Surface and Atmospheric Radiation Budget (SARB)
"CRS" bubble in CERES schematic

23rd CERES Science Team Meeting
Williamsburg, Virginia 23-25 January 2001

A memo (attached at the end) gives details on this presentation.
URL for this group **http://srbsun.larc.nasa.gov/sarb/sarb.html**

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Input

Clouds, aerosols, wind, T(z), H2O(z), O3(z)

Constrainment process

Compute parameters that CERES observes at TOA:
SW fluxes, LW and window radiances
Tune clouds, aerosols, surface albedo, H2O(z), T(skin),
and TOA parameters

Output

Adjusted parameters (i.e., aerosol τ, cloud area)
Flux profiles as SW(z), LW(z), window(z)

SARB presentations at this meeting of CERES

(Items 1-4 in this 30 min. report)

1. Monthly Surface Albedo History (SAH) maps
2. Full CRS processing in limited TRMM domain
3. Study of Collins-Rasch Aerosol Assimilation
4. Schedule for test of ECMWF and GEOS meteorology

(Items 5-6 during Co-I reports on Jan. 23)

5. Coupled air-sea radiative transfer (Zhonghai Jin)
   jin@sunbeam.larc.nasa.gov
6. Sea-reflected radiances in model and COVE data (W. Su)
   wsu@wind.larc.nasa.gov

Monthly Surface Albedo History (SAH) maps

Problem: Land surface albedo (A) is retrieved only when sky is clear…

but is still needed for cloudy-sky calculations.

Solution: Apply quick SAH table lookup to clear footprints at start of month…

and use as default land surface albedo (A) in Fu-Liou radiative transfer calculations.

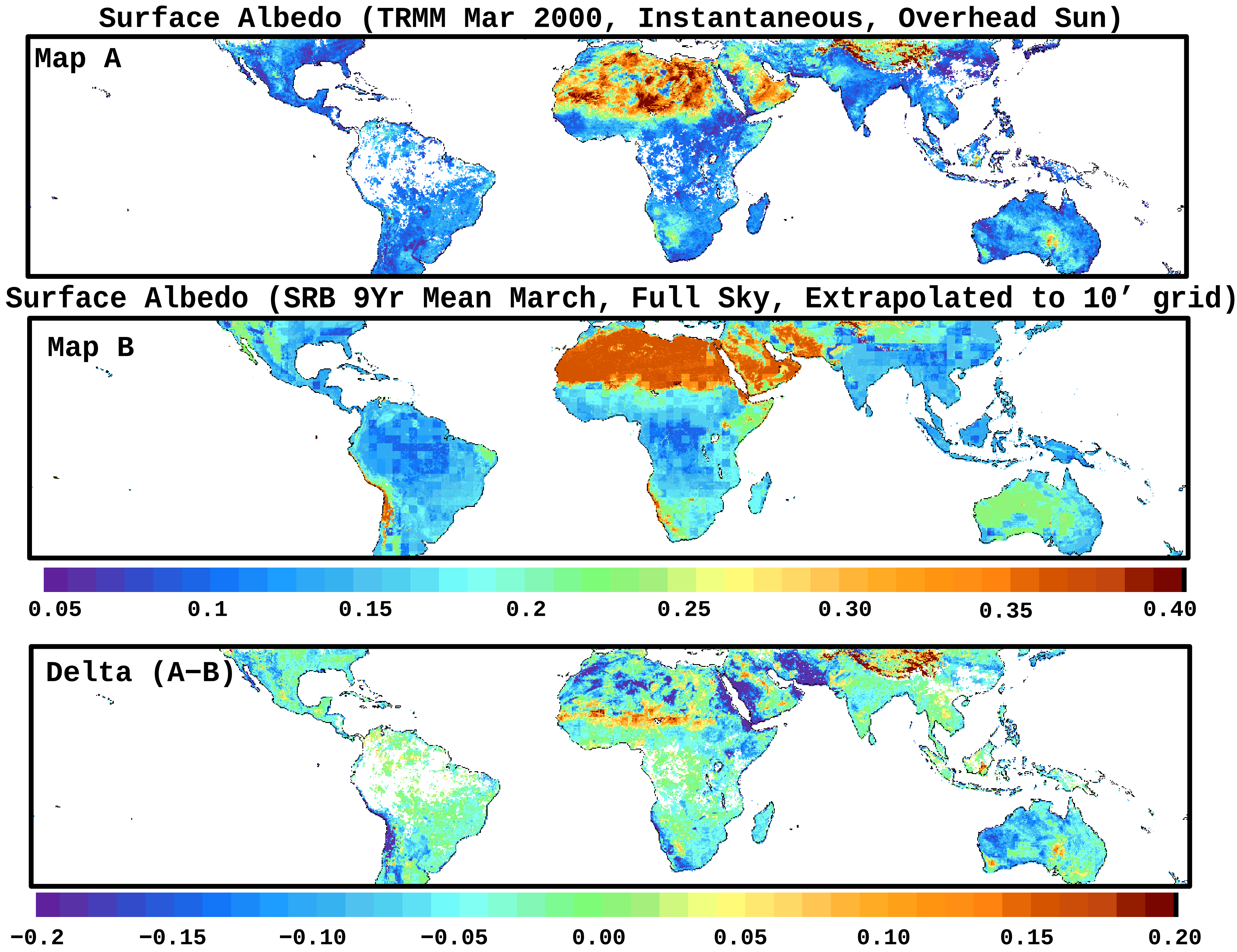
Assume variation of A with μ=cos(SZA):

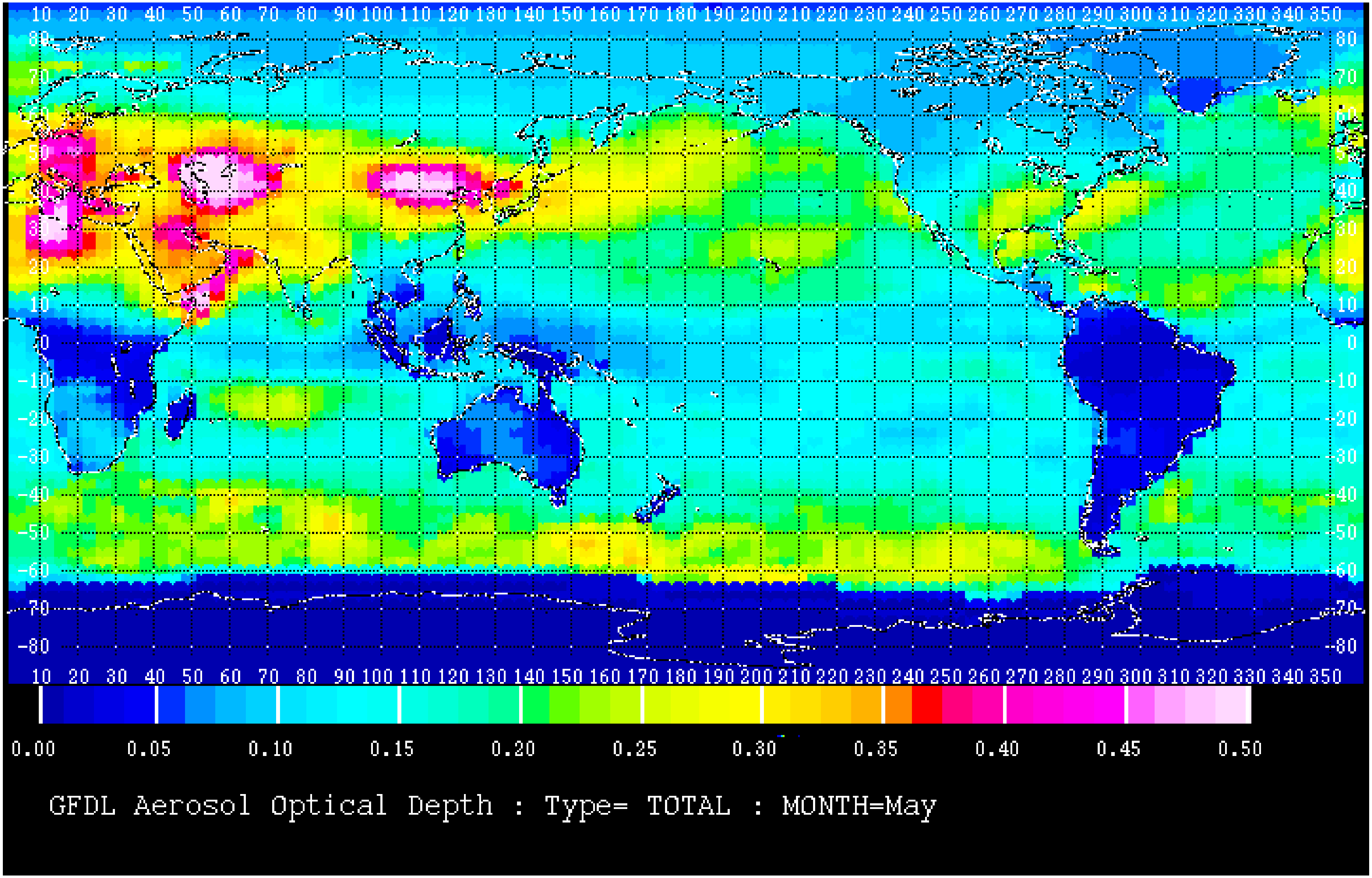
$$\mathbf{A(\mu) = A_o(1+d)/(1+2d\mu)}$$

This page has detailed notes that were NOT projected on the screen during the viewgraph presentation.

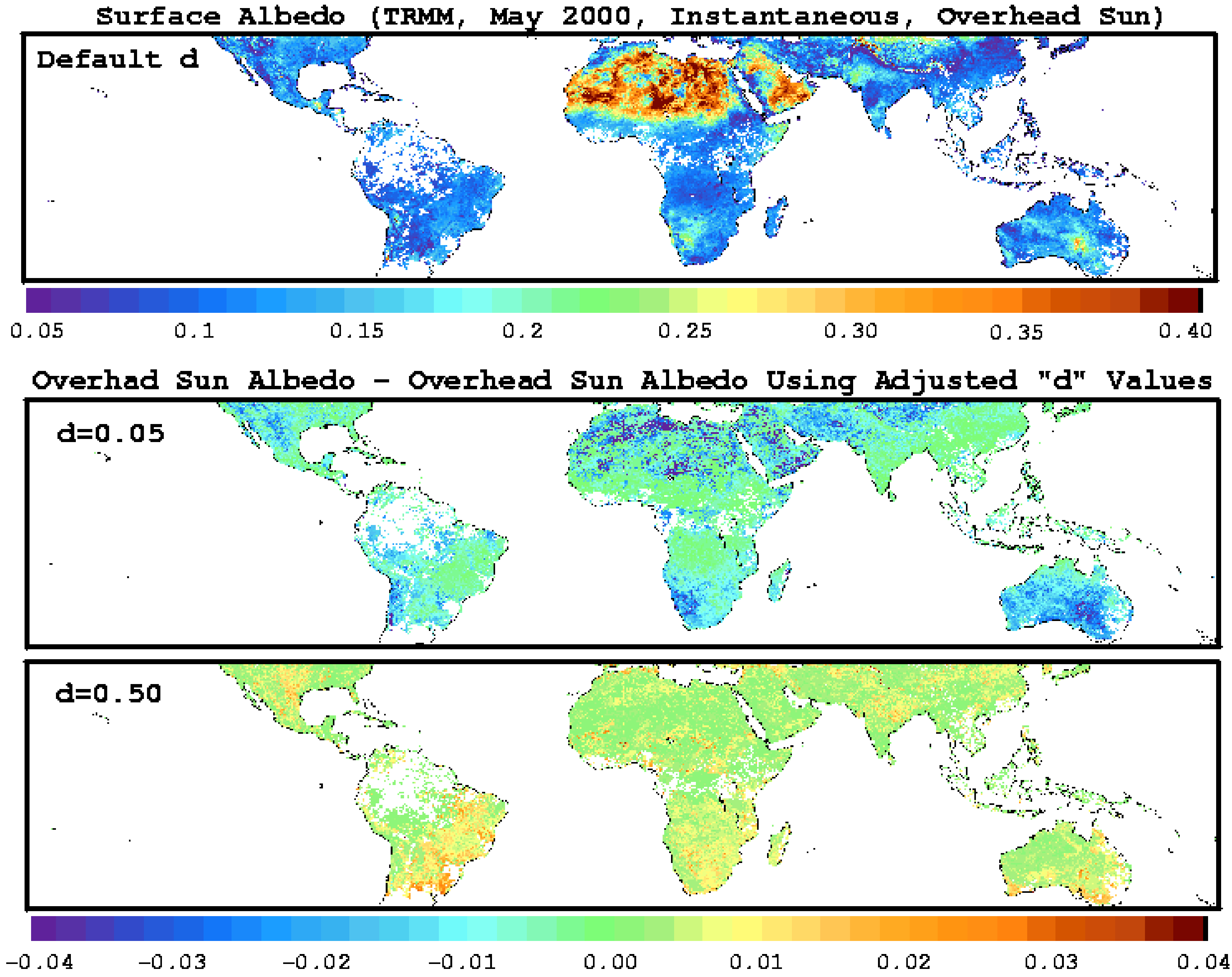
Notes on plots that follow.

SAH is a quick table lookup to the Fu-Liou code using the SSF observed clear sky CERES TOA broadband SW flux, precipitable water (PW) from ECMWF, surface pressure/elevation, SZA, and aerosol τ. This is typically done a few times during a month. At this stage, we are using the monthly mean aerosol τ from the GFDL CTM. Later, we will test the more timely, 6-hourly aerosol τ from the Collins-Rasch aerosol assimilation. The retrieved surface albedo (A) is expressed for overhead sun using the above formula (Dickinson, 1982) with d-values that vary with IGBP surface type. Sensitivity to d-value is shown. Results are compared to the GEWEX SRB Project retrievals.

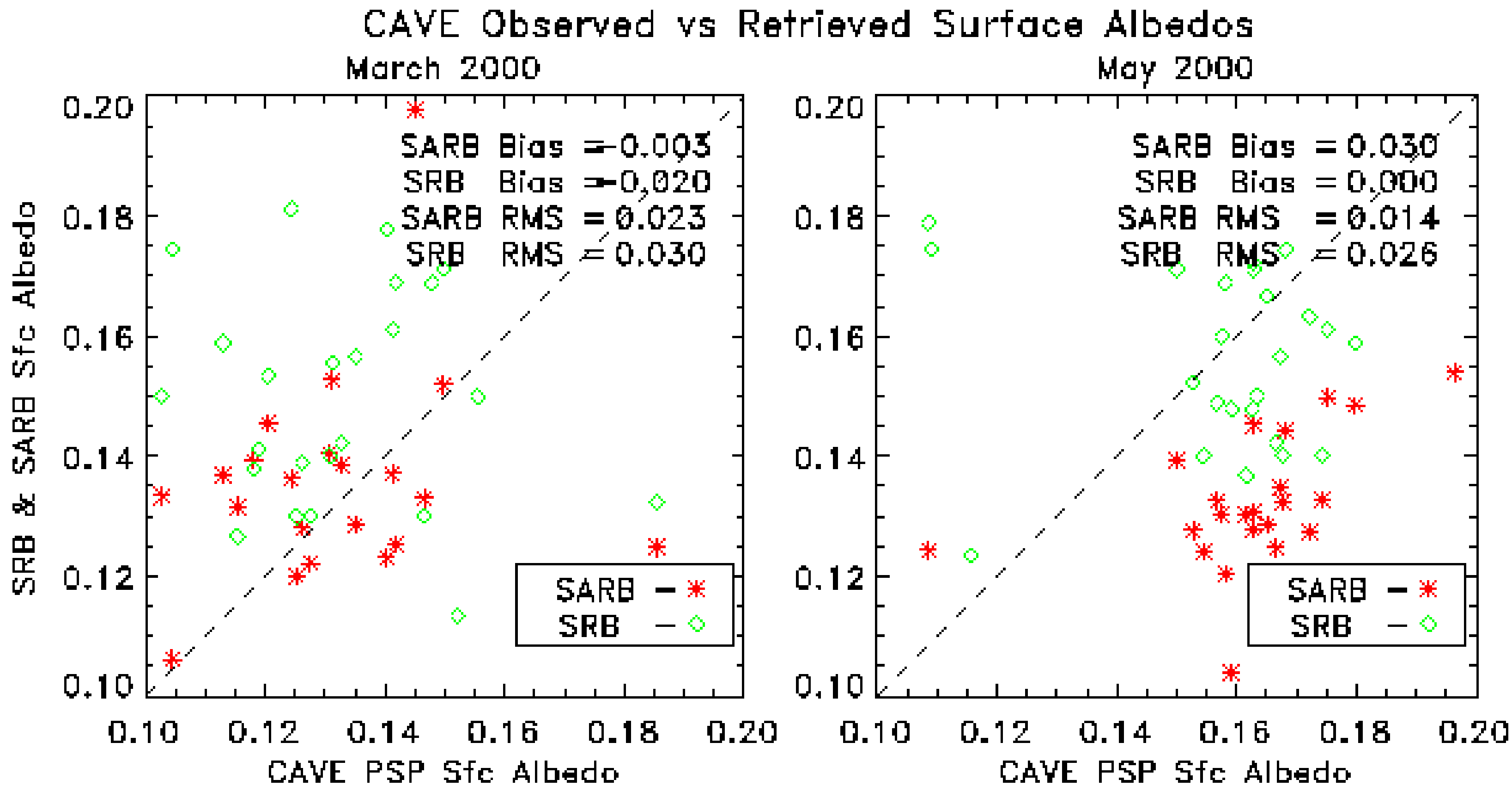

Surface Albedo (TRMM Mar 2000, Instantaneous, Overhead Sun)
Map A
Surface Albedo (SRB 9Yr Mean March, Full Sky, Extrapolated to 10′ grid)
Map B
0.05
0.1
0.15
0.2
0.25
0.30
0.35
0.40
Delta (A−B)
−0.2
−0.15
−0.10
−0.05
0.00
0.05
0.10
0.15
0.20



10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350
80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80
0.00 0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50
GFDL Aerosol Optical Depth : Type= TOTAL : MONTH=May



Surface Albedo (TRMM, May 2000, Instantaneous, Overhead Sun)
Default d
0.05
0.1
0.15
0.2
0.25
0.30
0.35
0.40
Overhad Sun Albedo - Overhead Sun Albedo Using Adjusted "d" Values
d=0.05
d=0.50
-0.04
-0.03
-0.02
-0.01
0.00
0.01
0.02
0.03
0.04


CAVE Observed vs Retrieved Surface Albedos
March 2000
May 2000
SARB Bias = -0.003
SRB Bias = -0.020
SARB RMS = 0.023
SRB RMS = 0.030
SARB Bias = 0.030
SRB Bias = 0.000
SARB RMS = 0.014
SRB RMS = 0.026
SARB
SRB
SRB & SARB Sfc Albedo
CAVE PSP Sfc Albedo
0.10
0.12
0.14
0.16
0.18
0.20

Full CRS Processing in Limited TRMM Domains

Points from all of TRMM for one day (May 1, 1998)

Clear sky SW: Difficulty without Stowe aerosols

Questions on surface optics continue

Here use placeholder Edition1 total-sky SSF

Overcast water: Fu-Liou reflects 30 Wm-2 more than SSF; depends on SZA

Overcast ice: Fu-Liou has less SW reflection and LW opacity than SSF; depends on τ

This page has detailed notes that were NOT projected on the screen during the viewgraph presentation.

Notes on plots that follow.

Edition 1 SSF has clear-sky TOA fluxes that are at (or near) archival quality; they should be superior to the ERBE-like ES8 clear sky fluxes currently in the archive. The Edition 1 total-sky TOA fluxes are not intended for archive; they are probably better than total-sky ES8, but not good enough for archive. The Edition 1 total-sky TOA fluxes are probably reliable for the ensemble mean (i.e., the average of all the observations that have been taken); when segregated for particular cases (i.e., overcast ice, overcast water clouds, etc.) the accuracy is in doubt.

For radiavite transfer calculations with Fu-Liou, the temperature and humidity sounding is taken from ECMWF. Ozone is from SMOBA.

For clear ocean and total-sky ocean, the surface spectral albedo input is from a table lookup to Hu-Cox-Munk dependent on SZA, optical depth τ of aerosol or cloud, and surface wind speed (ECMWF); this accounts for Fresnel reflection, a constant correction for underlight, and wind-speed dependent foam. A retrieved aerosol τ from SSF is used; if this is not available, we use the monthly aerosol τ from the GFDL CTM. Ocean SST is from ECMWF (blended NOAA Reynolds AVHRR).

For clear land, the spectral albedo is from a table lookup to Fu-Liou; a full Fu-Liou calculation is then done using the skin temperature retrieved by the Cloud WG with VIRS. For cloudy land, the Surface Albedo History (SAH), the cloud properties on SSF, and ECMWF skin temperature are used.

This page has detailed notes that were NOT projected on the screen during the viewgraph presentation.

Legend for plots that follow:

Untuned TOA SW = reflected SW from Fu-Liou radiative transfer with initial (untuned) inputs.

CERES TOA SW = reflected SW observation from Edition 1 SSF

Untuned TOA OLR = Fu-Liou with initial (untuned) inputs

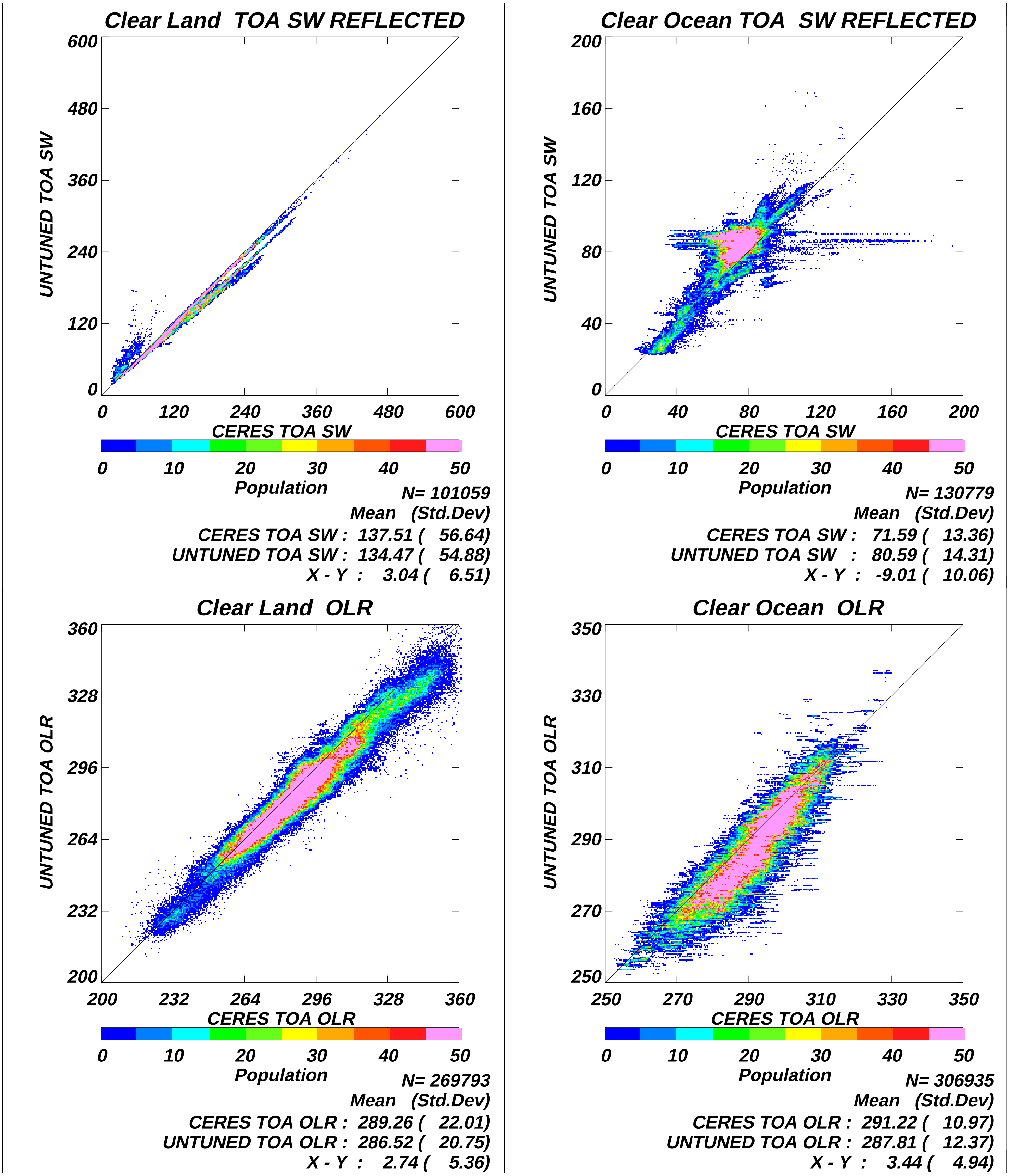
CERES TOA OLR = broadband observed OLR on SSF

MODEL FltWin radiance = Filtered window (8-12 μm) radiance computed by Fu-Liou Instrument spectral response function has been applied to make this compatible with the following observation.

CERES FltWin radiance = Filtered window (8-12 μm) radiance observation on SSF Spectral response of instrument has not been accounted for (i.e., the observation is not yet "unfiltered")

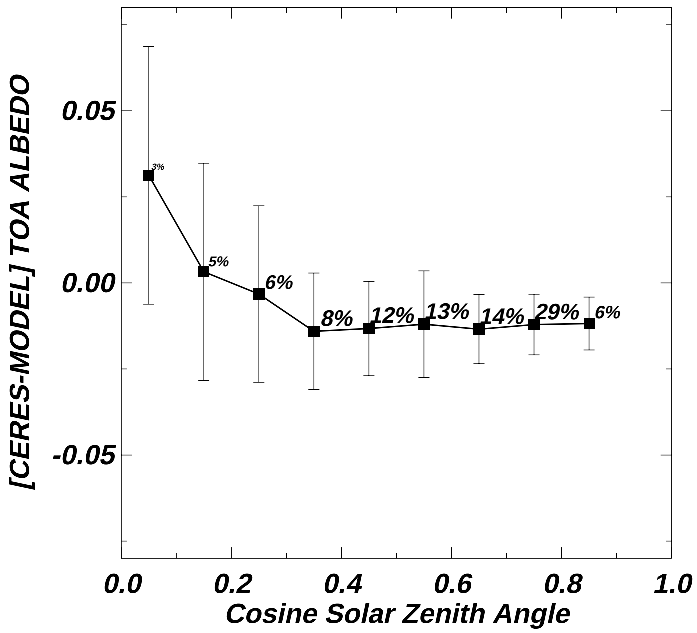
MODEL TOTAL LW radiance = broadband LW radiance at TOA from Fu-Liou code using untuned (initial) input parameters. This is "unfiltered".

CERES TOTAL LW radiance = broadband LW radiance at TOA from CERES SSF observation. The spectral response of the instrument has been accounted for, yielding an "unfiltered" radiance.



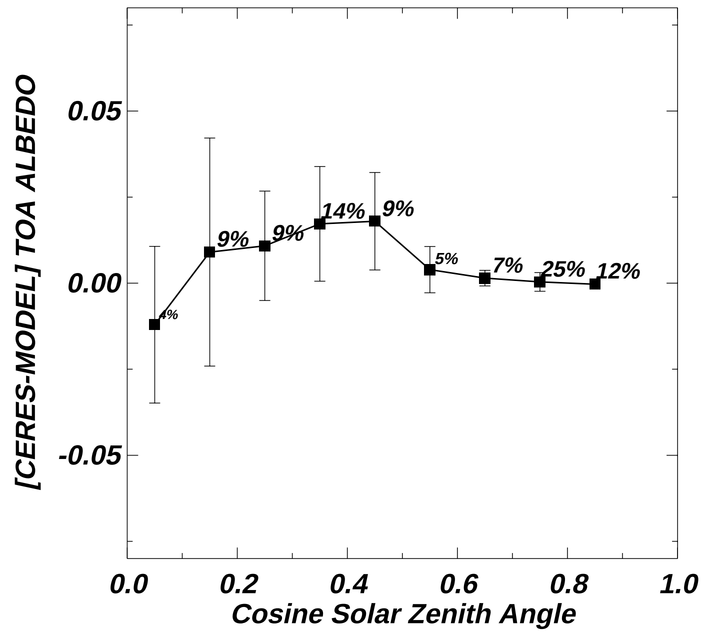
Clear Land TOA SW REFLECTED
UNTUNED TOA SW
CERES TOA SW
Population
N= 101059
Mean (Std.Dev)
CERES TOA SW : 137.51 (56.64)
UNTUNED TOA SW : 134.47 (54.88)
X - Y : 3.04 (6.51)
Clear Ocean TOA SW REFLECTED
UNTUNED TOA SW
CERES TOA SW
Population
N= 130779
Mean (Std.Dev)
CERES TOA SW : 71.59 (13.36)
UNTUNED TOA SW : 80.59 (14.31)
X - Y : -9.01 (10.06)
Clear Land OLR
UNTUNED TOA OLR
CERES TOA OLR
Population
N= 269793
Mean (Std.Dev)
CERES TOA OLR : 289.26 (22.01)
UNTUNED TOA OLR : 286.52 (20.75)
X - Y : 2.74 (5.36)
Clear Ocean OLR
UNTUNED TOA OLR
CERES TOA OLR
Population
N= 306935
Mean (Std.Dev)
CERES TOA OLR : 291.22 (10.97)
UNTUNED TOA OLR : 287.81 (12.37)
X - Y : 3.44 (4.94)

Clear Ocean



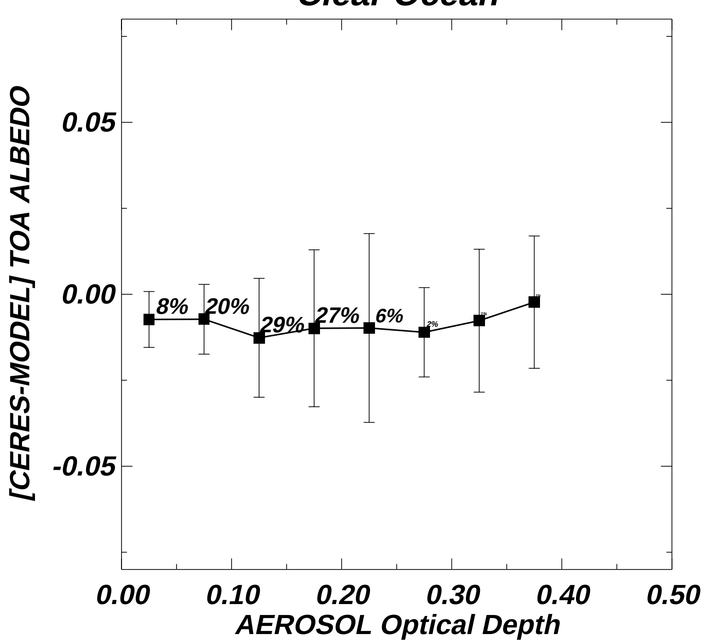
N= 130779
Mean (Std.Dev)
Cosine Solar Zenith Angle : 0.56 (0.21)
[CERES-MODEL] TOA ALBEDO : -0.01 (0.02)

Clear Land



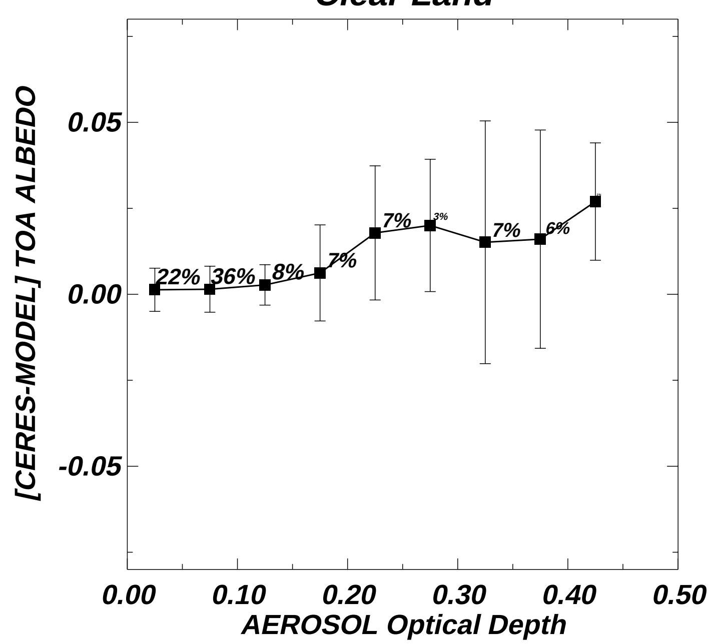
N= 101059
Mean (Std.Dev)
Cosine Solar Zenith Angle : 0.52 (0.25)
[CERES-MODEL] TOA ALBEDO : 0.01 (0.02)

Clear Ocean

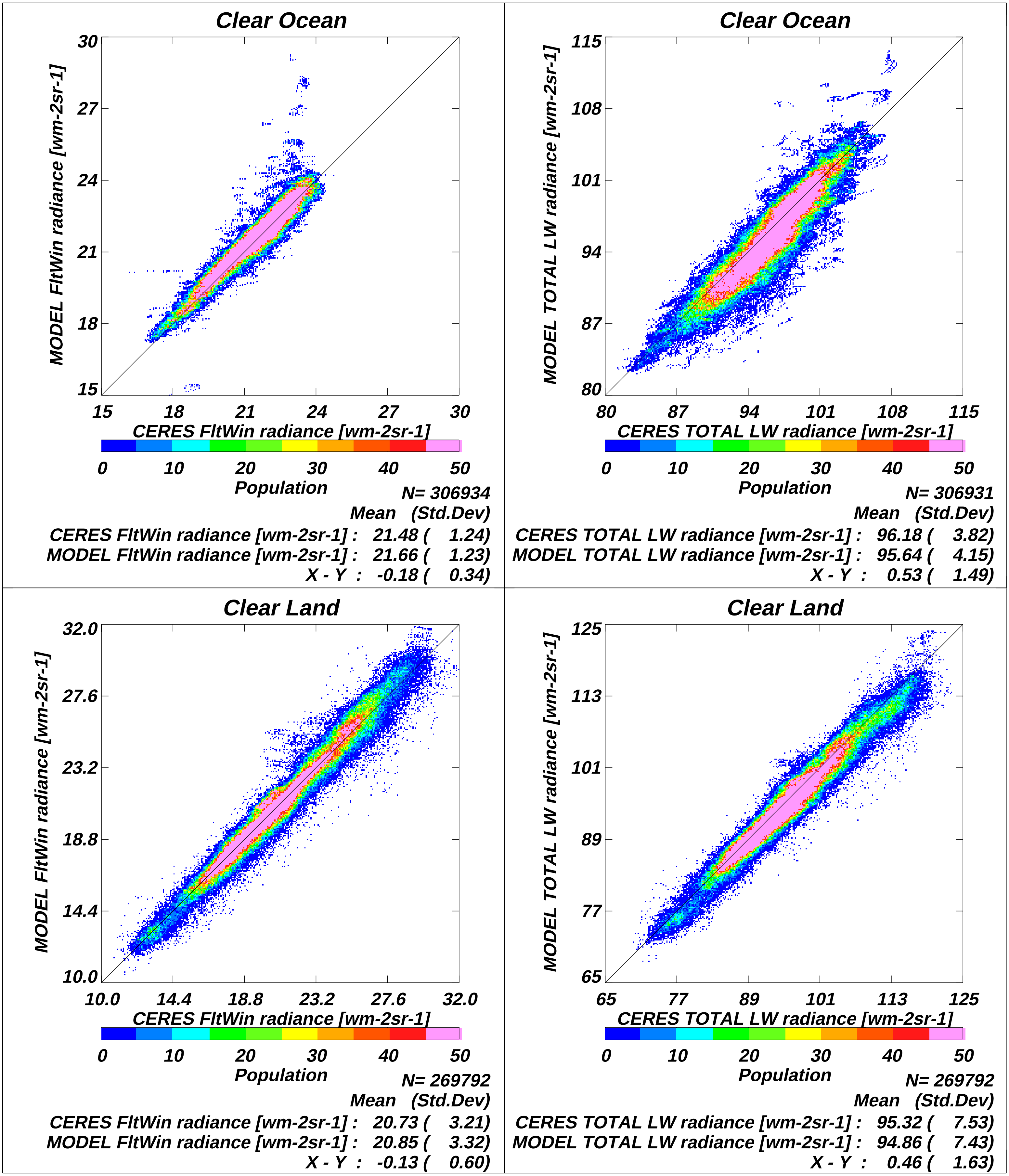


N= 130779
Mean (Std.Dev)
AEROSOL Optical Depth : 0.14 (0.08)
[CERES-MODEL] TOA ALBEDO : -0.01 (0.02)

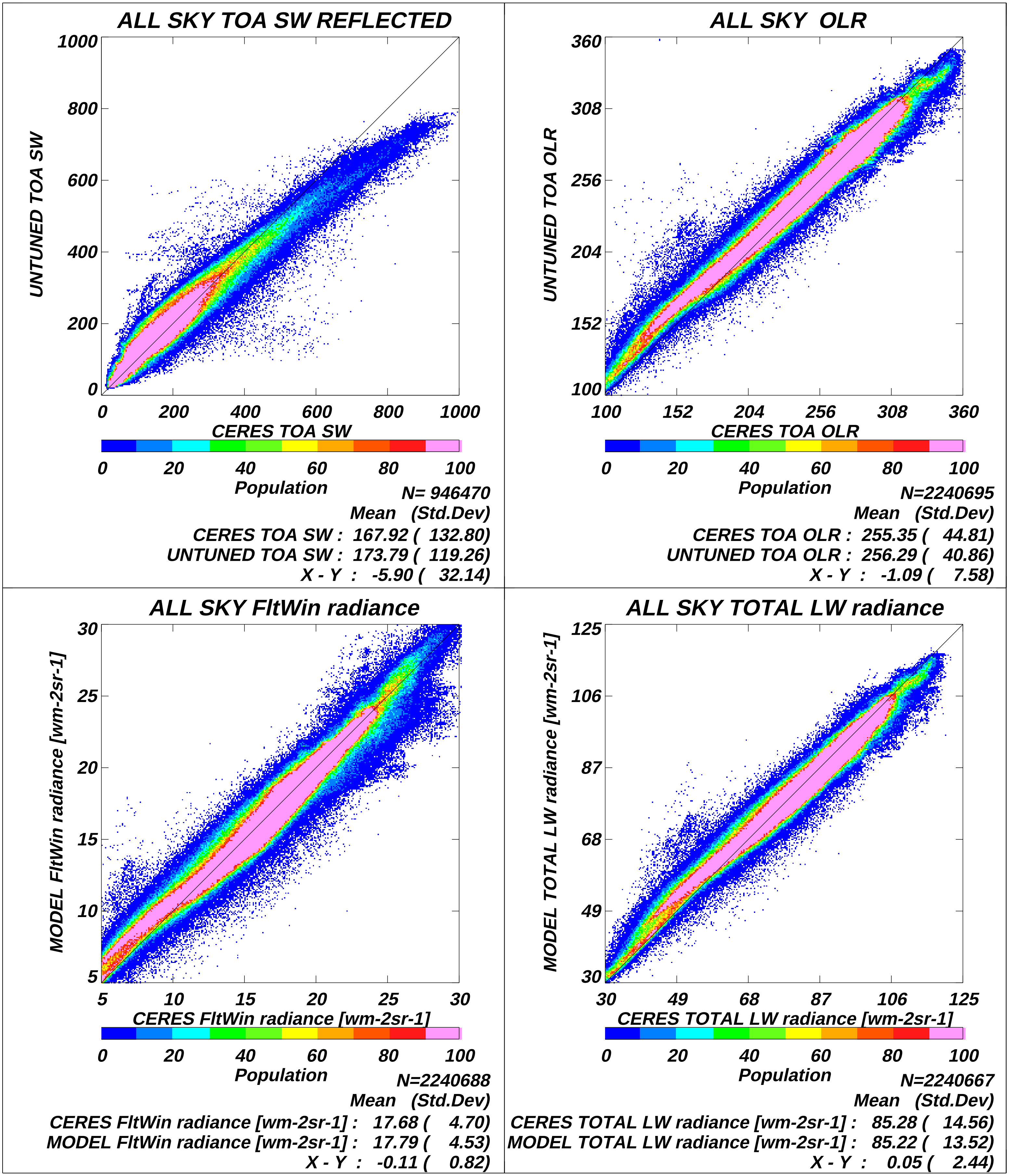
Clear Land

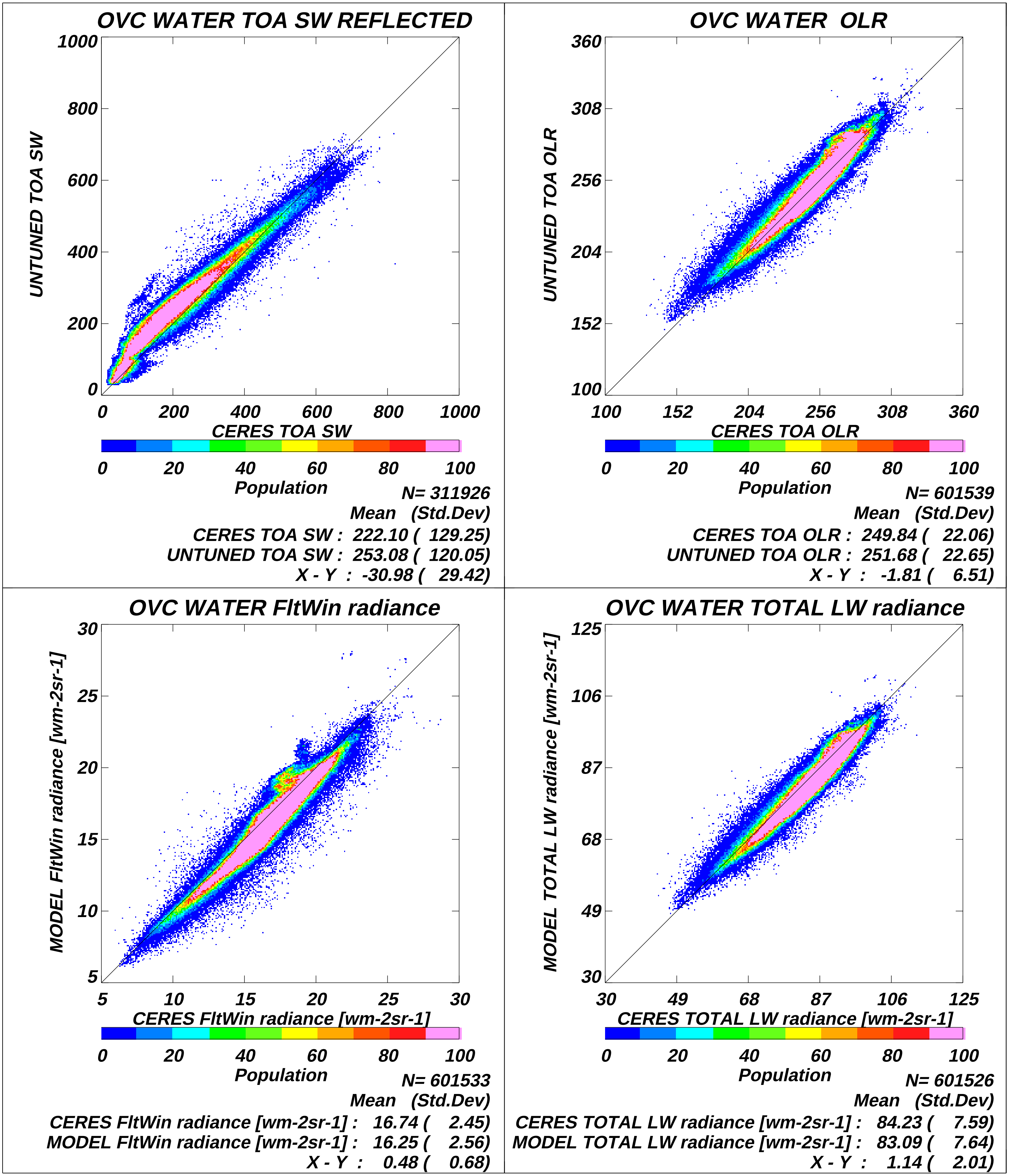


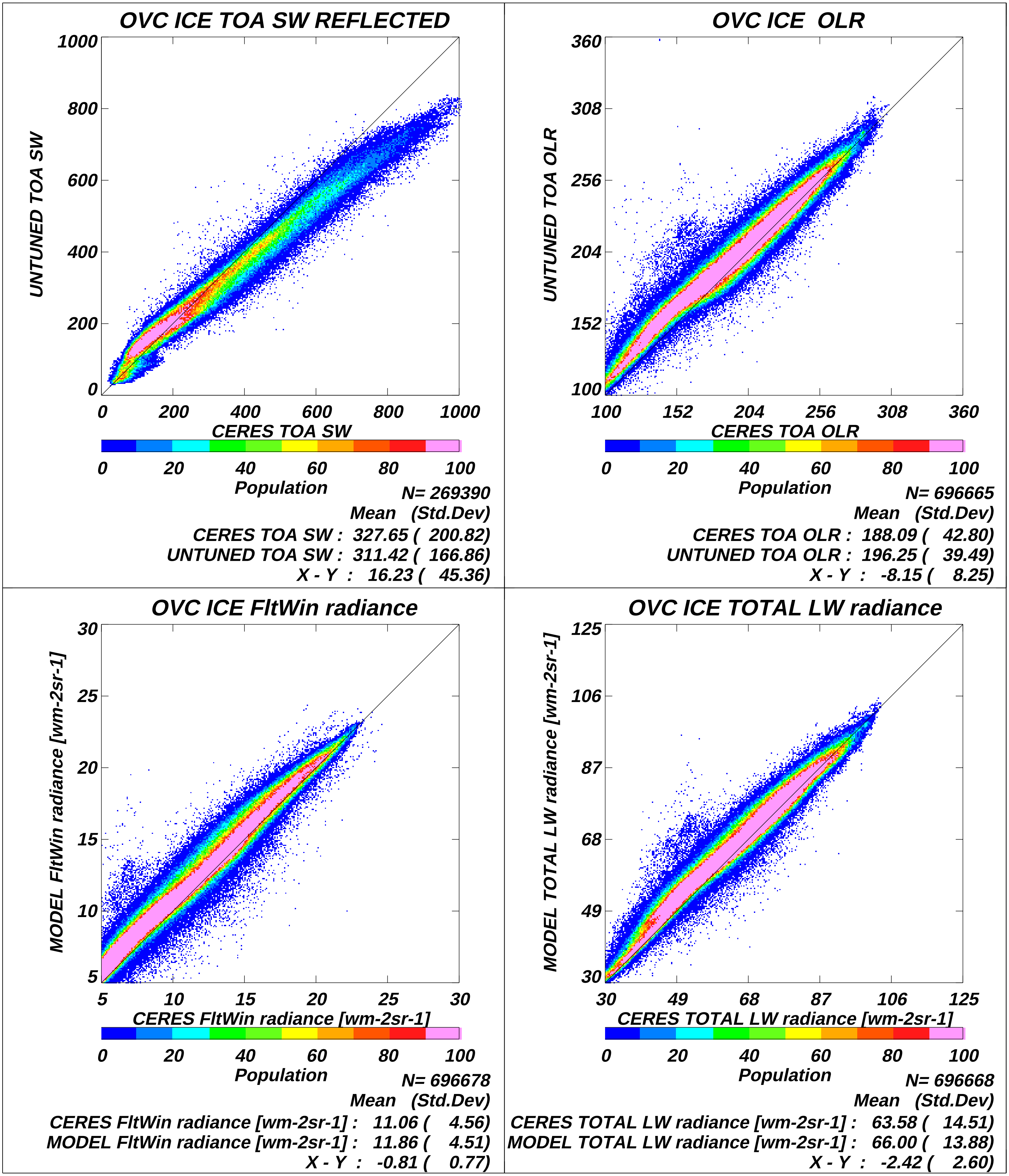
N= 101059
Mean (Std.Dev)
AEROSOL Optical Depth : 0.13 (0.11)
[CERES-MODEL] TOA ALBEDO : 0.01 (0.02)



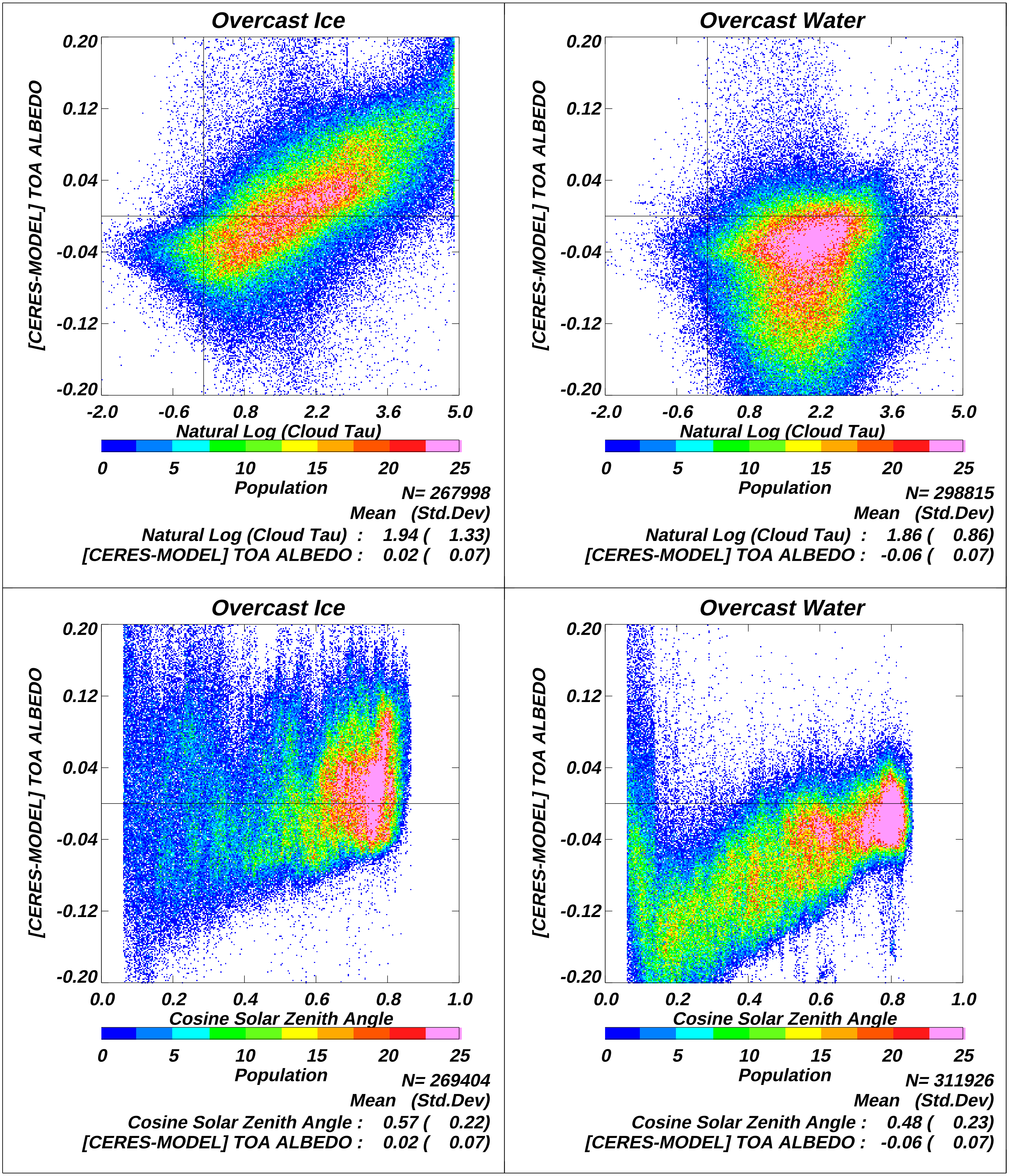
Clear Ocean
MODEL FltWin radiance [wm-2sr-1]
CERES FltWin radiance [wm-2sr-1]
Population
N= 306934
Mean (Std.Dev)
CERES FltWin radiance [wm-2sr-1] : 21.48 (1.24)
MODEL FltWin radiance [wm-2sr-1] : 21.66 (1.23)
X - Y : -0.18 (0.34)
Clear Ocean
MODEL TOTAL LW radiance [wm-2sr-1]
CERES TOTAL LW radiance [wm-2sr-1]
Population
N= 306931
Mean (Std.Dev)
CERES TOTAL LW radiance [wm-2sr-1] : 96.18 (3.82)
MODEL TOTAL LW radiance [wm-2sr-1] : 95.64 (4.15)
X - Y : 0.53 (1.49)
Clear Land
MODEL FltWin radiance [wm-2sr-1]
CERES FltWin radiance [wm-2sr-1]
Population
N= 269792
Mean (Std.Dev)
CERES FltWin radiance [wm-2sr-1] : 20.73 (3.21)
MODEL FltWin radiance [wm-2sr-1] : 20.85 (3.32)
X - Y : -0.13 (0.60)
Clear Land
MODEL TOTAL LW radiance [wm-2sr-1]
CERES TOTAL LW radiance [wm-2sr-1]
Population
N= 269792
Mean (Std.Dev)
CERES TOTAL LW radiance [wm-2sr-1] : 95.32 (7.53)
MODEL TOTAL LW radiance [wm-2sr-1] : 94.86 (7.43)
X - Y : 0.46 (1.63)


ALL SKY TOA SW REFLECTED
UNTUNED TOA SW
CERES TOA SW
Population
N= 946470
Mean (Std.Dev)
CERES TOA SW : 167.92 (132.80)
UNTUNED TOA SW : 173.79 (119.26)
X - Y : -5.90 (32.14)
ALL SKY OLR
UNTUNED TOA OLR
CERES TOA OLR
Population
N=2240695
Mean (Std.Dev)
CERES TOA OLR : 255.35 (44.81)
UNTUNED TOA OLR : 256.29 (40.86)
X - Y : -1.09 (7.58)
ALL SKY FltWin radiance
MODEL FltWin radiance [wm-2sr-1]
CERES FltWin radiance [wm-2sr-1]
Population
N=2240688
Mean (Std.Dev)
CERES FltWin radiance [wm-2sr-1] : 17.68 (4.70)
MODEL FltWin radiance [wm-2sr-1] : 17.79 (4.53)
X - Y : -0.11 (0.82)
ALL SKY TOTAL LW radiance
MODEL TOTAL LW radiance [wm-2sr-1]
CERES TOTAL LW radiance [wm-2sr-1]
Population
N=2240667
Mean (Std.Dev)
CERES TOTAL LW radiance [wm-2sr-1] : 85.28 (14.56)
MODEL TOTAL LW radiance [wm-2sr-1] : 85.22 (13.52)
X - Y : 0.05 (2.44)

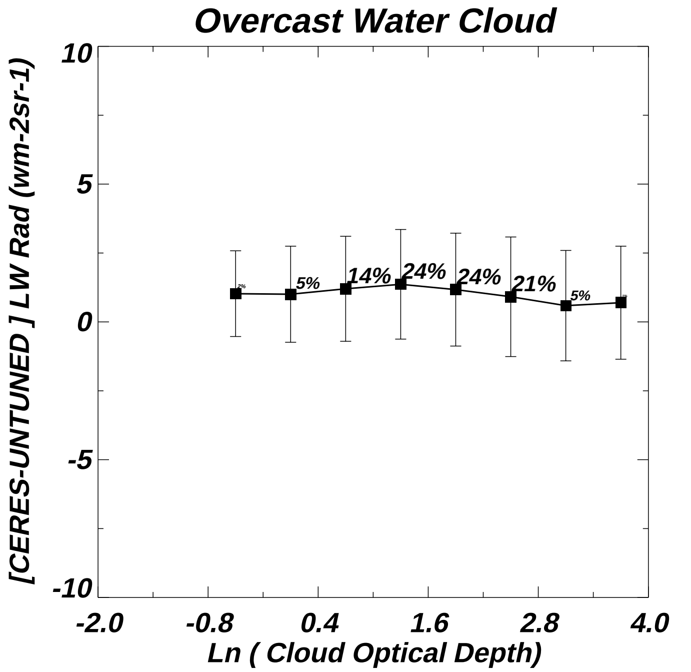

OVC WATER TOA SW REFLECTED
UNTUNED TOA SW
CERES TOA SW
Population
N= 311926
Mean (Std.Dev)
CERES TOA SW : 222.10 (129.25)
UNTUNED TOA SW : 253.08 (120.05)
X - Y : -30.98 (29.42)
OVC WATER OLR
UNTUNED TOA OLR
CERES TOA OLR
Population
N= 601539
Mean (Std.Dev)
CERES TOA OLR : 249.84 (22.06)
UNTUNED TOA OLR : 251.68 (22.65)
X - Y : -1.81 (6.51)
OVC WATER FltWin radiance
MODEL FltWin radiance [wm-2sr-1]
CERES FltWin radiance [wm-2sr-1]
Population
N= 601533
Mean (Std.Dev)
CERES FltWin radiance [wm-2sr-1] : 16.74 (2.45)
MODEL FltWin radiance [wm-2sr-1] : 16.25 (2.56)
X - Y : 0.48 (0.68)
OVC WATER TOTAL LW radiance
MODEL TOTAL LW radiance [wm-2sr-1]
CERES TOTAL LW radiance [wm-2sr-1]
Population
N= 601526
Mean (Std.Dev)
CERES TOTAL LW radiance [wm-2sr-1] : 84.23 (7.59)
MODEL TOTAL LW radiance [wm-2sr-1] : 83.09 (7.64)
X - Y : 1.14 (2.01)



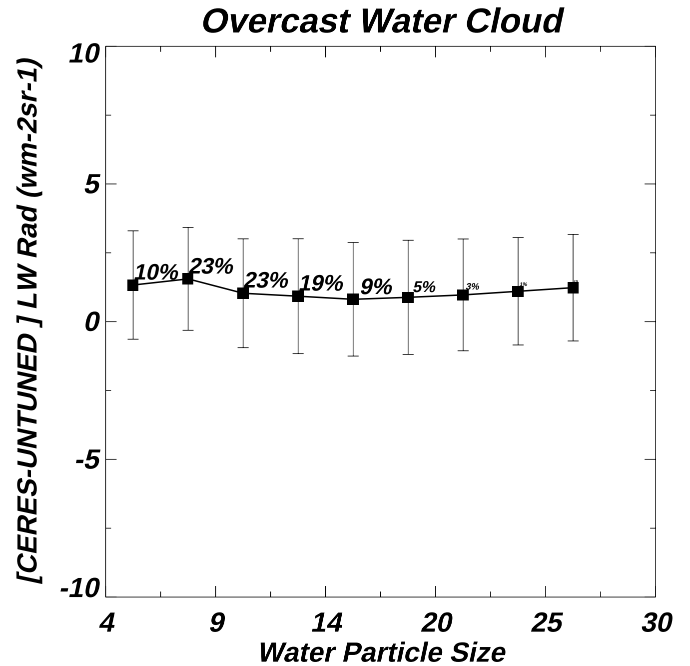
OVC ICE TOA SW REFLECTED
UNTUNED TOA SW
CERES TOA SW
Population
N= 269390
Mean (Std.Dev)
CERES TOA SW : 327.65 (200.82)
UNTUNED TOA SW : 311.42 (166.86)
X - Y : 16.23 (45.36)
OVC ICE OLR
UNTUNED TOA OLR
CERES TOA OLR
Population
N= 696665
Mean (Std.Dev)
CERES TOA OLR : 188.09 (42.80)
UNTUNED TOA OLR : 196.25 (39.49)
X - Y : -8.15 (8.25)
OVC ICE FltWin radiance
MODEL FltWin radiance [wm-2sr-1]
CERES FltWin radiance [wm-2sr-1]
Population
N= 696678
Mean (Std.Dev)
CERES FltWin radiance [wm-2sr-1] : 11.06 (4.56)
MODEL FltWin radiance [wm-2sr-1] : 11.86 (4.51)
X - Y : -0.81 (0.77)
OVC ICE TOTAL LW radiance
MODEL TOTAL LW radiance [wm-2sr-1]
CERES TOTAL LW radiance [wm-2sr-1]
Population
N= 696668
Mean (Std.Dev)
CERES TOTAL LW radiance [wm-2sr-1] : 63.58 (14.51)
MODEL TOTAL LW radiance [wm-2sr-1] : 66.00 (13.88)
X - Y : -2.42 (2.60)



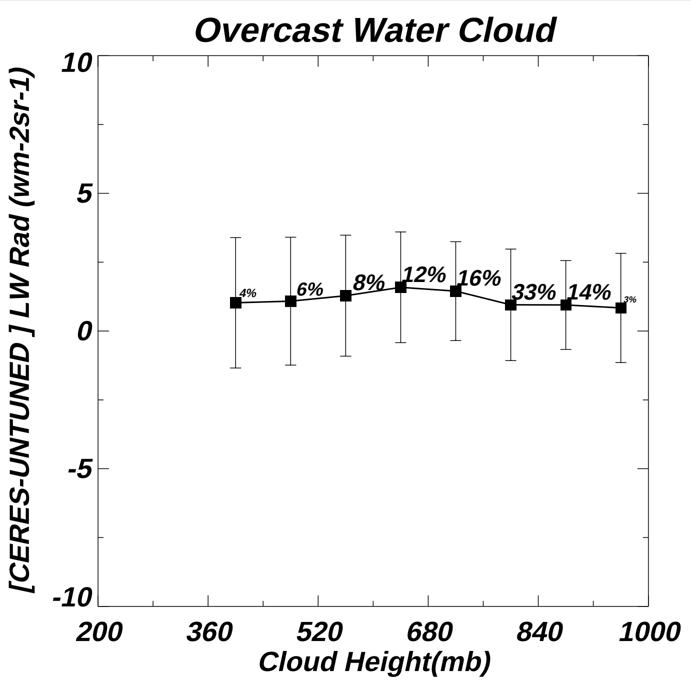
Overcast Ice
0.20
0.12
0.04
-0.04
-0.12
-0.20
[CERES-MODEL] TOA ALBEDO
-2.0
-0.6
0.8
2.2
3.6
5.0
Natural Log (Cloud Tau)
0
5
10
15
20
25
Population
N= 267998
Mean (Std.Dev)
Natural Log (Cloud Tau) : 1.94 (1.33)
[CERES-MODEL] TOA ALBEDO : 0.02 (0.07)
Overcast Water
0.20
0.12
0.04
-0.04
-0.12
-0.20
[CERES-MODEL] TOA ALBEDO
-2.0
-0.6
0.8
2.2
3.6
5.0
Natural Log (Cloud Tau)
0
5
10
15
20
25
Population
N= 298815
Mean (Std.Dev)
Natural Log (Cloud Tau) : 1.86 (0.86)
[CERES-MODEL] TOA ALBEDO : -0.06 (0.07)
Overcast Ice
0.20
0.12
0.04
-0.04
-0.12
-0.20
[CERES-MODEL] TOA ALBEDO
0.0
0.2
0.4
0.6
0.8
1.0
Cosine Solar Zenith Angle
0
5
10
15
20
25
Population
N= 269404
Mean (Std.Dev)
Cosine Solar Zenith Angle : 0.57 (0.22)
[CERES-MODEL] TOA ALBEDO : 0.02 (0.07)
Overcast Water
0.20
0.12
0.04
-0.04
-0.12
-0.20
[CERES-MODEL] TOA ALBEDO
0.0
0.2
0.4
0.6
0.8
1.0
Cosine Solar Zenith Angle
0
5
10
15
20
25
Population
N= 311926
Mean (Std.Dev)
Cosine Solar Zenith Angle : 0.48 (0.23)
[CERES-MODEL] TOA ALBEDO : -0.06 (0.07)



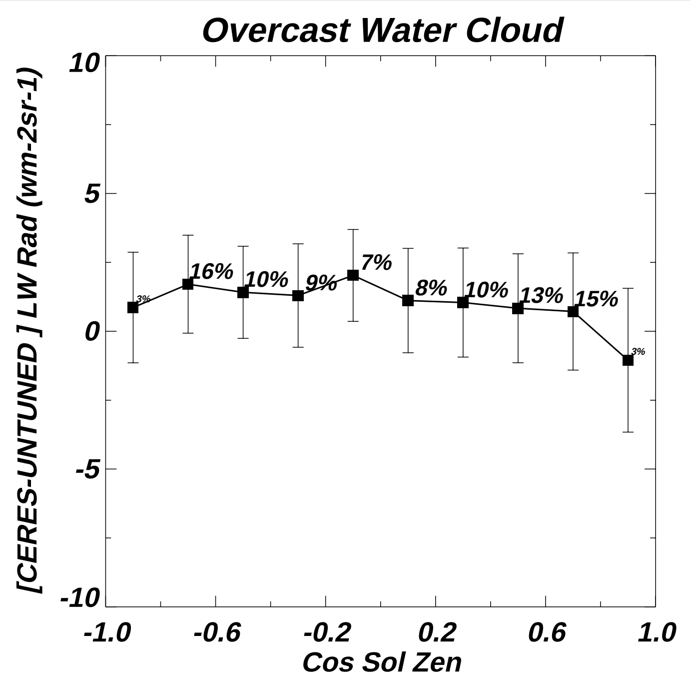
N= 575492
Mean (Std.Dev)
Ln (Cloud Optical Depth) : 1.64 (0.89)
[CERES-UNTUNED] LW Rad (wm-2sr-1) : 1.12 (2.02)



N= 601526
Mean (Std.Dev)
Water Particle Size : 11.64 (4.91)
[CERES-UNTUNED] LW Rad (wm-2sr-1) : 1.14 (2.01)

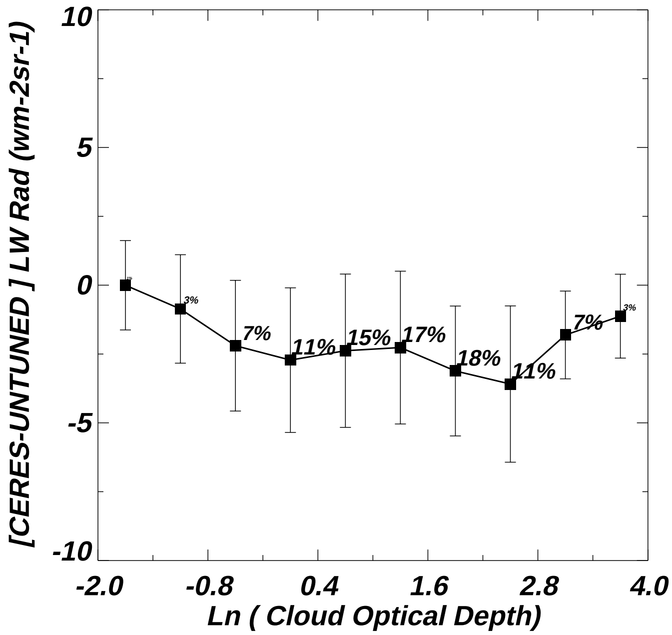


N= 600854
Mean (Std.Dev)
Cloud Height(mb) : 719.23 (139.06)
[CERES-UNTUNED] LW Rad (wm-2sr-1) : 1.14 (2.01)



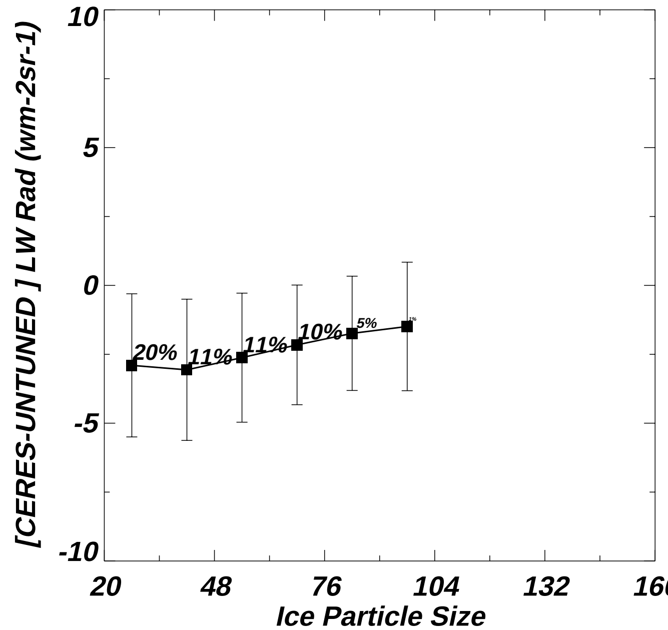
N= 601526
Mean (Std.Dev)
Cos Sol Zen : 0.01 (0.54)
[CERES-UNTUNED] LW Rad (wm-2sr-1) : 1.14 (2.01)

Overcast Ice Cloud



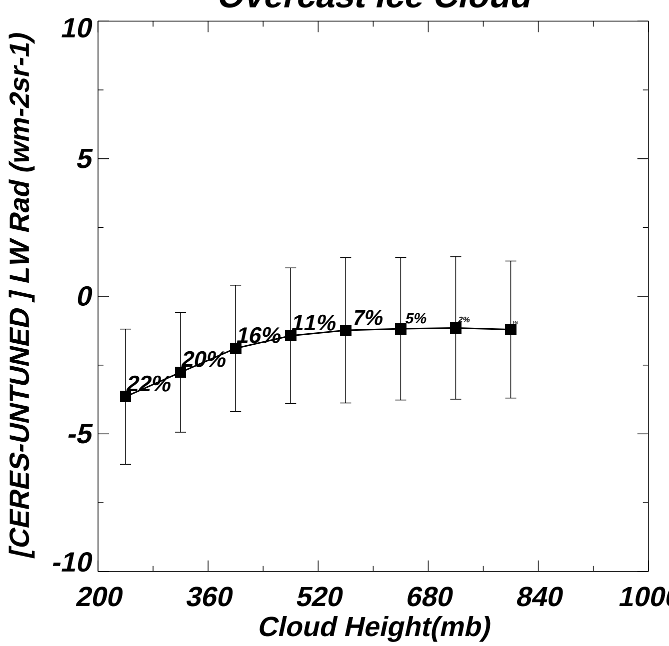
N= 691565
Mean (Std.Dev)
Ln (Cloud Optical Depth) : 1.36 (1.32)
[CERES-UNTUNED] LW Rad (wm-2sr-1) : -2.42 (2.60)

Overcast Ice Cloud



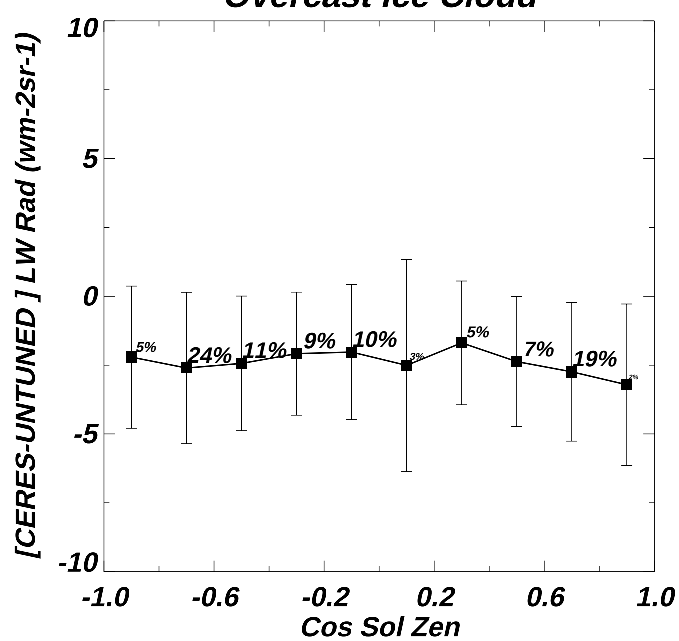
N= 696668
Mean (Std.Dev)
Ice Particle Size : 36.15 (26.61)
[CERES-UNTUNED] LW Rad (wm-2sr-1) : -2.42 (2.60)

Overcast Ice Cloud



N= 696641
Mean (Std.Dev)
Cloud Height(mb) : 370.20 (156.31)
[CERES-UNTUNED] LW Rad (wm-2sr-1) : -2.42 (2.60)

Overcast Ice Cloud



N= 696668
Mean (Std.Dev)
Cos Sol Zen : -0.09 (0.57)
[CERES-UNTUNED] LW Rad (wm-2sr-1) : -2.42 (2.60)

Subset Domain for May 1998 – Full CRS Processing

On-line collocated surface+TOA data (CAVE)
http://www-cave.larc.nasa.gov/cave/

Surface flux down (untuned Fu-Liou)-(observations):

		Wm-2	N
day & nite	LW total sky	-7	1241
	SW total sky	-52	1047
day only	LW (CERES cloud < 0.05)	2	387
	SW (CERES cloud < 0.05)	-42	395
	LW (Long-Ackerman < 0.10)	-1	353
	SW (Long-Ackerman < 0.10)	-31	351

This page has detailed notes that were NOT projected on the screen during the viewgraph presentation.

Notes on the table (previous page) and the figure (next page).

In surface flux down

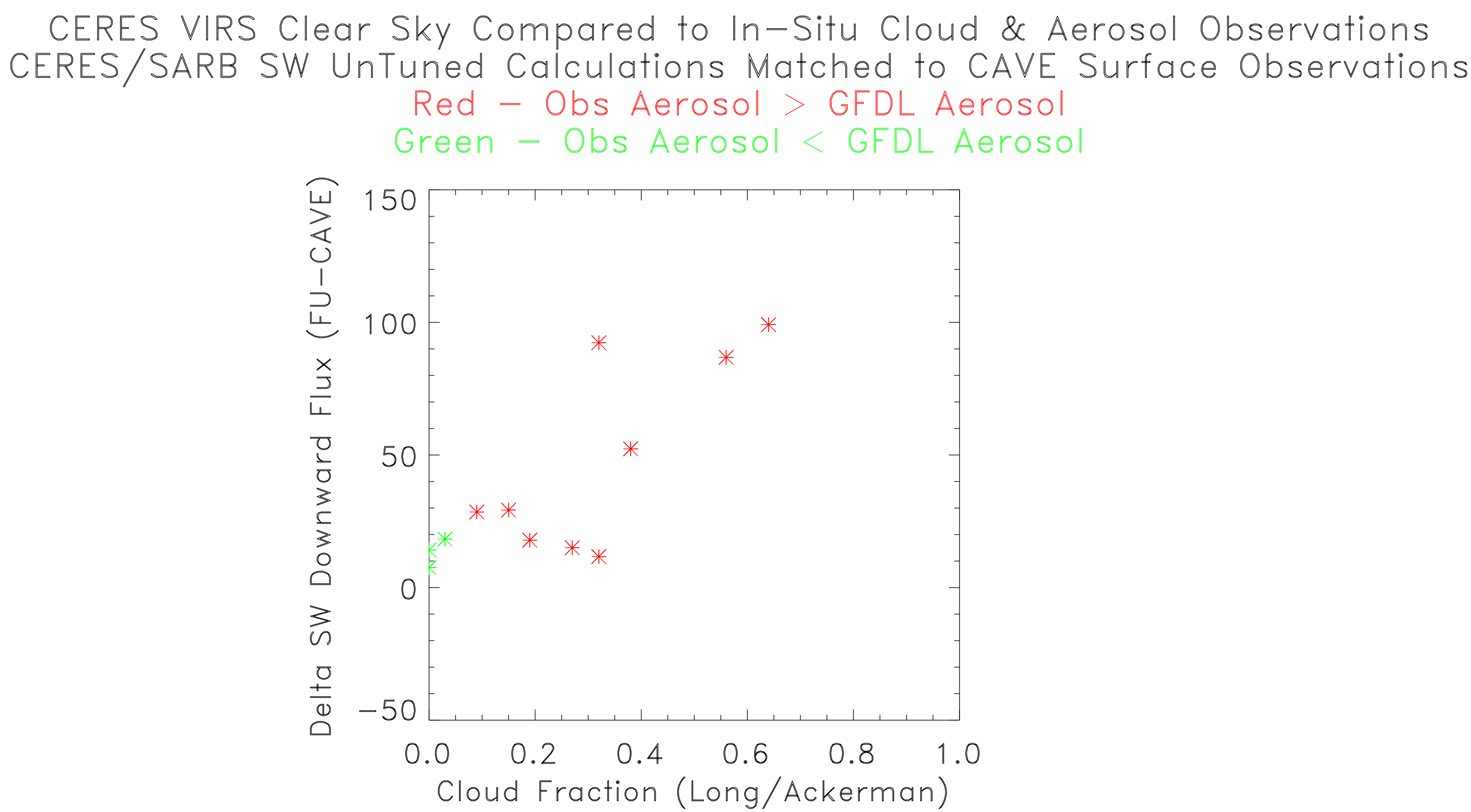
untuned Fu-Liou = initial CRS calculation (not tuned or constrained) that is closest to surface site

observation = 30-minute mean ground based observation. SW values have been adjusted to correspond with the instantaneous SZA of the CERES footprint and the Fu-Liou calculations. Most SW observations have also been corrected for thermal offset of the diffuse pyranometer.

CERES cloud < 0.05 We here regard "clear sky" as a cloud cover from VIRS of less than 5% over the footprint.

Long-Ackerman < 0.10 The Long-Ackerman algorithm for cloud screening has been applied to temporally intensive ground-based radiometer data.

When the following figure for May 1998 was presented, Pat Minnis commented that during that month SGP saw extensive plumes of smoke from Mexico. When clear with such smoke, the Long-Ackerman algorithm was said to identify the sky condition as "cloudy".


CERES VIRS Clear Sky Compared to In-Situ Cloud & Aerosol Observations
CERES/SARB SW UnTuned Calculations Matched to CAVE Surface Observations
Red - Obs Aerosol > GFDL Aerosol
Green - Obs Aerosol < GFDL Aerosol
Delta SW Downward Flux (FU-CAVE)
150
100
50
0
-50
0.0
0.2
0.4
0.6
0.8
1.0
Cloud Fraction (Long/Ackerman)

Study of Collins-Rasch Aerosol Assimilation

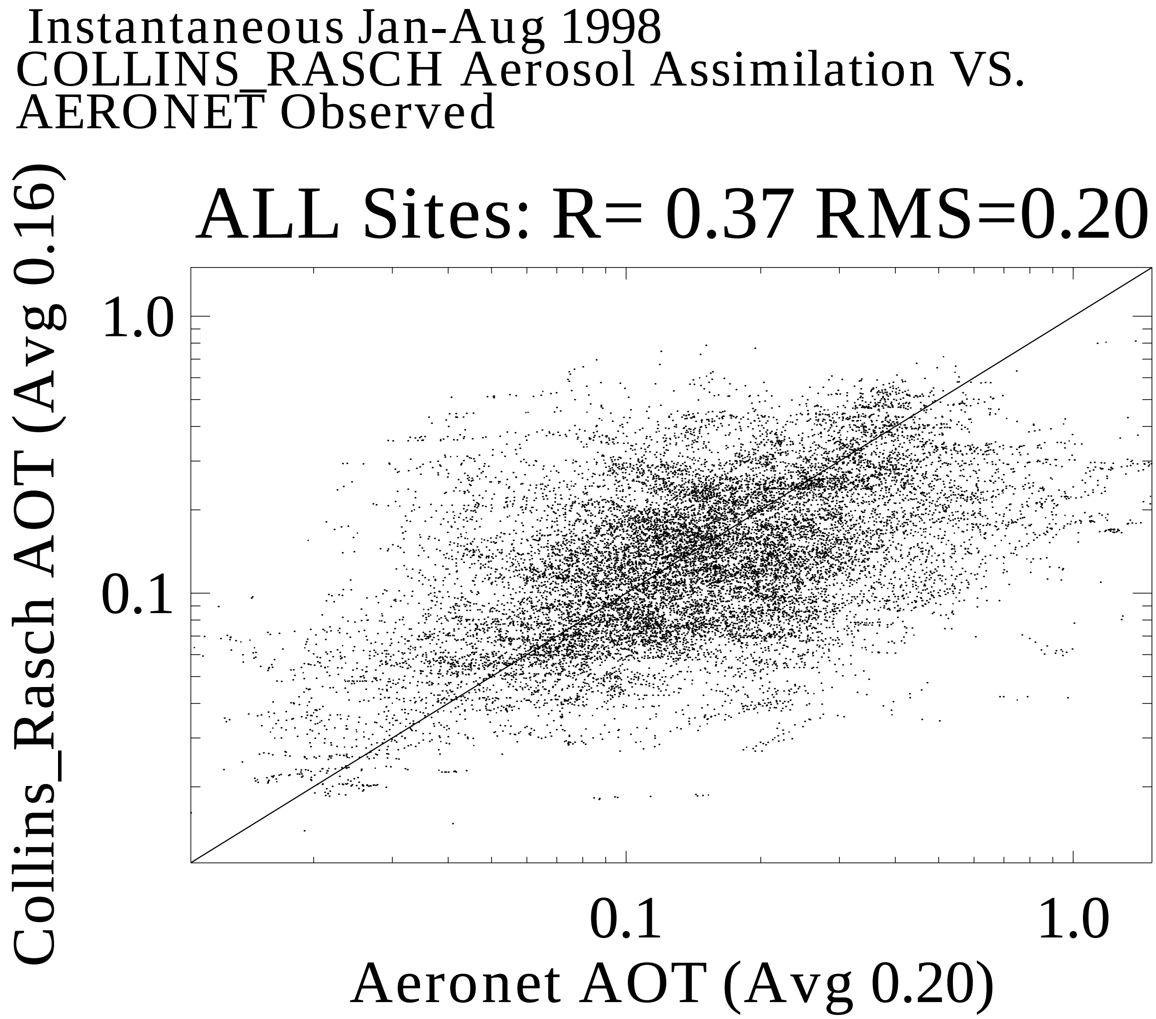
Present CRS: If we have no Stowe aerosol τ,
use τ from monthly GFDL CTM.

Collins-Rasch: Rain, hail, sleet or snow,
6-hourly τ is a global "go".

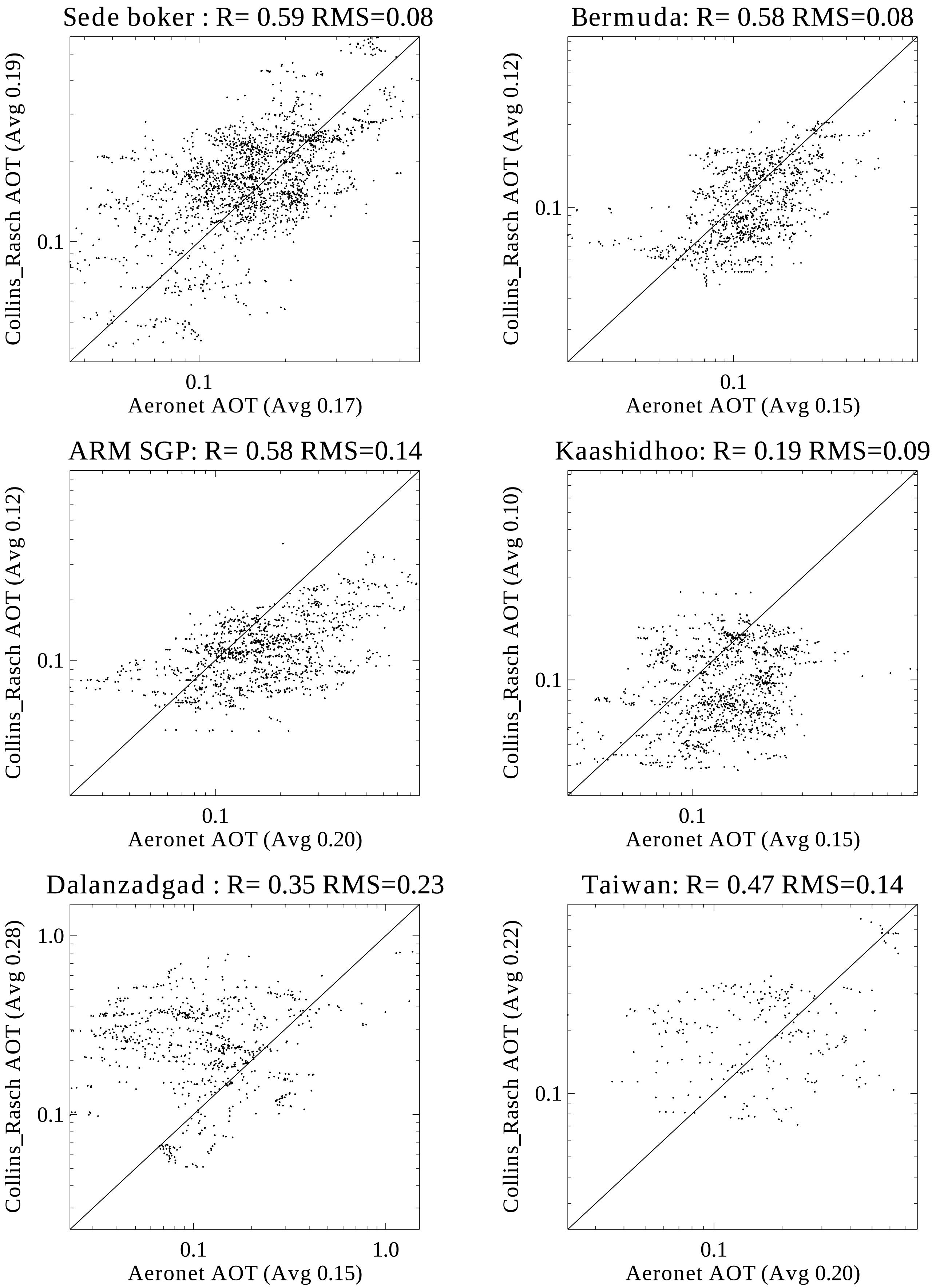
Aerosol assimilation will be tested for CRS
Heating rate profile in all sky conditions
Dust screen for surface albedo retrieval

Here quickly compare Jan-Aug 1998 Collins-Rasch
with GFDL CTM and AERONET ground data

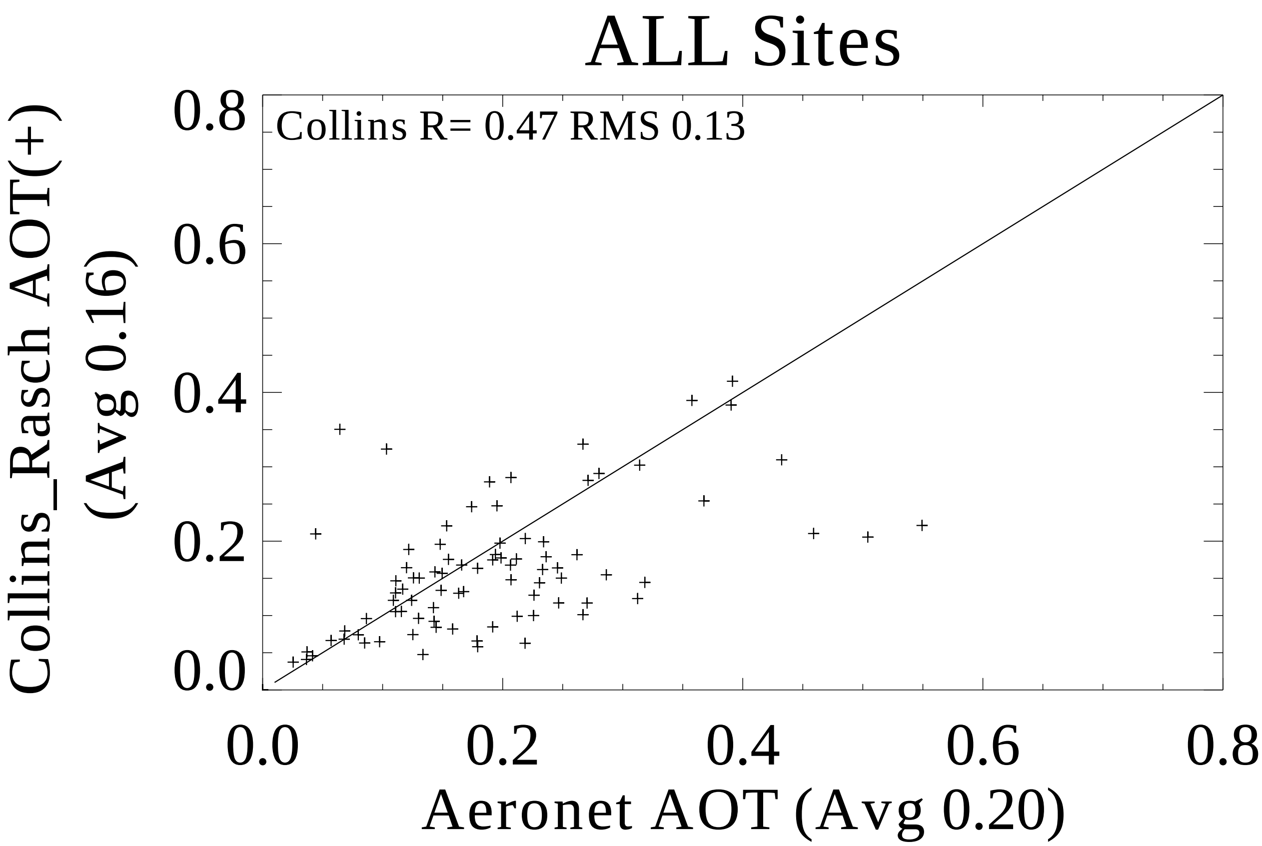
In these comparisons of the Collins-Rasch aerosol assimilation with ground data, the assimilation aerosol τ (630 nm) is compared with AERONET data averaged from 500 nm and 670 nm.

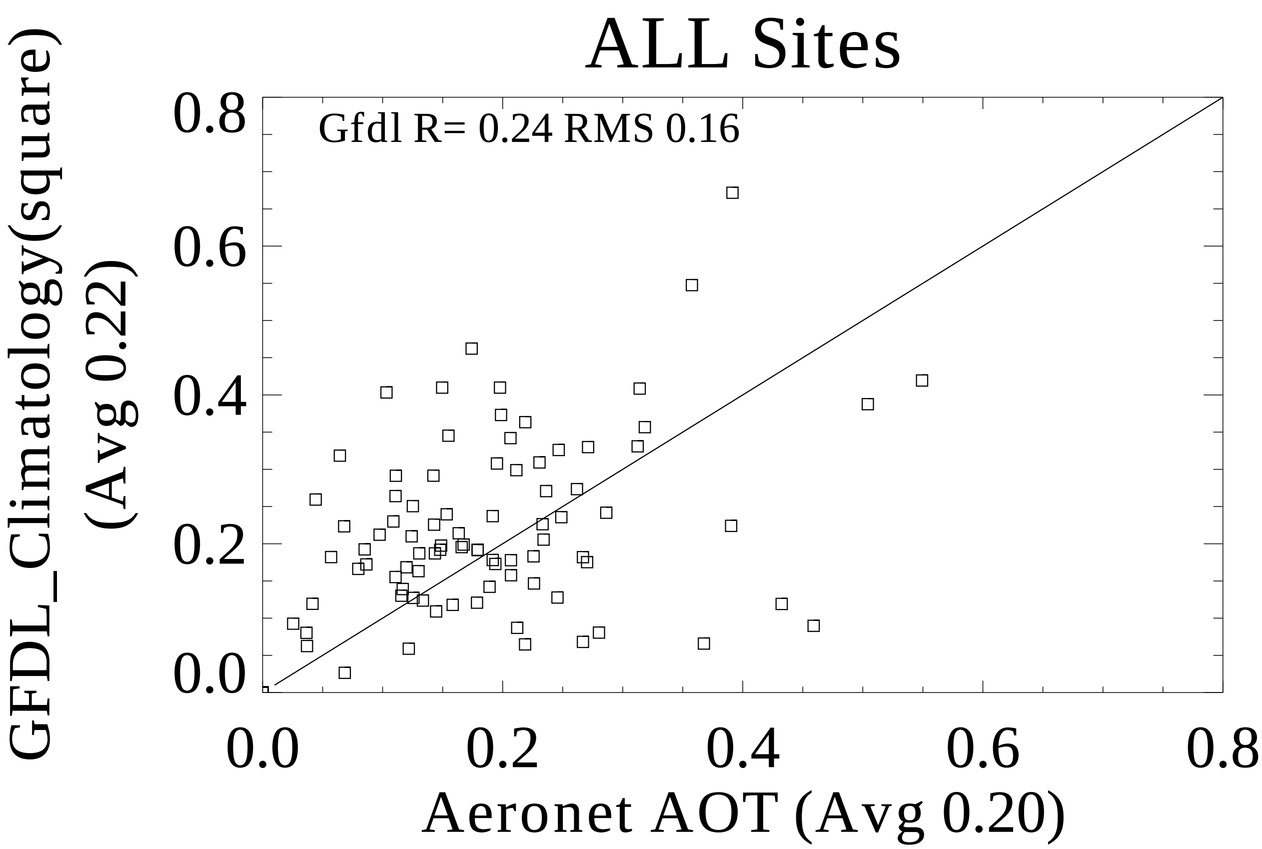

Instantaneous Jan-Aug 1998
COLLINS_RASCH Aerosol Assimilation VS.
AERONET Observed
ALL Sites: R= 0.37 RMS=0.20
Collins_Rasch AOT (Avg 0.16)
1.0
0.1
0.1
1.0
Aeronet AOT (Avg 0.20)

Instantaneous Jan-Aug 1998
COLLINS_RASCH Aerosol Assimilation VS.
AERONET Observed



MONTHLY AVERAGE Jan-Aug 1998
COLLINS_RASCH Aerosol Assimilation VS.
AERONET Observed





Schedule for Test of ECMWF and GEOS

Sample of latest GEOS not available for STM

DAO now says “early March” for delivery

What can we expect?

ITOVS (interactive TOVS)

Coarser resolution than ECMWF

Pre-ITOVS GEOS was indeed close to ECMWF

T(skin) & PW from TMI improved ECMWF for CERES

The remaining pages have detailed notes that were NOT projected on the screen during the viewgraph presentation.

January 10, 2001 CORRECTED Jan. 11

This is a preview of some material that the SARB WG will show at the CERES Science Team Meeting (23-25 Jan. 2001, Williamsburg).

1. Maps of surface albedo over the TRMM domain for March and May 1998, based table lookups to clear sky SSF.

2. Subset (~1% of TRMM) runs of CRS for 1-31 May 1998, yielding SARB results for comparison with CAVE surface observations.
And a full spatial CRS for 1 May 1998 (24 hours).

3. Test of T(z) and q(z) from ECMWF (currently used for CERES processing) and the new GEOS (newly available candidate) for 7-9 March 2000.

4. Comparison of Collins-Rasch 6-hourly aerosol assimilation with
- **ground-based aerosol optical thickness (AOT) for Jan-Aug 1998**
- **monthly mean GFDL-CTM AOT that were used in (1) and (2) above.**

5. Zhonghai Jin will use a coupled air-sea radiative transfer model to illustrate the impact of chlorophyl and "yellow stuff". Current CRS ocean optics is based on only sun angle, wind speed, and the optical depth of aerosol/clouds.

6. Wenying Su will compare COVE observations of upwelling SW spectral radiances with theory. She will also describe how her planned ocean measurements from the RV Ron Brown (ACE-Asia cruise March-April 2001) will be used to extend COVE and CLAMS obsersvations to the world ocean.

Details:

Topics 1-4 will be presented on Tuesday, January 23 during a 30 minute session "Sfc & Atm Rad. Budget". Topics 5 (15 min.) and 6 (15 min.) will be presented as the SARB Co-I Report (30 min.) on Jan. 24 or 25. This memo will be stored in the "CURRENT SARB WG-NEWS" section of group URL http://srbsun.larc.nasa.gov/sarb/sarb.html

1. Maps of surface albedo over the TRMM domain for March and May 1998, based table lookups to clear sky SSF. CRS (SARB) needs a surface albedo for input to the Fu-Liou code. For an ice-free ocean footprint, the surface albedo comes from a lookup to the Hu-Cox-Munk table using input wind speed, sun angle and aerosol/cloud optical depth; CRS iterates Fu-Liou to adjust properties of aerosols or clouds, depending on whether the footprint is clear or cloudy. For clear land, there is a table-lookup to Fu-Liou for surface albedo; CRS then iterates to improve surface albedo. Over cloudy land, surface albedo is not adjusted. Where do we get the surface albedo for a cloudy footprint over land? Before interating a single footprint with the Fu-Liou code, we do a fast Surface Albedo History (SAH) lookup each month. SAH spans the whole domain of clear land footprints for a given month. Using assumed aerosol optical thickness (AOT), the most favorable geometry (i.e., high sun) is selected to determine the default surface albedo. If there are no clear footprints for a particular 10' by 10' tile, we use the surface albedo from CRS tuning in the previous month. There is a hierarchy of selection. The previous year for the same month is the next candidate. Lacking that, David Rutan's maps on the web (which determine the spectral SHAPE of albedo in all cases) give the default broadband land albedo.
Lisa Coleman will have SAH runs for the TRMM domain covering March and May 1998 for the STM. Fred Rose has put a preview on http://srbsun.larc.nasa.gov/sfcalb_history/lisa/

2. Subset (~1% of TRMM) runs of CRS for May 1998, yielding

SARB results for comparison with CAVE surface observations.
And a full spatial CRS for 1 May 1998 (24 hours).
Formal mass processing of CERES is presently done through SSF and includes no CRS (SARB). [SSF has clear sky TOA fluxes which will succeed the currently archived "ERBE-like" CERES ES8; cloud properties; and AOT. Some have access to the experimental TOA on SSF.] Hence Lisa is again running "subsets" of CRS with the SSF as input. The subsets of CRS cover David's CAVE surface observation sites and additional gridboxes (as specified other WGs) as validation targets. We'll have subset CRS products for 1-31 May 1998 in all-sky (total-sky) for comparison with CAVE.
While over clear sky ocean we have access to the VIRS retreivals of AOT, for most footprints we are stuck using monthly mean AOT from GFDL Chemical Transport Model (CTM).
Fred's http://srbsun.larc.nasa.gov/gfdlaer/ has GFDL AOT maps.
We'll have some analysis of a full spatial CRS for a single day, 1 May 1998. Lisa hopes to provide us, later this week, with the CRS runs described in this section (2) and the Surface Albedo History (SAH) maps in section (1). Fred has put some examples of EARLIER diagnostic TOA plots on http://srbsun.larc.nasa.gov/ceres/r4/19980401.html

3. Test of T(z) and q(z) from ECMWF (currently used for CERES processing) and the new GEOS (newly available candidate) for 7-9 March 2000.

Recall that the Cloud, Surface-only, SARB, and TISA WGs are using ECMWF data. Man Li Wu will send (hopefully VERY soon!) to Fred the latest GEOS output. As ECMWF is expensive, while GEOS is "free", the PIs want us to evaluate them.
A preview (that does NOT use the very latest GEOS) is on http://srbsun.larc.nasa.gov/g3c/ and it looks pretty good.
We should have an even better GEOS for evaluation at the STM.

4. Comparison of Collins-Rasch 6-hourly aerosol assimilation with

- ground-based aerosol optical thickness (AOT) for Jan-Aug 1998
- monthly mean GFDL-CTM AOT that were used in (1) and (2) above.

Bill Collins has provided us with a global, 6-hourly aerosol assimilation covering January-August 1998. This assimilation inputs satellite retrieved aerosol optical thickness (AOT) over the clear ocean; spews out climatological emissions over industrial regions and turns them into aerosols; removes aerosols by cloud processes; lofts dust from deserts, depending on wind speed; and blows the whole mess around the globe with 6-hourly updated NWS meteorological data. For TRMM, we have NO retrievals of aerosol over land; such retrievals over land will be experimental with MODIS. One obvious application of the assimilation is to test is the vertical distribution of heating due to aerosols in SARB. We'll try using it as a "dust screen" in the surface albedo retrievals described in section 1 (above). The clear sky ADM over land is problematic: the surface itself is often quasi lambertian, but the aerosol is both highly directional and variable. A strategy for more effective use of the assimilation may interest different components of CERES. At this STM, we'll mostly compare the assimilation with surface observations. For an example, see http://srbsun.larc.nasa.gov/collins/trmm/sede.plt1.ps

5. Zhonghai Jin will use a coupled air-sea radiative transfer model to illustrate the impact of chlorophyl and "yellow stuff". Current CRS ocean optics is based on only sun angle, wind speed, and the optical depth of aerosol/clouds.

Radiative Transfer Modeling of Ocean Surface Albedo for CERES SARB

Zhonghai Jin and Thomas Charlock

We report early steps to improve the SARB ocean surface spectral albedo with an advanced model that treats scattering and absorption in both the ocean and the atmosphere explicitly. The current SARB input for surface spectral reflectance over ice-free ocean uses the Hu-Cox-Munk parameterization for Fresnel reflection (dependent on wind speed, cloud/aerosol optical depth, and sun angle); constant underlight (volume scattering from water below the surface); and foam (wind-speed dependent but spectrally flat). The advanced coupled model includes phytoplankton pigment concentration, dissolved organic matter (DOM), sediments, and an ocean bottom of finite depth - in addition to aerosols and clouds in the atmosphere. Ocean spectral albedos from the advanced model show the importance of including these components. Our goal is to parameterize the ocean surface albedo using data (e.g., concentrations of chlorophyl and DOM) which can be obtained from new sources like SeaWIFS, and thereby improve fluxes and optical depths retrieved in SARB. The new model will be verified with field observations from COVE, CLAMS, and the ACE-Asia cruise.

6. Wenying Su will compare COVE observations of upwelling SW spectral radiances with theory. She will also describe how her planned ocean measurements from the RV Ron Brown (ACE-Asia cruise March-April 2001) will be used to extend COVE and CLAMS obsersvations to the world ocean.

Preliminary Comparison of Theory and Observation for Ocean-reflected Surface Radiance at COVE

Wenying Su, Ken Rutledge, and Thomas P. Charlock

The SP1A Spectralphotometer at COVE has observed reflected radiances at 500 nm since May, 2000. The record for 9 elevation angles (2, 12, 22, 32, 42, 52, 62, 72, and 90 degrees) spans 180 degrees of azimuth. Measured radiance distributions have been compared with the model "6S" (Second Simulation of Satellite Signal in the Solar Spectrum). As elevation angle increases, the field of view decreases, and the temporal signature of ocean waves then becomes obvious. In order to reduce the influence of transient facets on the radiance distribution, a polynominal fit was adopted for the measurements. Our comparison reveals big

discrepancies for elevation angles less than 22 degrees, arguing for a review of the Cox and Munk sunglint statistics. When apart from the sunglint region at low sun, the measured radiance is often smaller than that of the 6S; this is probably caused by the strong absorption of coastal water. The differences between 6S and measurement could be explained by the inadequate theory and/or different water type.
The upcoming ACE-Asia cruise in the mid Pacific will be an opportunity to resolve this issue.