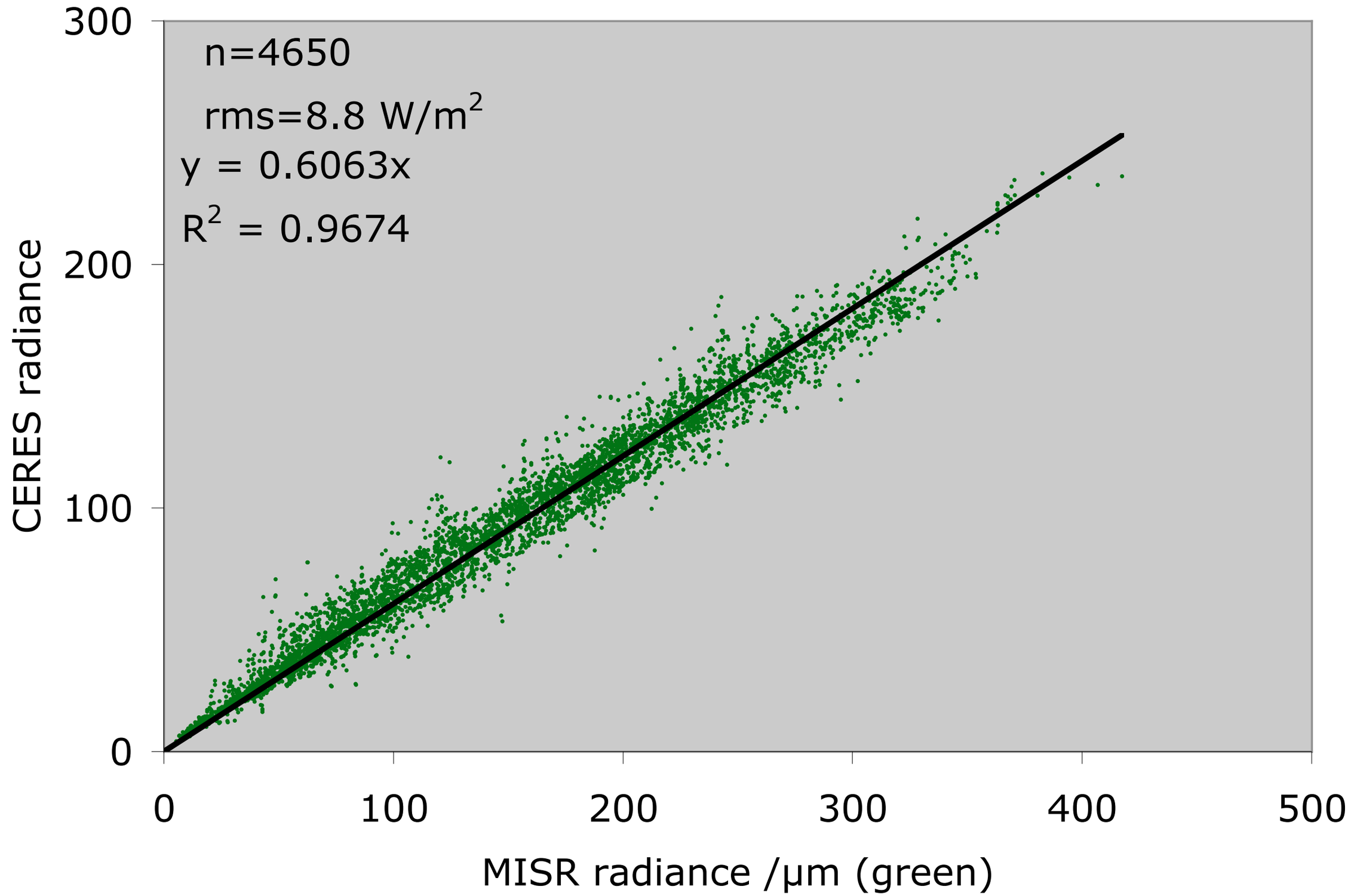


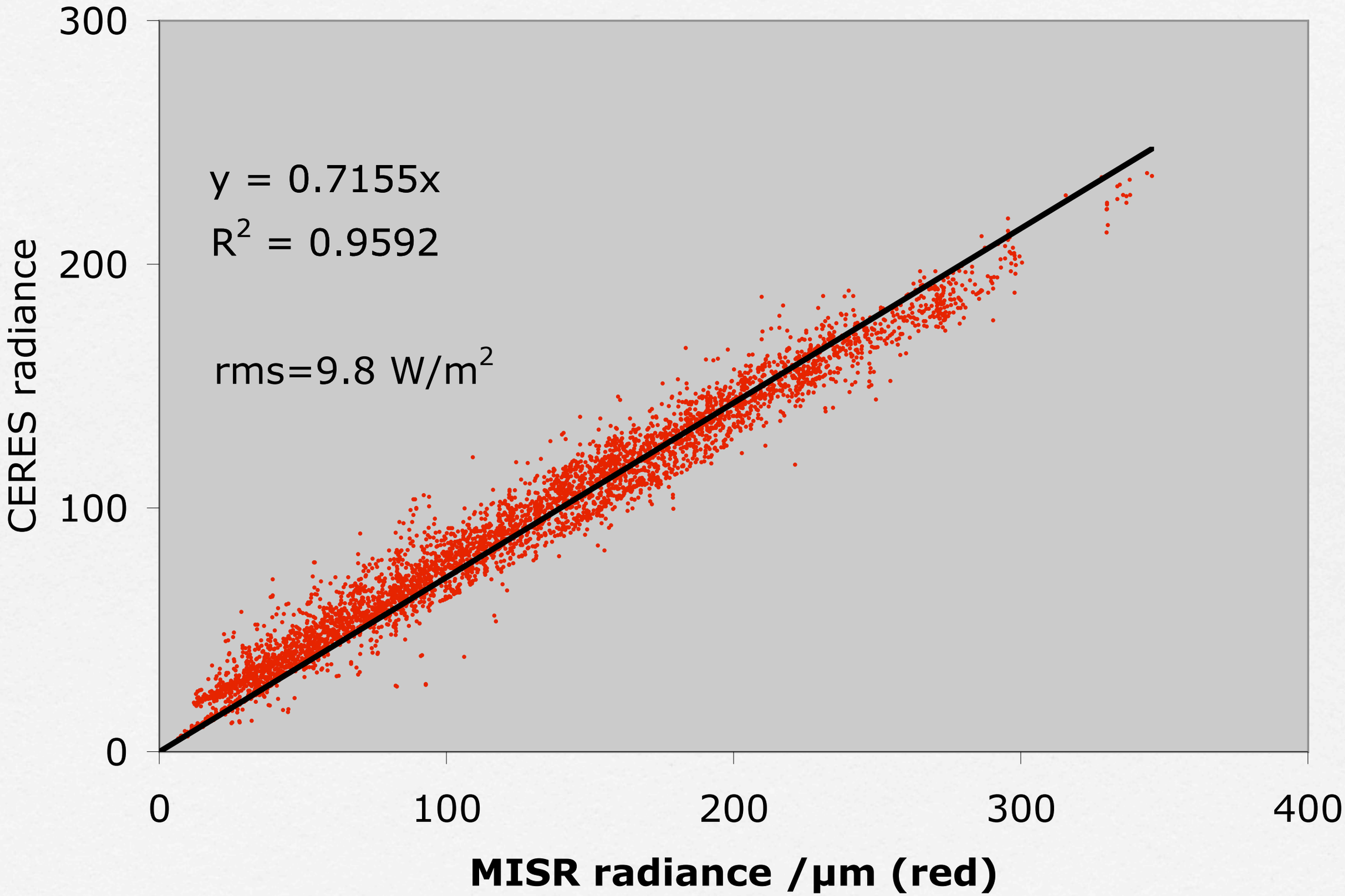
Preliminary results of MISR/CERES SSF radiance regression

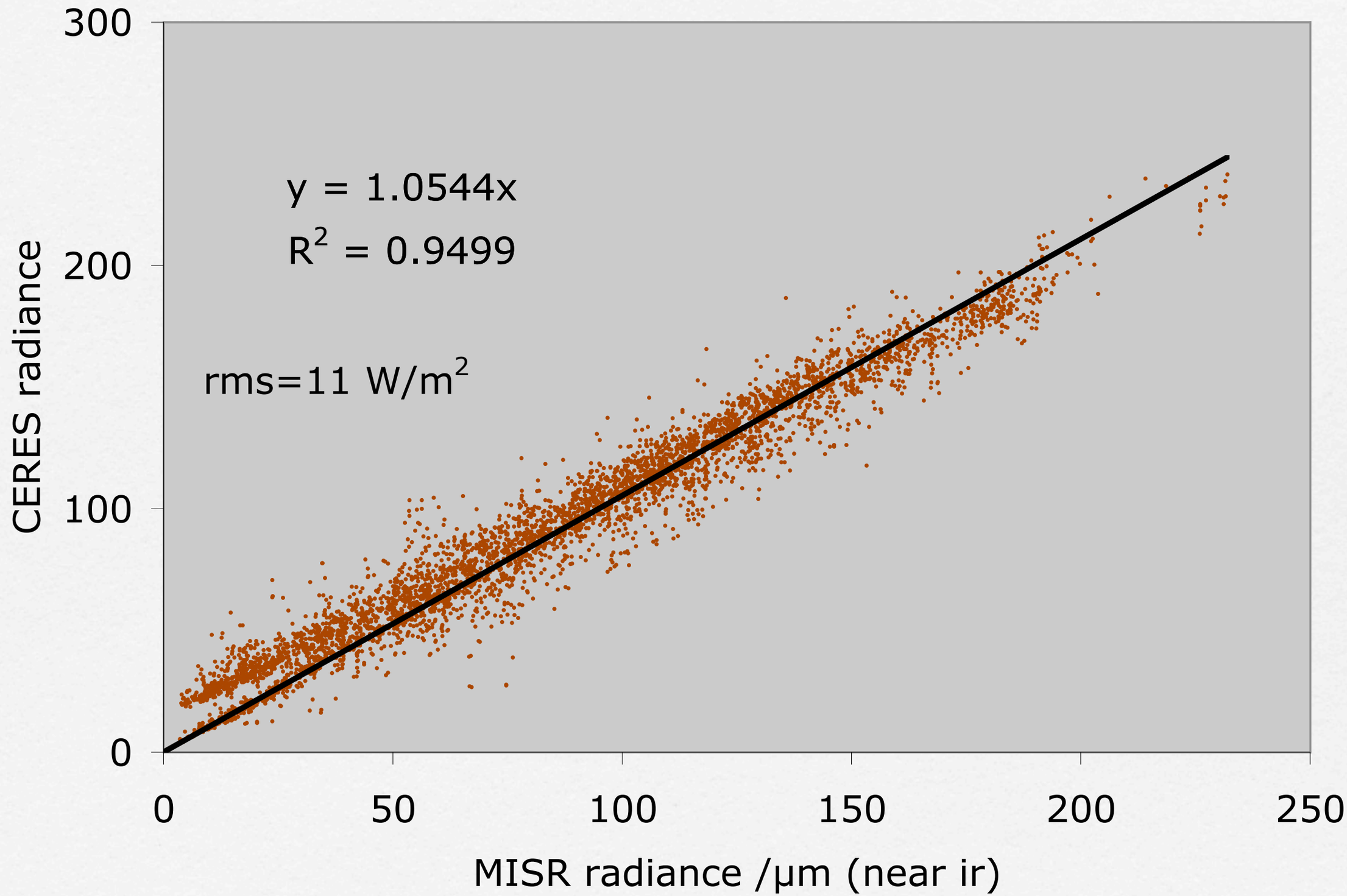
- To check
  - MISR calibration
    - low light linearity/non-linearity?
    - consistency from orbit to orbit
  - single vs multiple regression tradeoffs
  - stratification by scene type, view angle, etc.

- Three orbits analyzed so far:
  - 5953 & 5954 [MISR v22, CERES Edition 1A], 1/30/2001
  - 6980 [MISR v18, CERES Edition 1A], 4/10/2001
  - approximate MISR integration over SSF
  - ≈4000 coincident matches per orbit
    - ≈400 per view angle

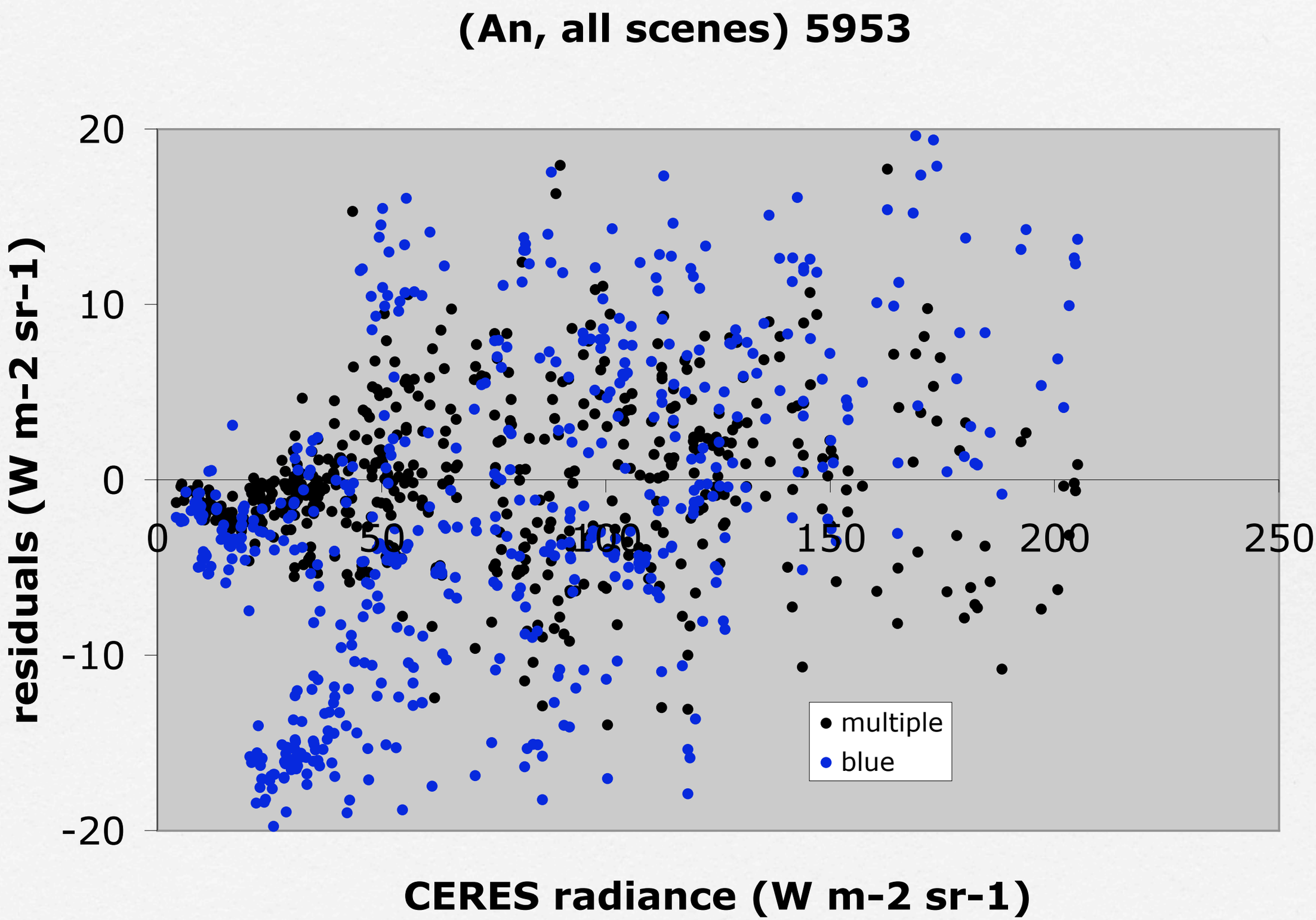

n=4650
rms=12 W/m2
y = 0.516x
R2 = 0.9372
CERES radiance
MISR radiance /µm (blue)
0
100
200
300
0
100
200
300
400
500

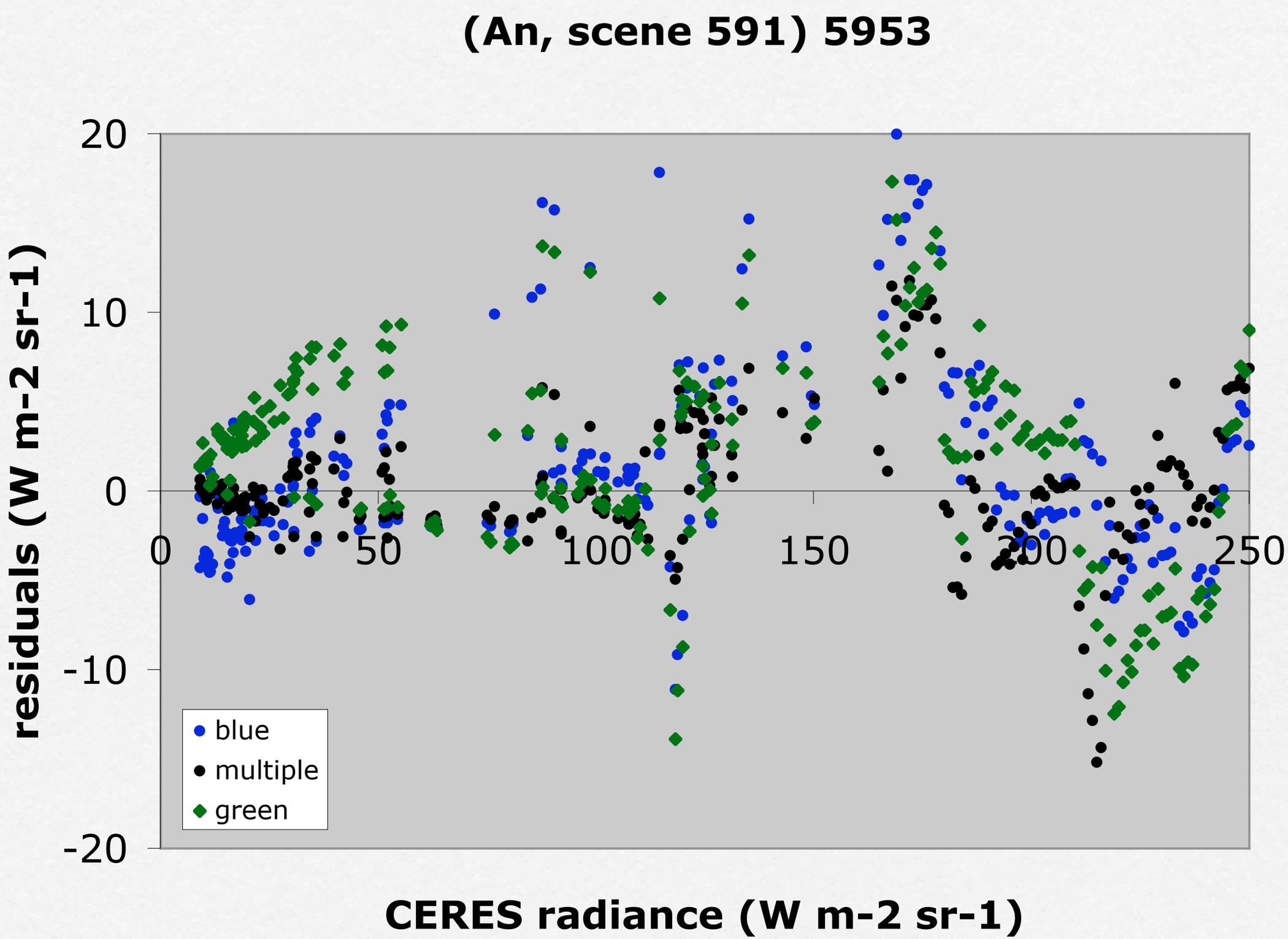

n=4650
rms=8.8 W/m2
y = 0.6063x
R2 = 0.9674
CERES radiance
MISR radiance /µm (green)
0
100
200
300
0
100
200
300
400
500


y = 0.7155x
R2 = 0.9592
rms=9.8 W/m2
CERES radiance
MISR radiance /µm (red)
0
100
200
300
400


y = 1.0544x
R2 = 0.9499
rms=11 W/m2
CERES radiance
MISR radiance /µm (near ir)
0
100
200
300
0
50
100
150
200
250

orbit	blue	green	red	nir	multiple
5953, all	0.516	0.606	0.715	1.054	
5954, all	0.509	0.592	0.705	1.048	
6980, all	0.484	0.587	0.664	0.995	
residual rms, all	12.2	8.8	9.8	10.9	6.9
r2	0.937	0.967	0.959	0.950	0.980
5953, An, all scenes	0.516	0.598	0.714	1.070	
rms	10.0	7.3	8.8	9.3	5.2
r2	0.956	0.976	0.966	0.962	0.988
5953, An, scene 591	0.501	0.571	0.677	1.087	
rms	4.26	4.51	3.85	3.45	1.72
r2	0.990	0.989	0.992	0.994	0.998


(An, all scenes) 5953
residuals (W m-2 sr-1)
20
10
0
-10
-20
0
50
100
150
200
250
multiple
blue
CERES radiance (W m-2 sr-1)


(An, scene 591) 5953
residuals (W m-2 sr-1)
CERES radiance (W m-2 sr-1)
20
10
0
-10
-20
0
50
100
150
200
250
blue
multiple
green

Summary

- calibration tests
  - constrained, single regression over ideal scene types seems to work best
  - accuracy tbd, but ≈<3%
  - no strong evidence of non-linearity at low light levels
- broadband albedo regressions
  - multiple regression reduces rms of residuals
  - stratify by scene and angle
    - not very sensitive to mistakes in scene id
  - expect to release provisional broadband MISR albedos this summer


the end