26th CERES Science Team Meeting Report

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Other Contributors:

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We are now applying the CERES data in a number of scientific studies, dealing with the following topics:

1) Atmospheric cloud radiative forcing and its role in the large-scale atmospheric circulation and energy transport (*Baijun Tian & Ram*)

2) Spatial and temporal scales of tropical clouds and precipitation in TRMM/CERES imagery and a GCM (*Eric Wilcox & Ram*)

3) SSMT2 Water Vapor and Greenhouse Effect from CERES Window a Broadband Channel (*Ramanathan, A. K. Inamdar & B. J. Sohn*)

4) Retrieval of surface radiation budget from CERES: Validation studies *(A. K. Inamdar)*

5) Atmospheric Greenhouse Effect from ERBE, TRMM & TERRA (*Ram Anand Inamdar)*

6) Absorption in the continuum and vibrational-rotational to pure rotational bands from CERES (*Inamdar & Ramanathan*)

Surface Radiation Budget (LW Model A) Revision
& Validation (Inamdar)

Long wave Cloud Radiative Forcing in the Broadband and
Window (Ramanathan & Inamdar)

Deep Convective Clouds: Sprinkler in the Upper
Troposphere
(Sohn, Chung, Ramanathan & Inamdar)

RES ATBD Subsystem 4.6.2 – Longwave Surface Radiation
dget for Clear Skies (April 2002 Version: Applicable to both
MM/TERRA Retrievals)

e: April 15, 2002

imation of Longwave Surface Radiation Budget from CERES:
difications to the Land Parameterization Scheme
bsystem 4.6.2)

Major Changes:

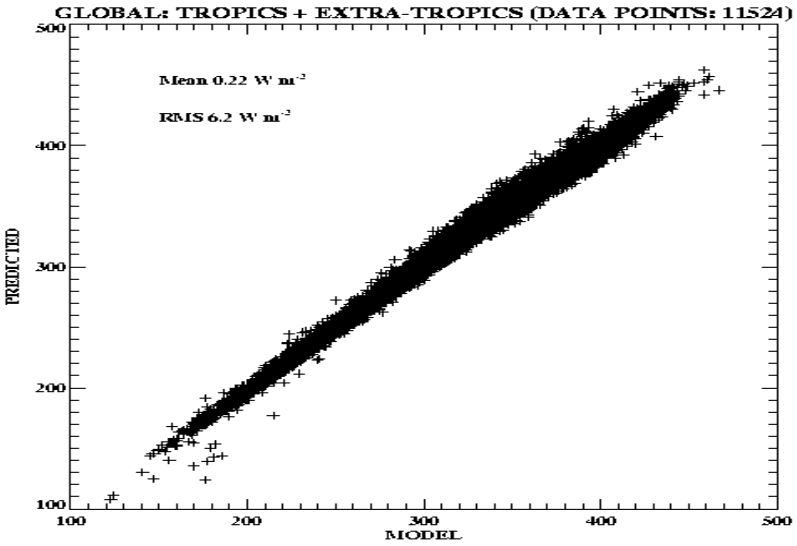
• Single scheme for the globe applicable over all scenes
Identified as land including glaciers

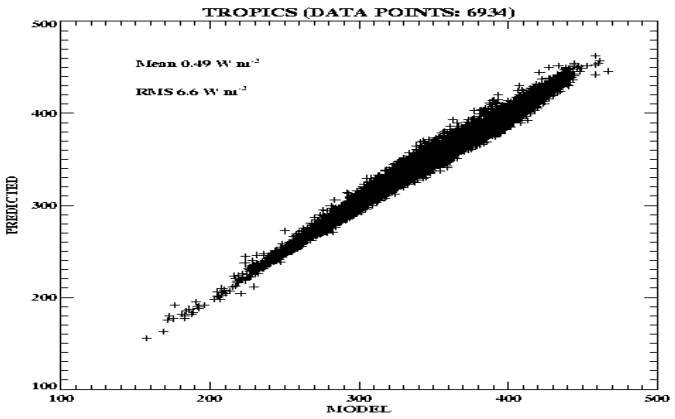
• Revised scheme for the estimation of the near surface
Air temperature, $\boldsymbol{T_a}$

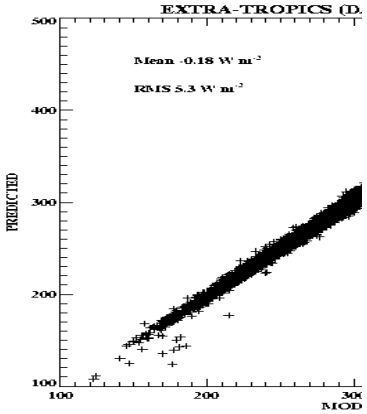
Scheme for Evaluation of Near surface temperatur

The optimum pressure level, P_e, to determine the effe
Emission temperature

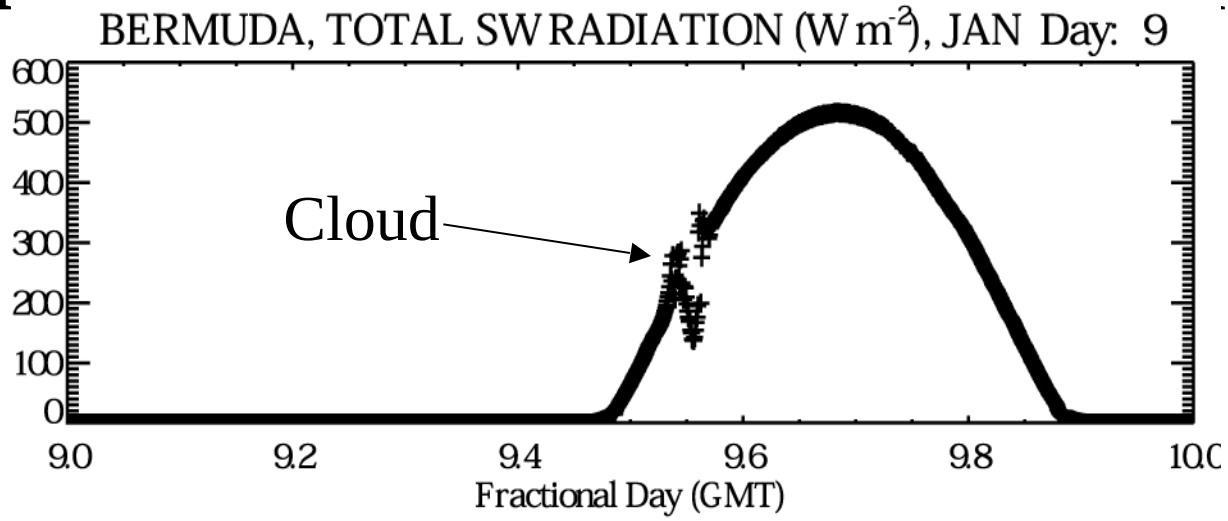
$$\boldsymbol{P_e/P_s = (0.15/300)*P_s + 0.45}.$$

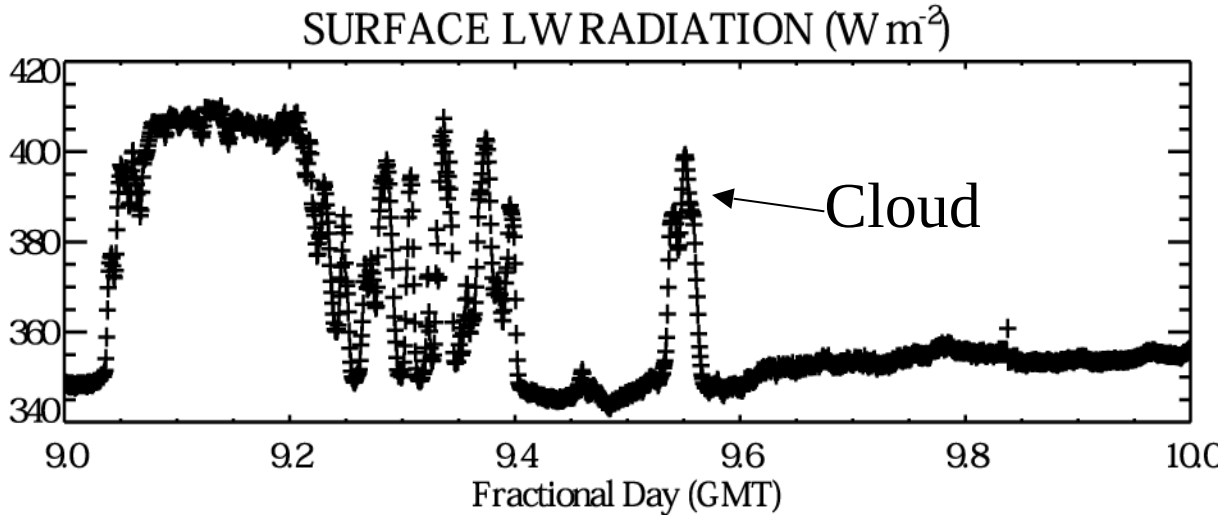

GLOBAL: TROPICS + EXTRA-TROPICS (DATA POINTS: 11524)
Mean 0.22 W m⁻²
RMS 6.2 W m⁻²
PREDICTED
MODEL
100
200
300
400
500

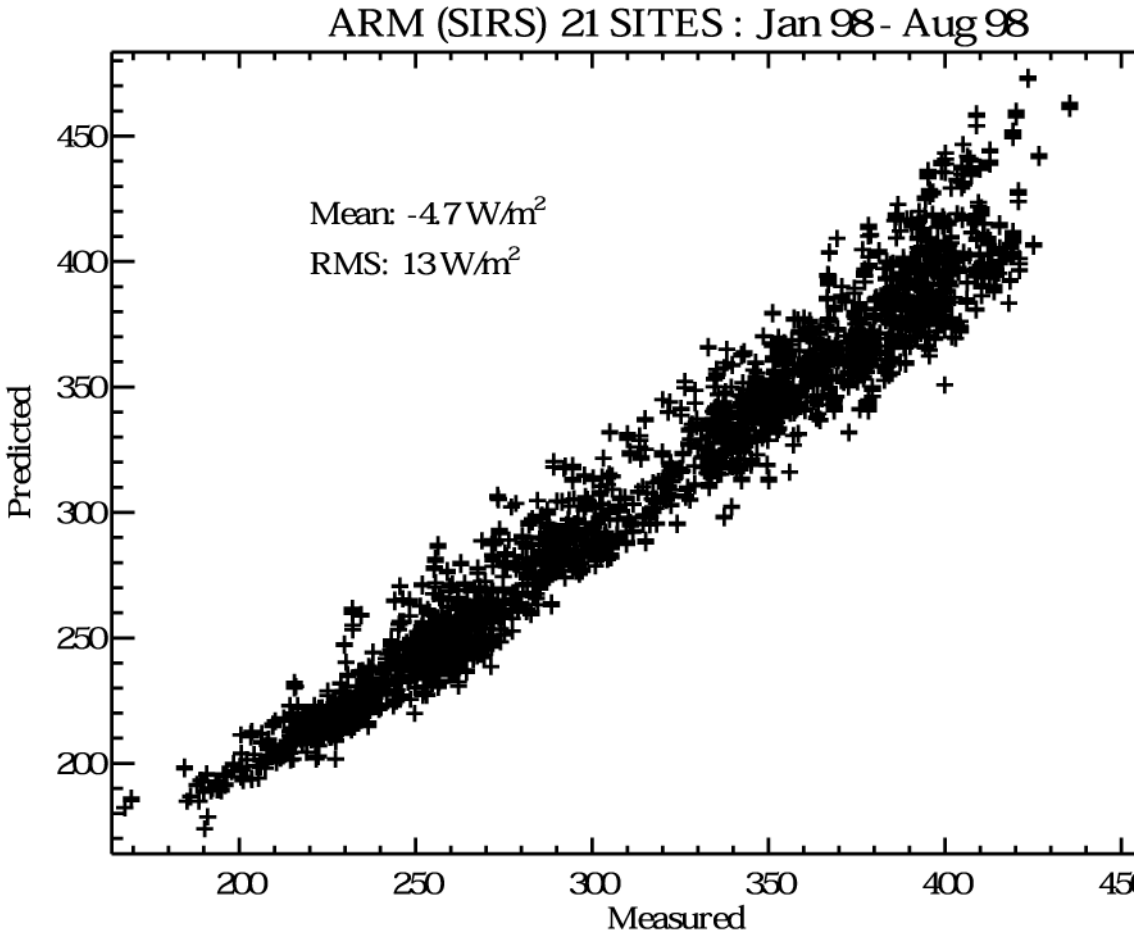

TROPICS (DATA POINTS: 6934)
Mean 0.49 W m⁻²
RMS 6.6 W m⁻²
PREDICTED
MODEL
100
200
300
400
500

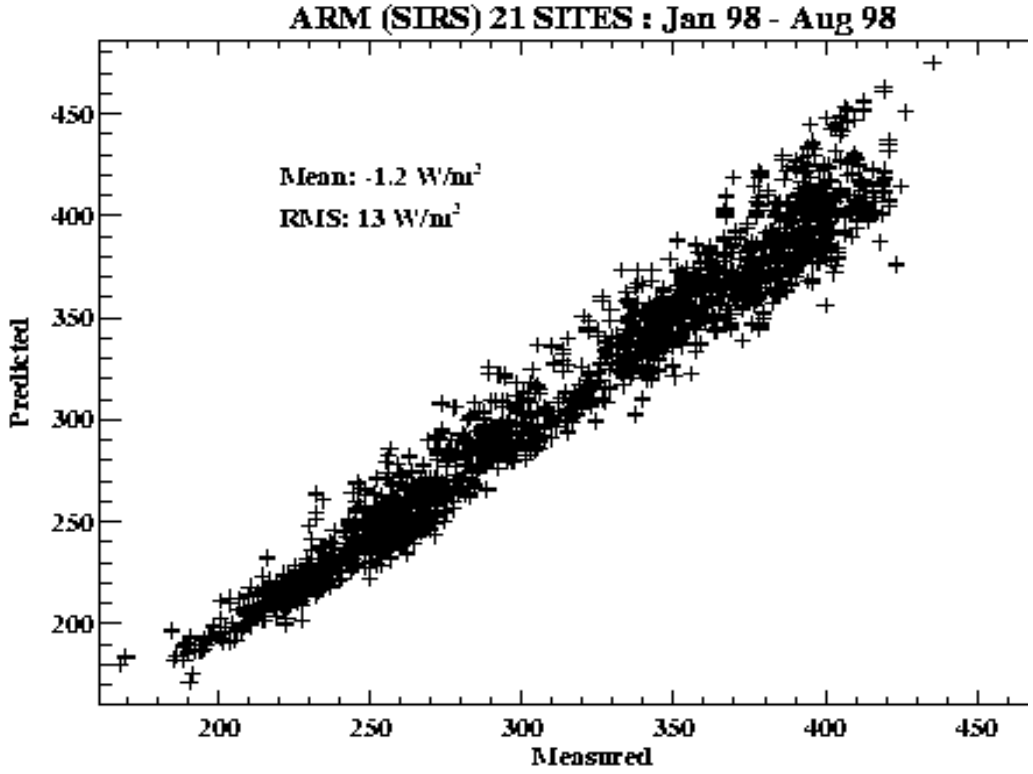

EXTRA-TROPICS (D
Mean -0.18 W m⁻²
RMS 5.3 W m⁻²
PREDICTED
MOD
100
200
300
400
500

Example of nearly clear daExample of nearly clear day






ARM (SIRS) 21 SITES : Jan 98 - Aug 98
Mean: -4.7 W/m^2
RMS: 13 W/m^2
Predicted
Measured
200
250
300
350
400
450

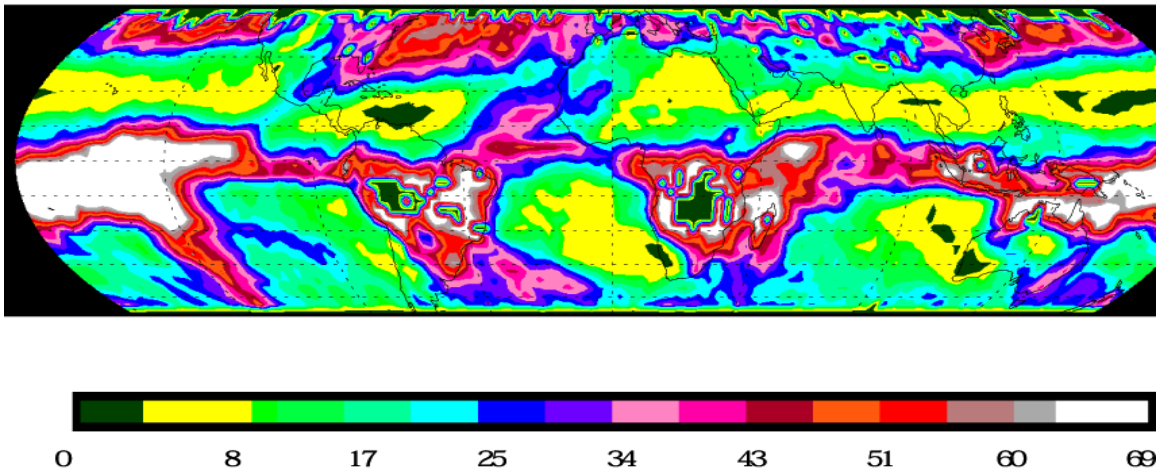

ARM (SIRS) 21 SITES : Jan 98 - Aug 98
Mean: -1.2 W/m²
RMS: 13 W/m²
Predicted
Measured
200
250
300
350
400
450

Long wave Cloud Radiative Forcing in the Windo
And Non-window

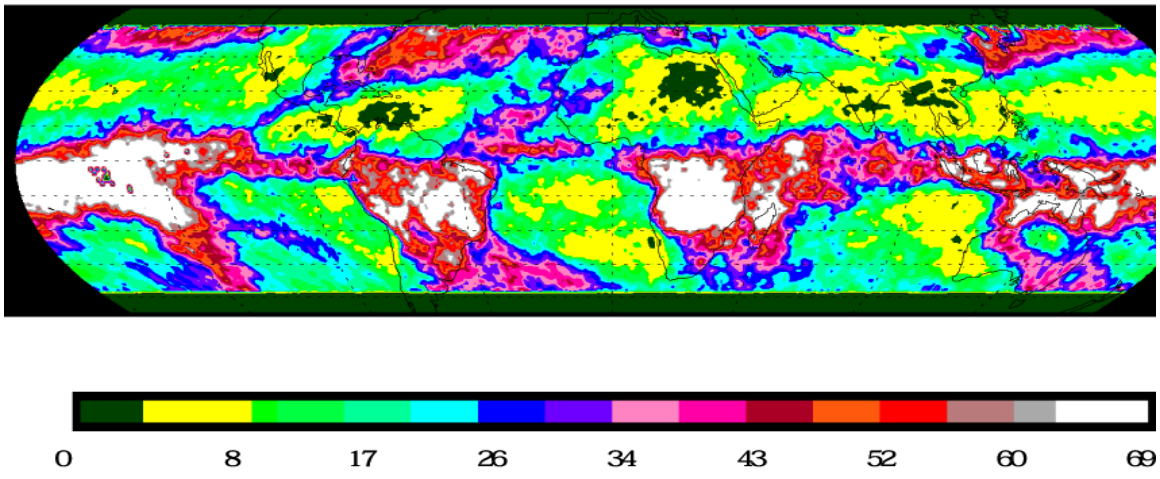
Ramanathan & Inamdar

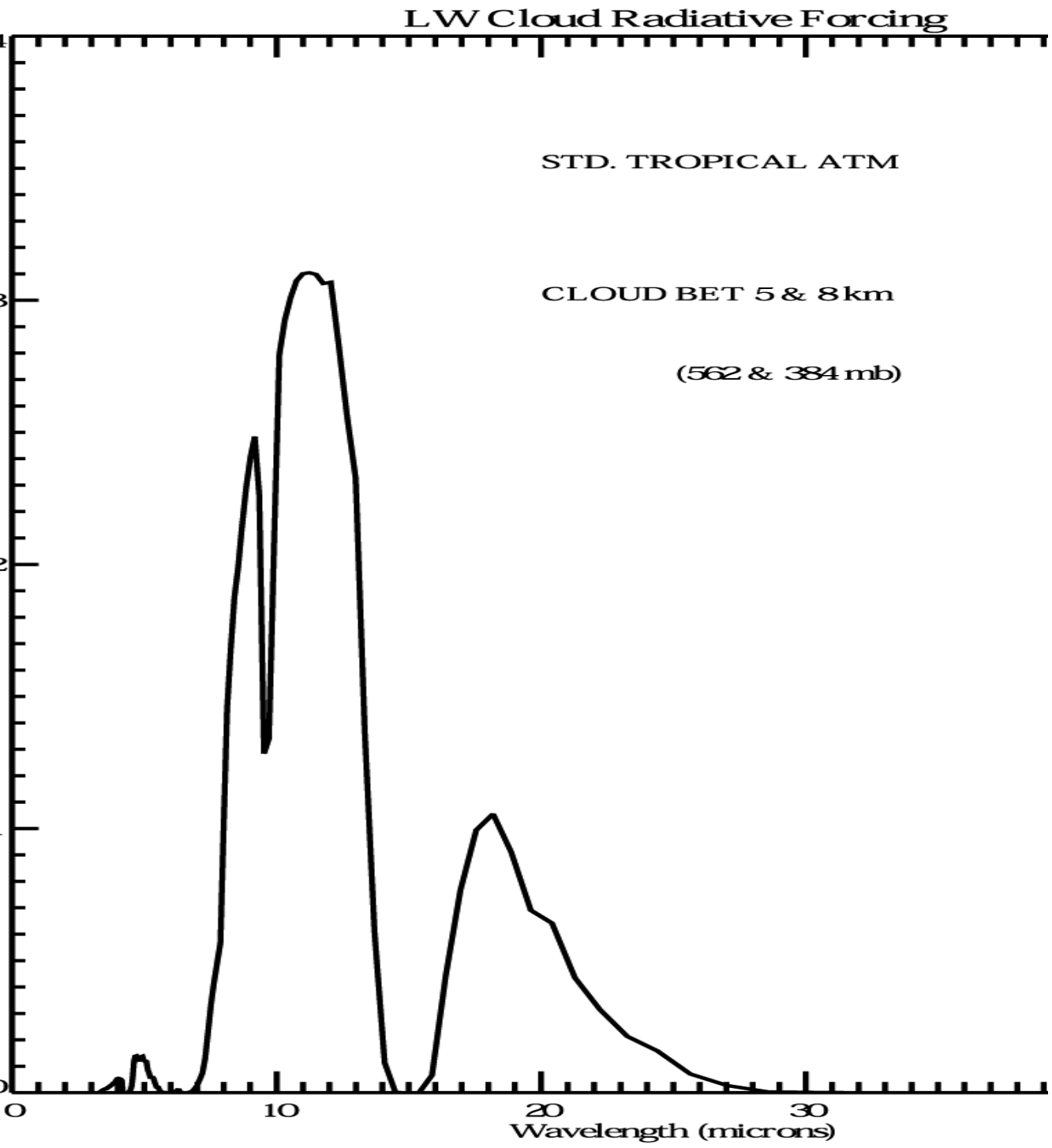
CERES (TRMM), JAN 1998, ES9 Edition2

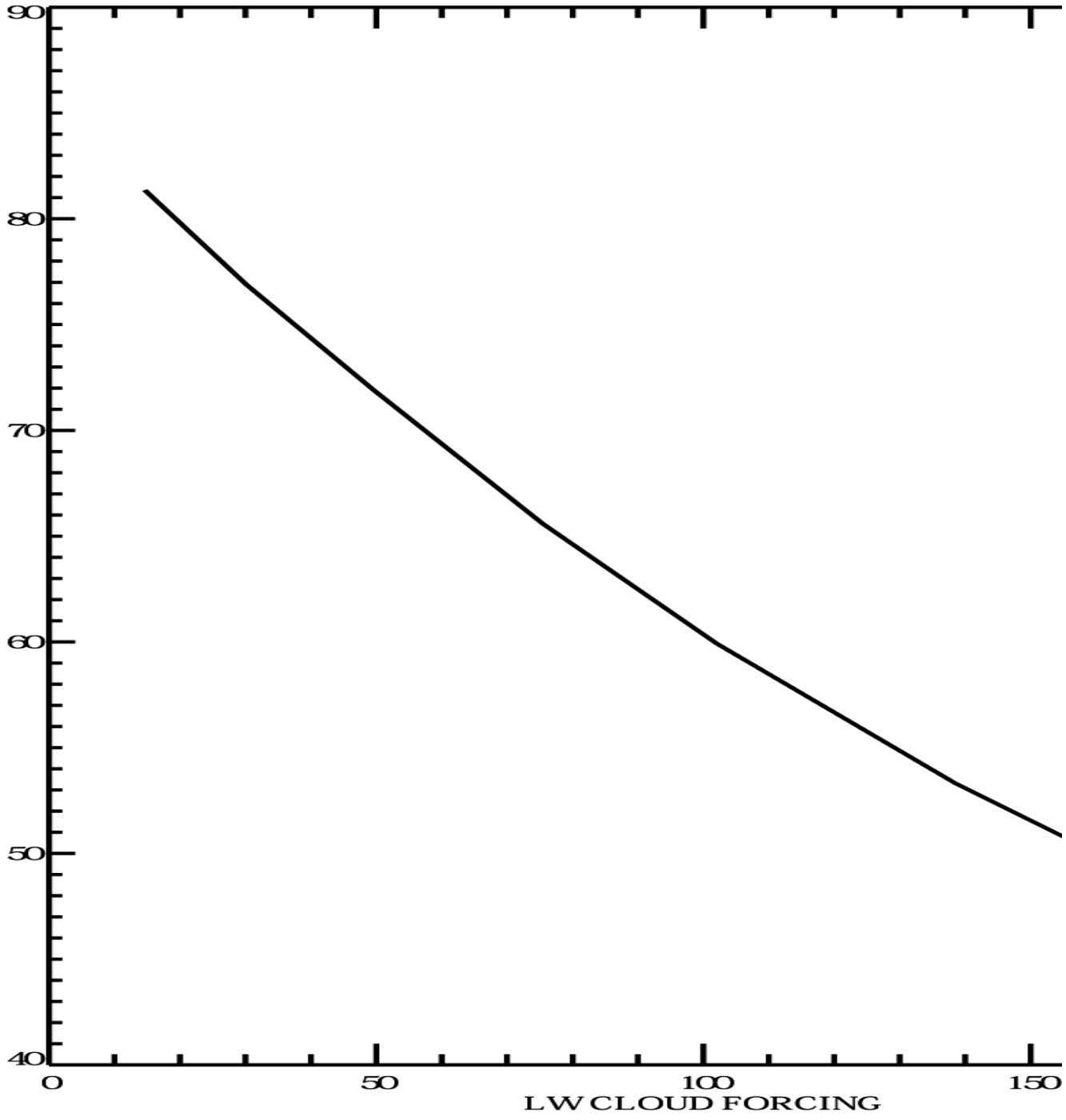
LW CLOUD FORCING ($W m^{-2}$): ES9 EDITION 2

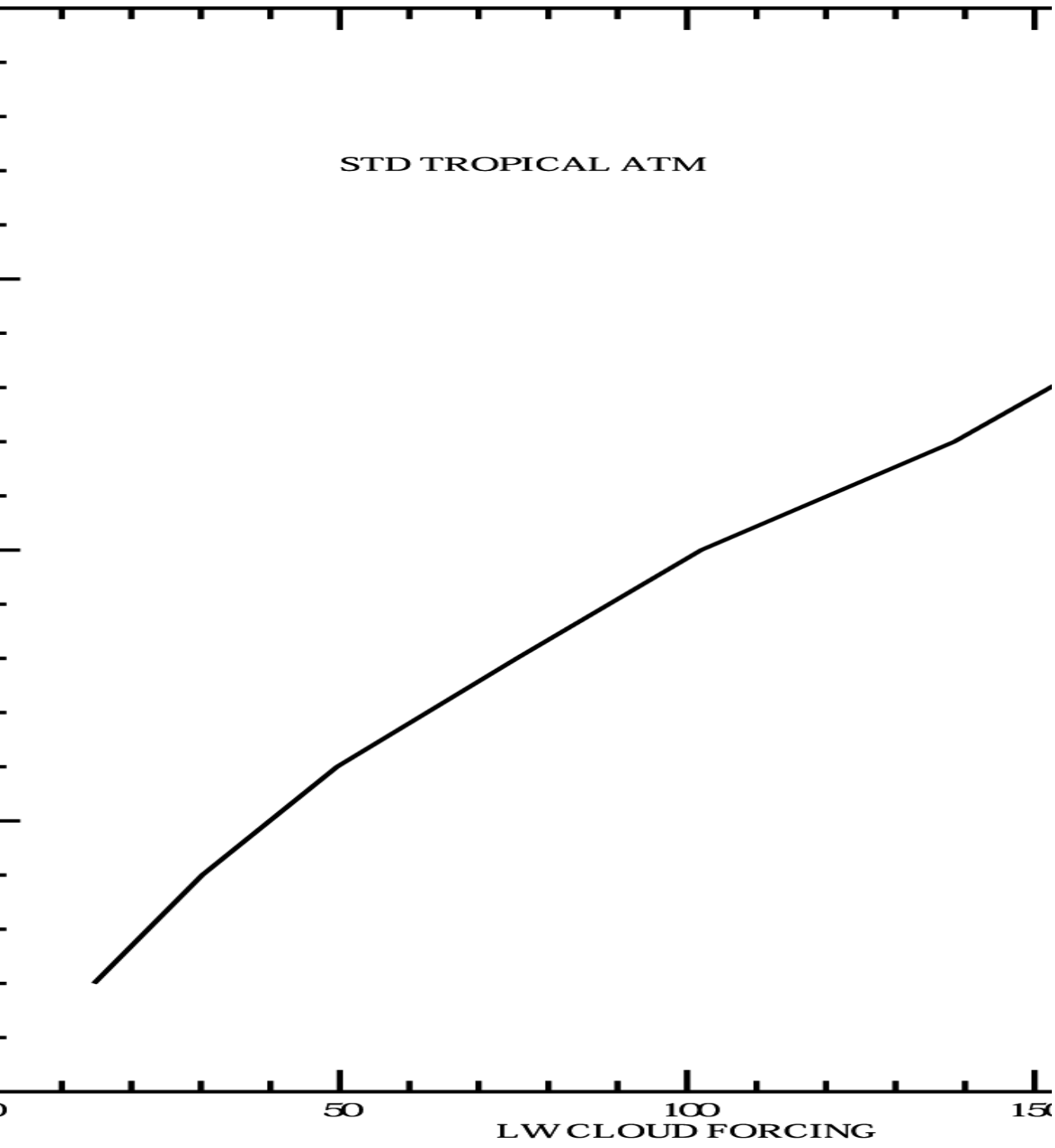


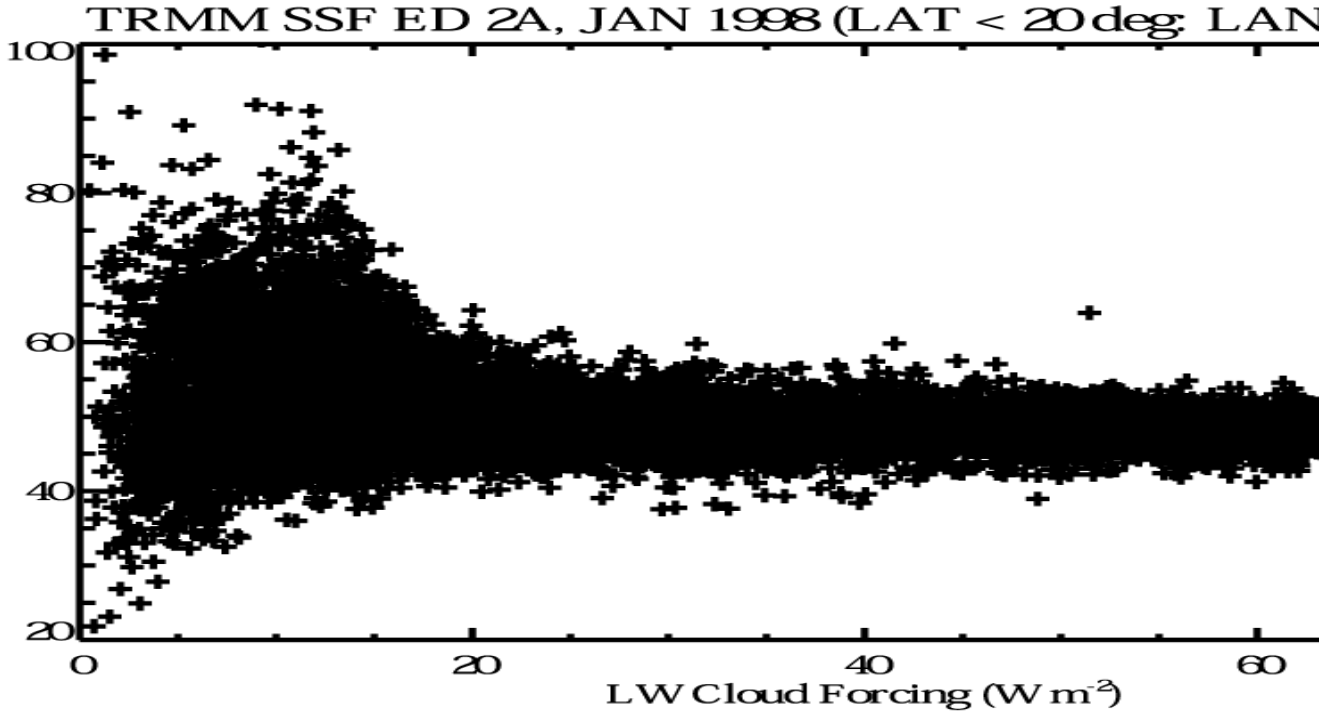
TRMM SSF EDITION 2A

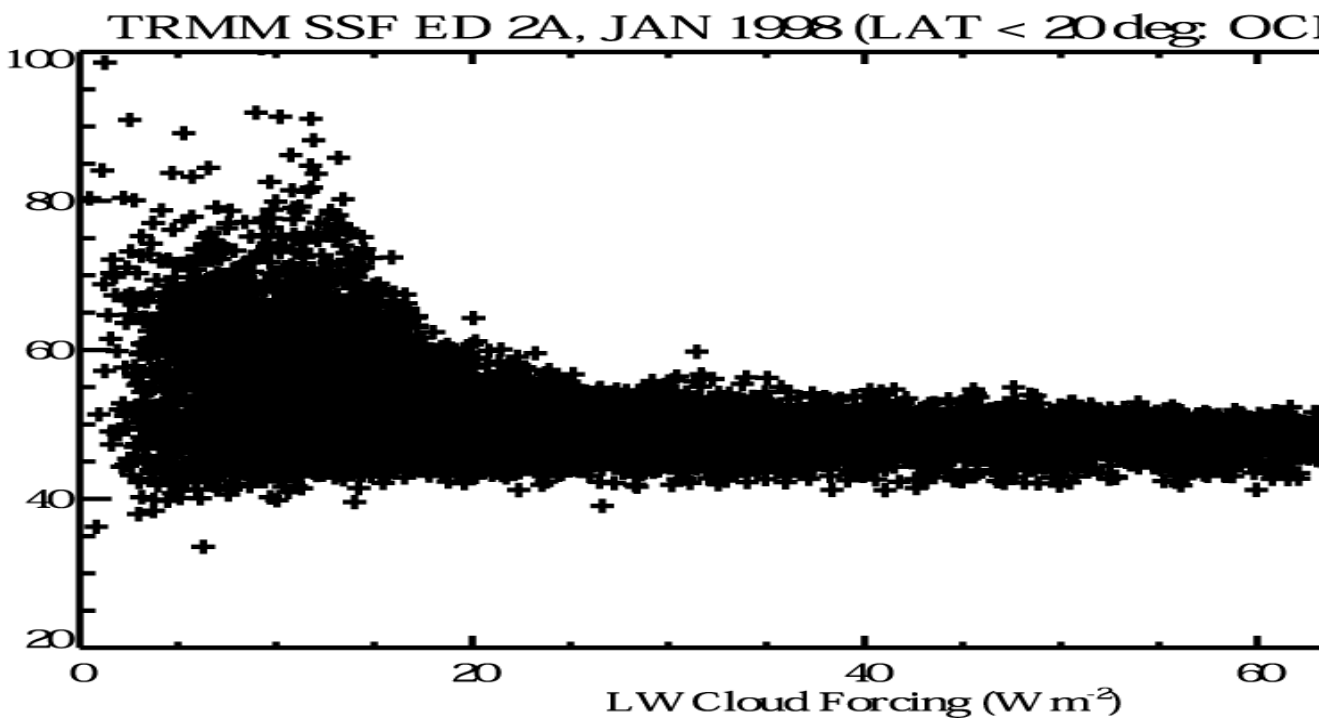


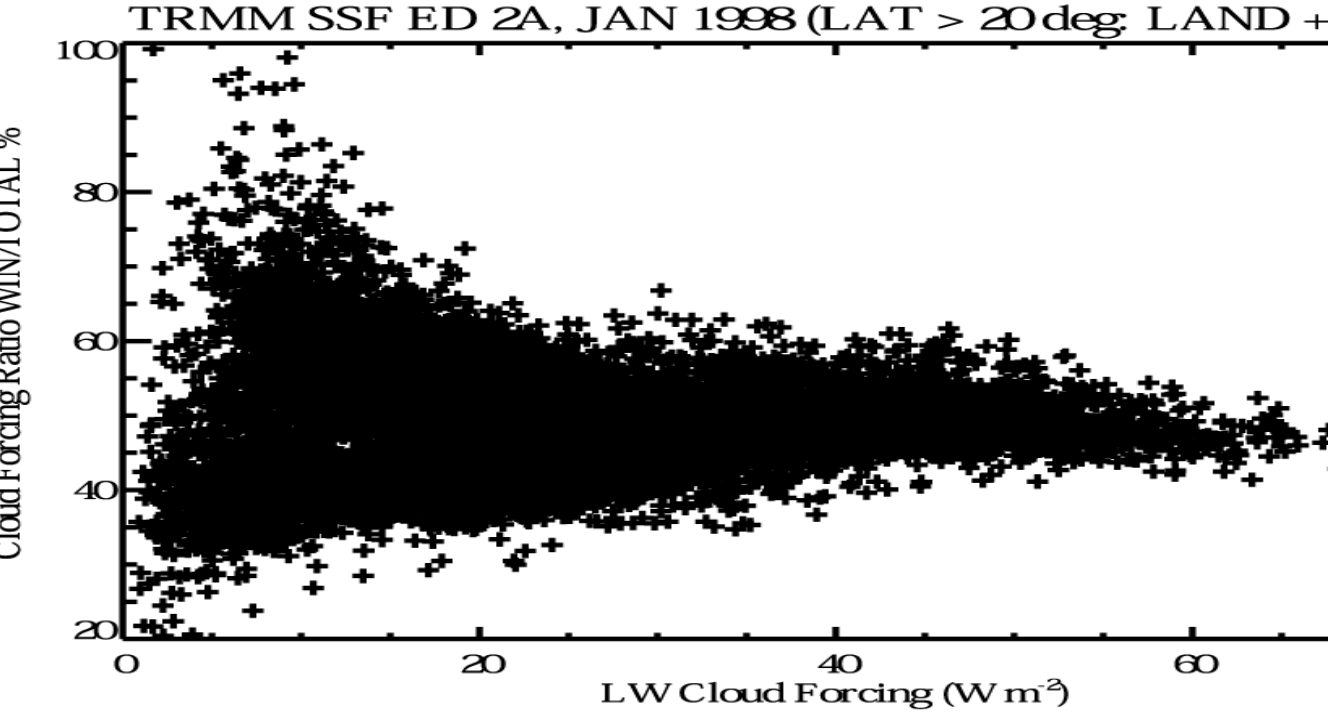

LW Cloud Radiative Forcing
STD. TROPICAL ATM
CLOUD BET 5 & 8 km
(562 & 384 mb)
0
10
20
30
Wavelength (microns)

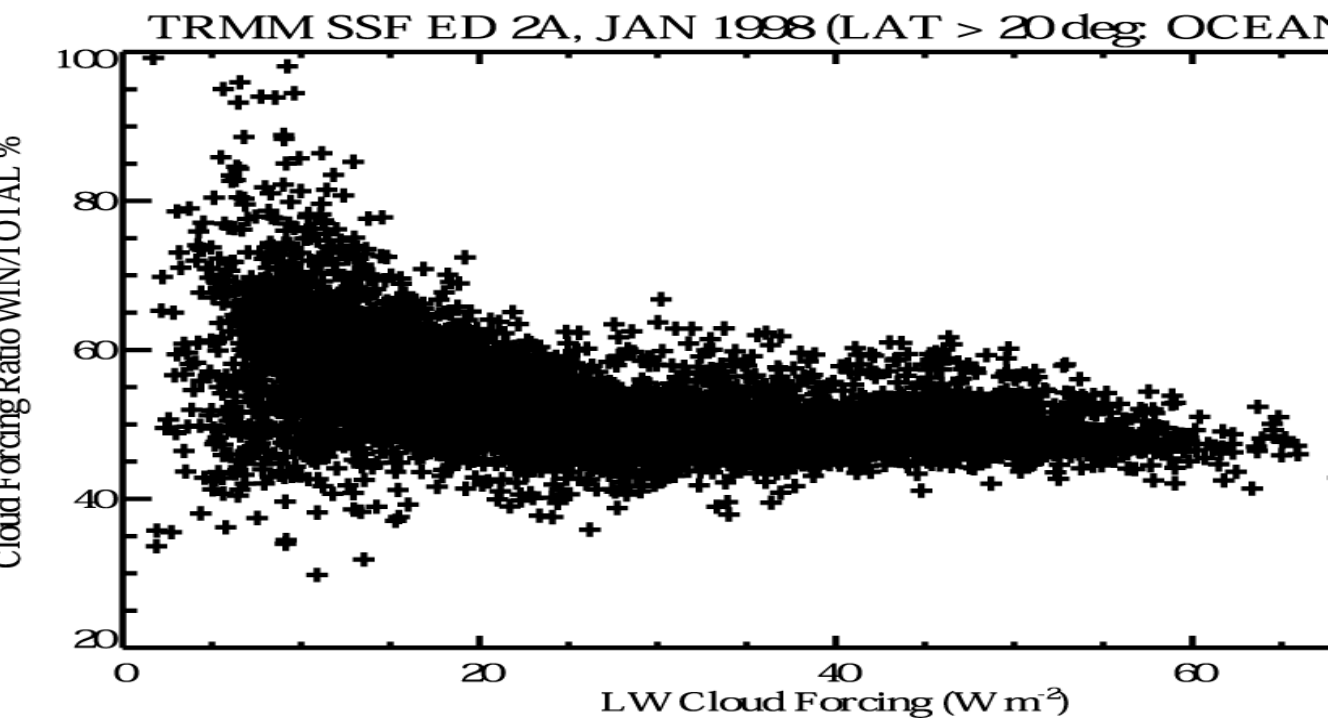

90
80
70
60
50
40
0
50
100
150
LW CLOUD FORCING


STD TROPICAL ATM
50
100
LW CLOUD FORCING


TRMM SSF ED 2A, JAN 1998 (LAT < 20 deg: LAN
100
80
60
40
20
0
20
40
60
LW Cloud Forcing (W m-2)

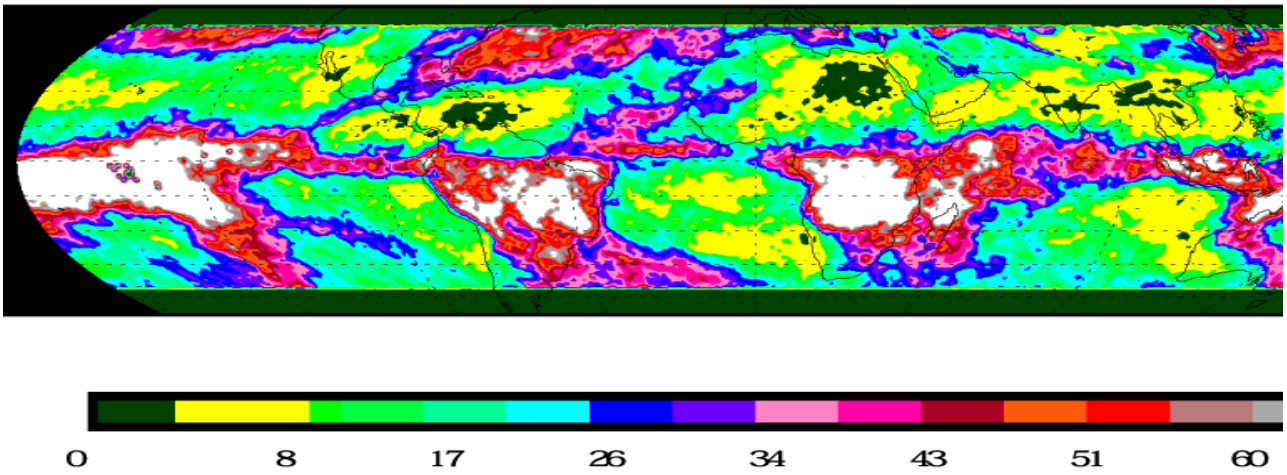

TRMM SSF ED 2A, JAN 1998 (LAT < 20 deg: OC
100
80
60
40
20
0
20
40
60
LW Cloud Forcing (W m-2)


TRMM SSF ED 2A, JAN 1998 (LAT > 20 deg: LAND +
Cloud Forcing Ratio WIN/TOTAL %
100
80
60
40
20
0
20
40
60
LW Cloud Forcing (W m-2)

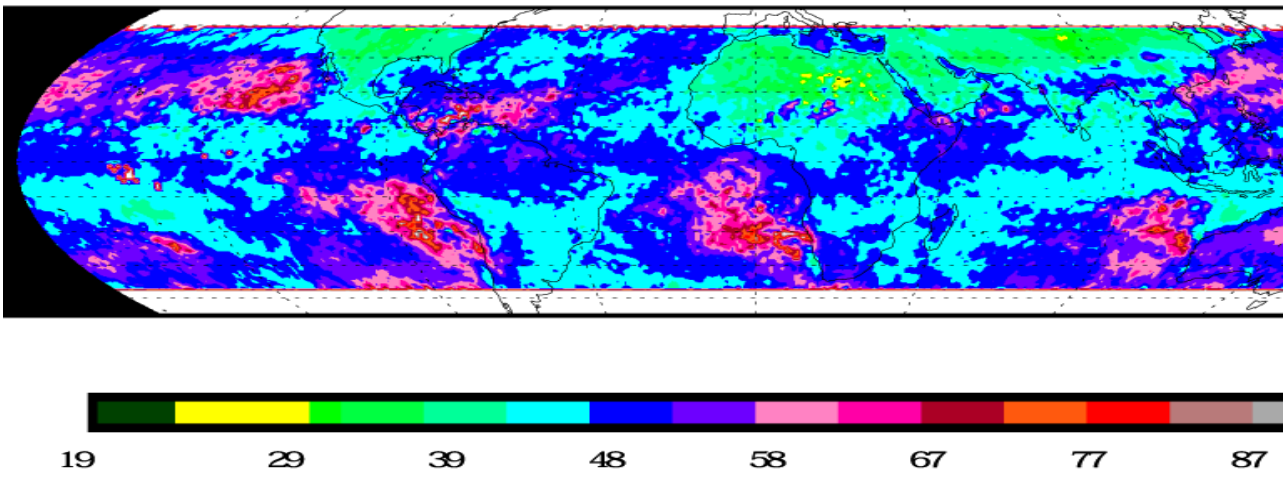

TRMM SSF ED 2A, JAN 1998 (LAT > 20 deg: OCEAN
Cloud Forcing Ratio WIN/TOTAL %
100
80
60
40
20
0
20
40
60
LW Cloud Forcing (W m-2)

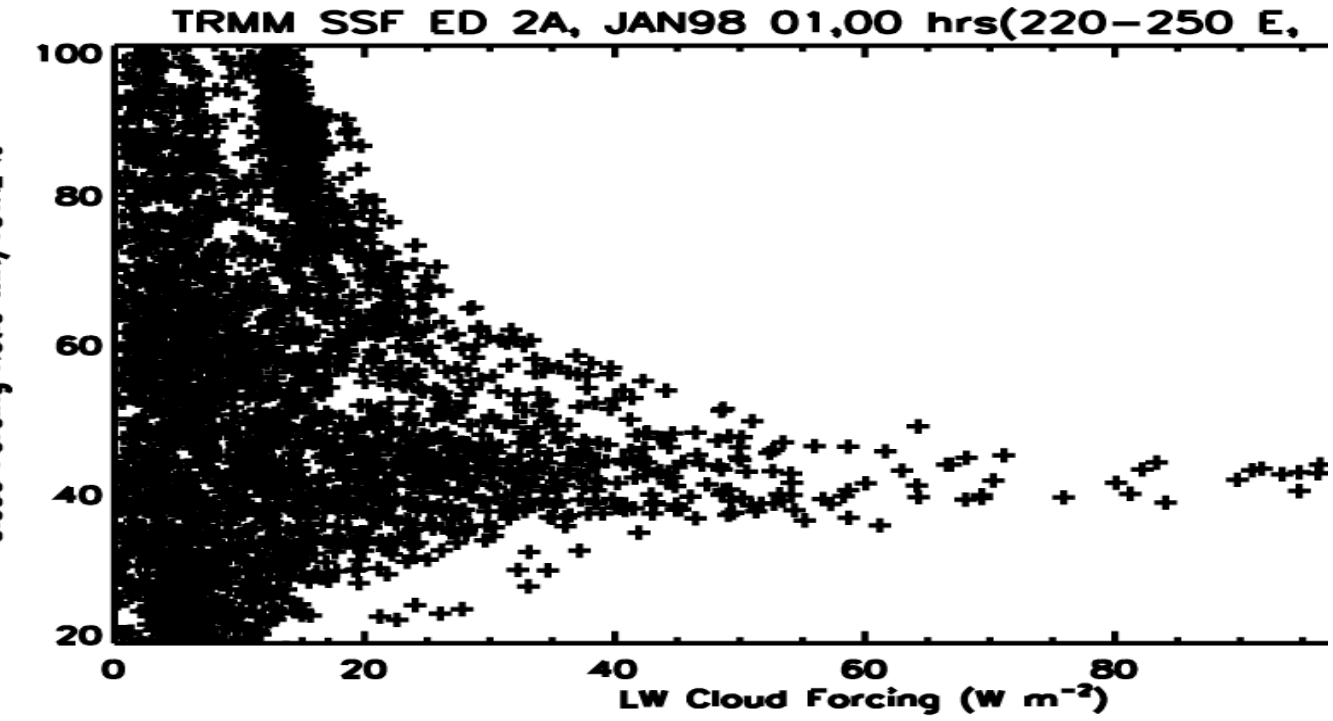
CERES (TRMM), SSF EDITION 2A, JAN 1998

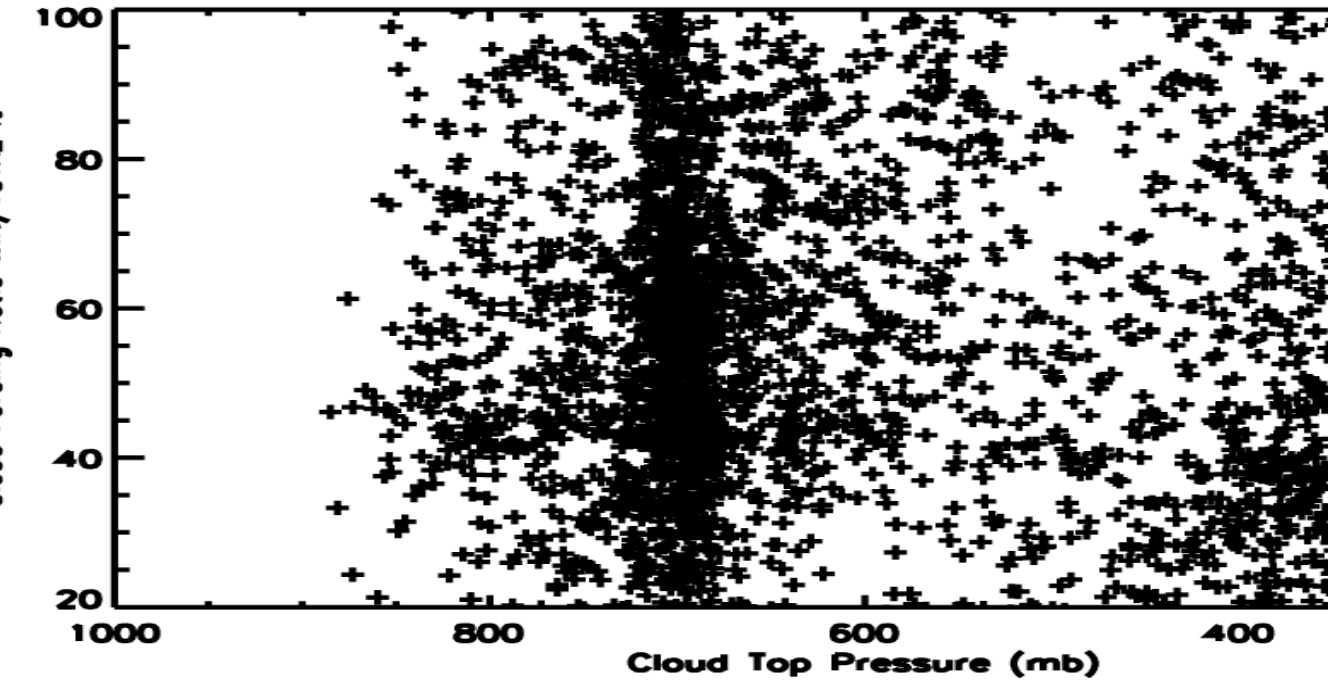
LW CLOUD FORCING (TOTAL) ($W m^{-2}$)



LW CLOUD FORCING RATIO(WINDOW/TOTAL) (%)




TRMM SSF ED 2A, JAN98 01,00 hrs(220−250 E,
100
80
60
40
20
0
20
40
60
80
LW Cloud Forcing (W m⁻²)

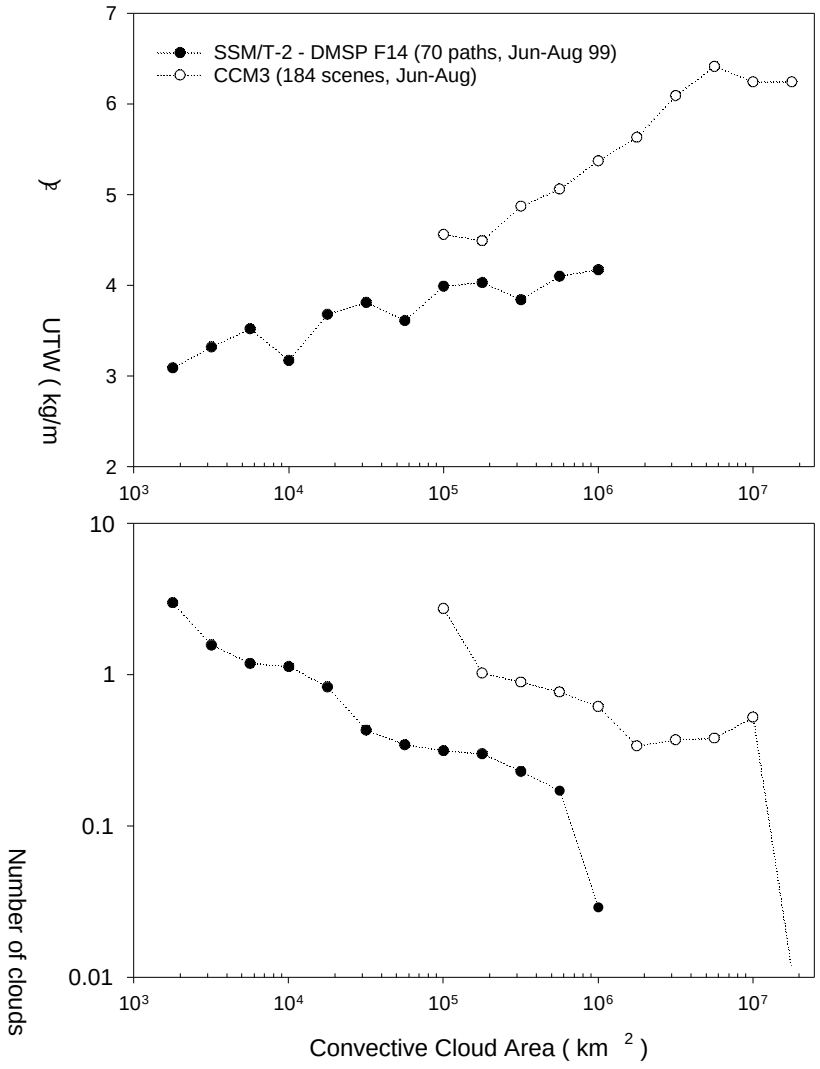

100
80
60
40
20
1000
800
600
400
Cloud Top Pressure (mb)

Deep Convective Clouds: Sprinkler in the Upper Troposphere

Contributors:

B. J. Sohn, Eui-Seok Chung, Ramanathan & Inamdar

Indian Ocean

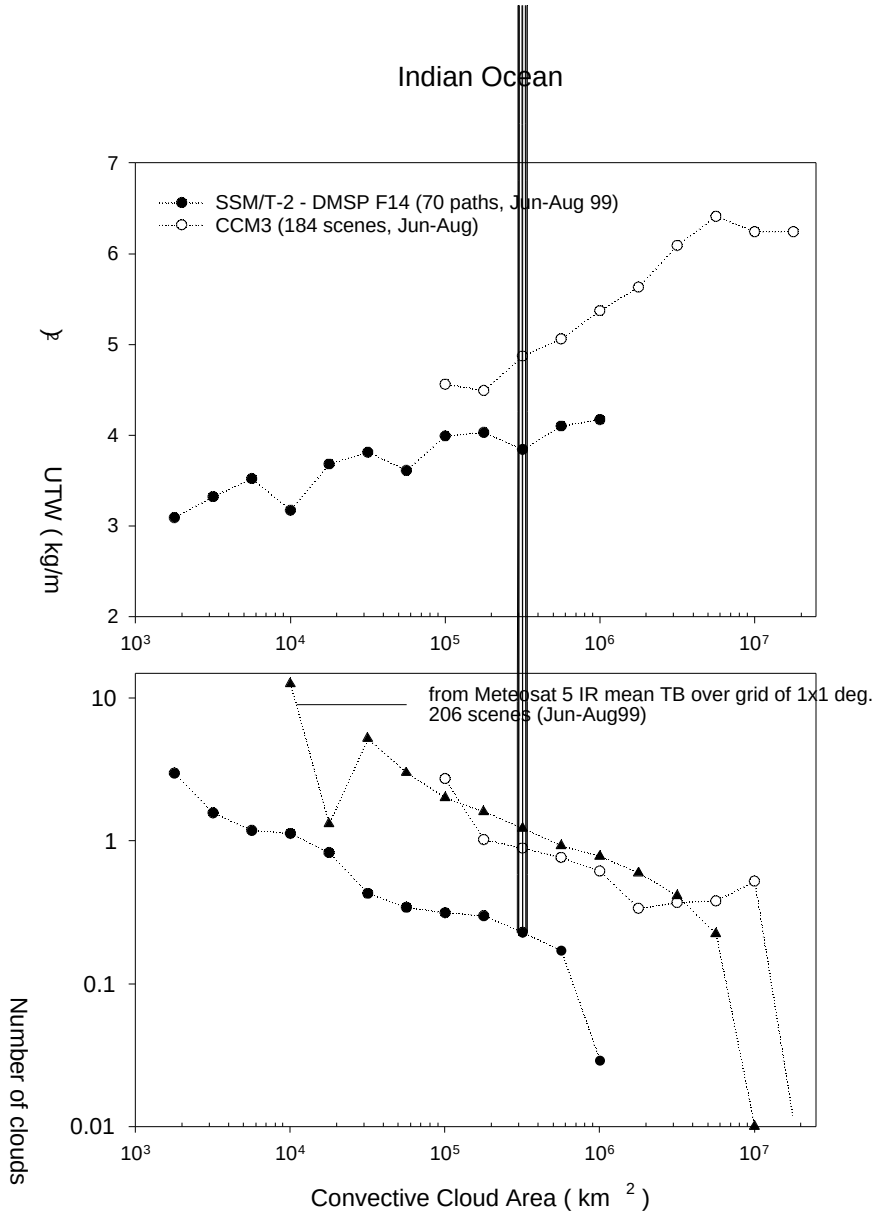


cloud selection criteria

1) SSM/T-2: collocated Meteosat 5 IR mean TB ≤ 260 K

2) CCM3: vertically(50-400 hPa) integrated high cloud fraction ≥ 0.99

& summation of cloud fractions at 3 pressure levels (251, 325, 409 hPa) ≥ 0.99



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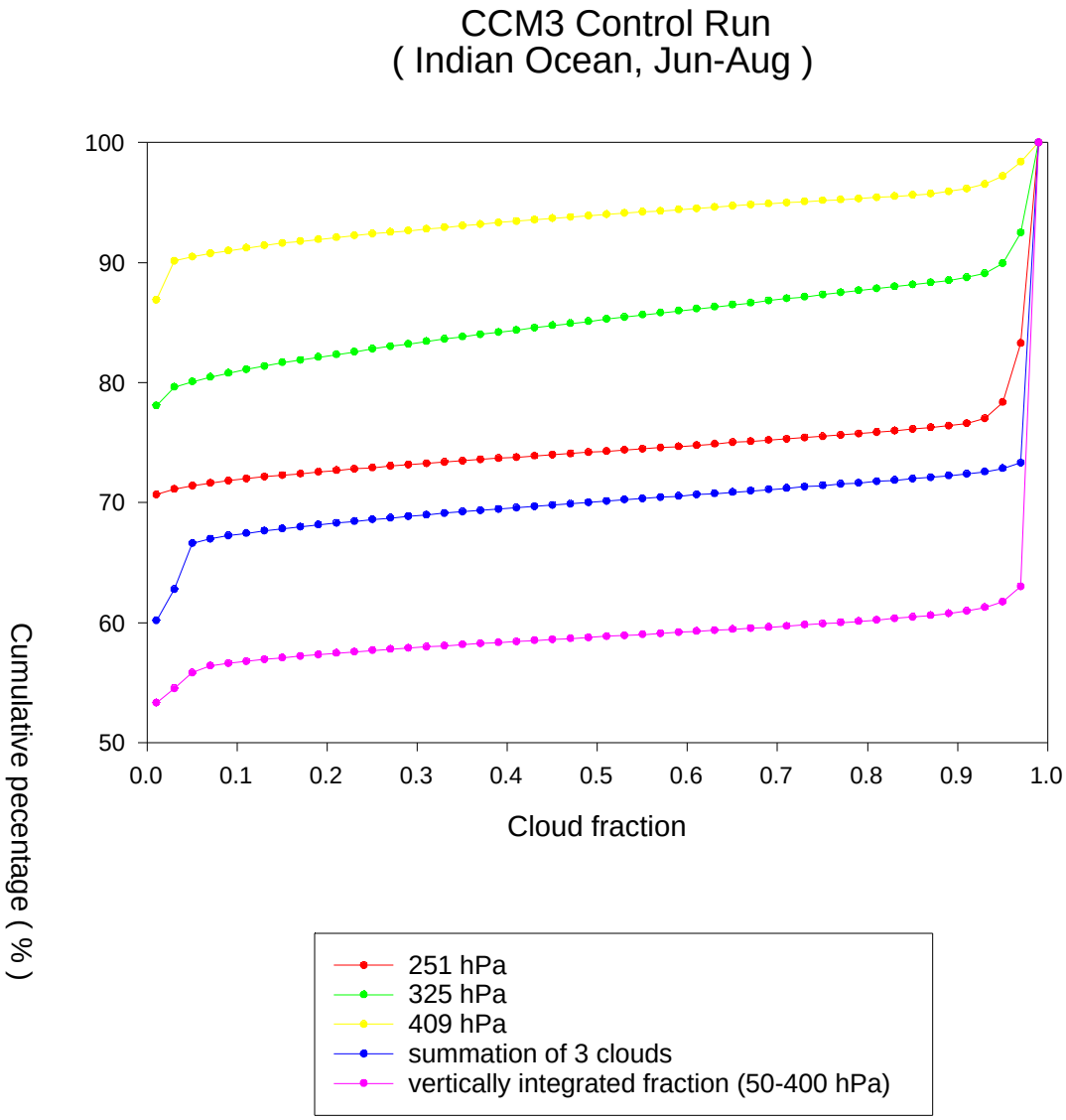
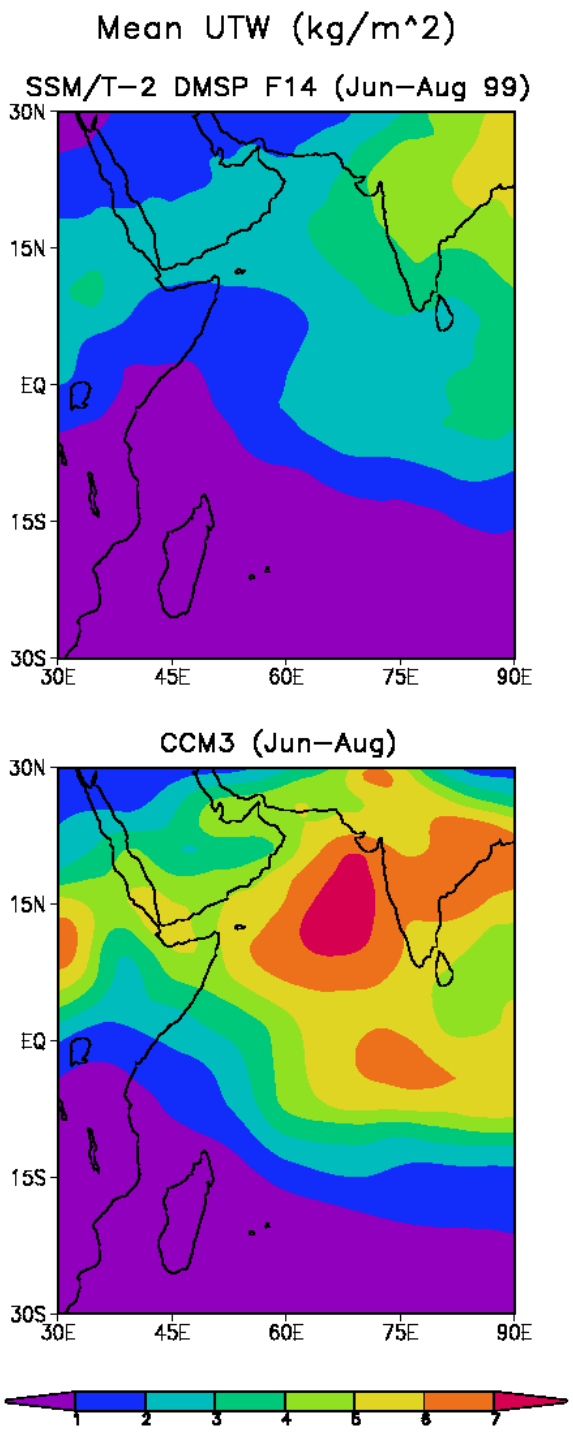
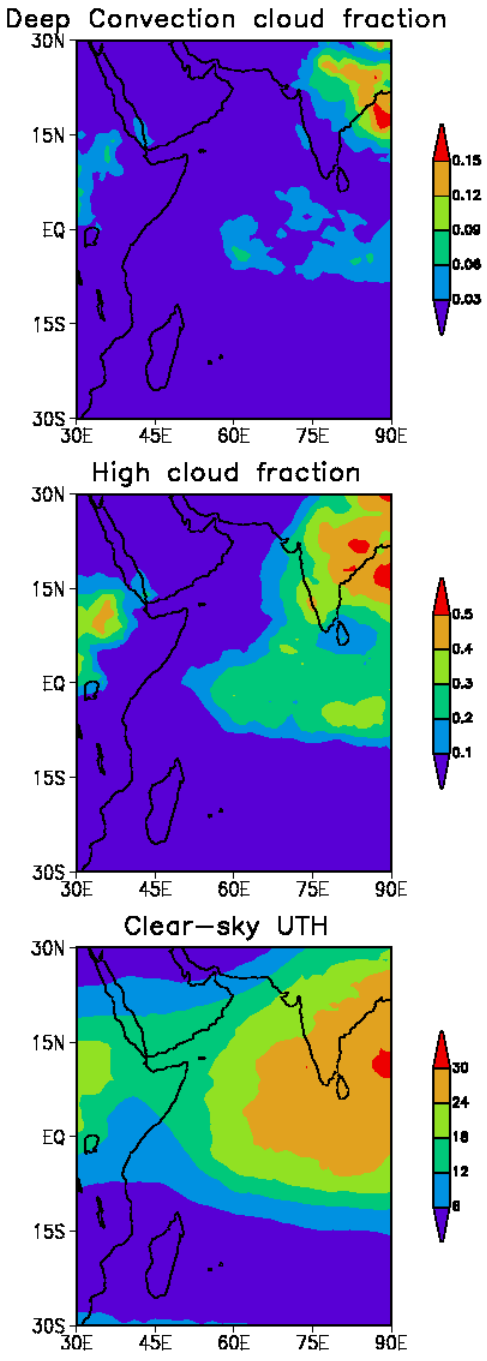

CCM3 Control Run
(Indian Ocean, Jun-Aug)
Cumulative pecentage (%)
100
90
80
70
60
50
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Cloud fraction
251 hPa
325 hPa
409 hPa
summation of 3 clouds
vertically integrated fraction (50-400 hPa)


Mean UTW (kg/m^2)
SSM/T-2 DMSP F14 (Jun-Aug 99)
30N
15N
EQ
15S
30S
30E
45E
60E
75E
90E
CCM3 (Jun-Aug)
30N
15N
EQ
15S
30S
30E
45E
60E
75E
90E
1
2
3
4
5
6
7


Deep Convection cloud fraction
30N
15N
EQ
15S
30S
30E
45E
60E
75E
90E
0.15
0.12
0.09
0.06
0.03
High cloud fraction
30N
15N
EQ
15S
30S
30E
45E
60E
75E
90E
0.5
0.4
0.3
0.2
0.1
Clear-sky UTH
30N
15N
EQ
15S
30S
30E
45E
60E
75E
90E
30
24
18
12
6

st of Publications funded by CERES grant:

) Rajeev, K., and V. Ramanathan, 2001: Direct observations of clear-sky radiative fo
om space during the Indian Ocean Experiment. *J. Geophys. Res*., **106**, 17,221-17,235.

) Ramanathan, V., and A. K. Inamdar, 2001: The radiative forcing due to clouds and
ater vapor. *Robert D. Cess Symposium Review paper*, Cambridge Univ. Press.

) Tian, B., and V. Ramanathan, 2002: Role of tropical clouds in surface and atmospl
ergy budget. *J. Climate*, **15**, 296-305.

) Inamdar, A. K., V. Ramanathan, and N. Loeb, 2002: On observations of water vap
eenhouse effect in window and non-window from CERES. Submitted to *Q. J. R. Met*
oc., London (UK). Feb 2002.

) Wilcox, EM; Ramanathan, V., 2001: Scale dependence of the thermodynamic forc
opical monsoon clouds: Results from TRMM observations. *J. Climate*, **14**, N7:1511-

) Tian, B., 2002: A simple moist model of the Hadley and Walker circulation. Subm
J. Climate. Apr 2002

) Wilcox, E.M., 2002: Spatial and temporal scales of precipitating tropical cloud sys
satellite imagery and the NCAR CCM3, submitted to *J. Climate*, April, 2002.