

# Validation of Surface-only Fluxes

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26th CERES Science Team Meeting  
Williamsburg, Virginia  
14 - 16 May 2002



## Surface -only Fluxes

# Validation of Surface-only Fluxes

(CERES Subsystem 4.6)

- Downwelling clear-sky and all-sky SW and LW surface fluxes derived from relationships with TOA fluxes and atmospheric data.

- Each component currently computed from two models

LPSA/LPLA:

Langley Parameterized  
SW/LW Algorithm

		Model A	Model B
SW	Clear	Li et al.	LPSA
	All-sky	-	LPSA
LW	Clear	Inamdar and Ramanathan	LPLA
	All-sky	-	LPLA

- Validation criteria:

$\pm 20 \text{ Wm}^{-2}$  for instantaneous CERES FOV

$\pm 10 \text{ Wm}^{-2}$  for monthly average 1-deg gridded

- Validation data sources:

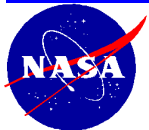
ARM Central facility and extended facilities; BSRN and CMDL sites



## Algorithm Changes Since the 24th STM

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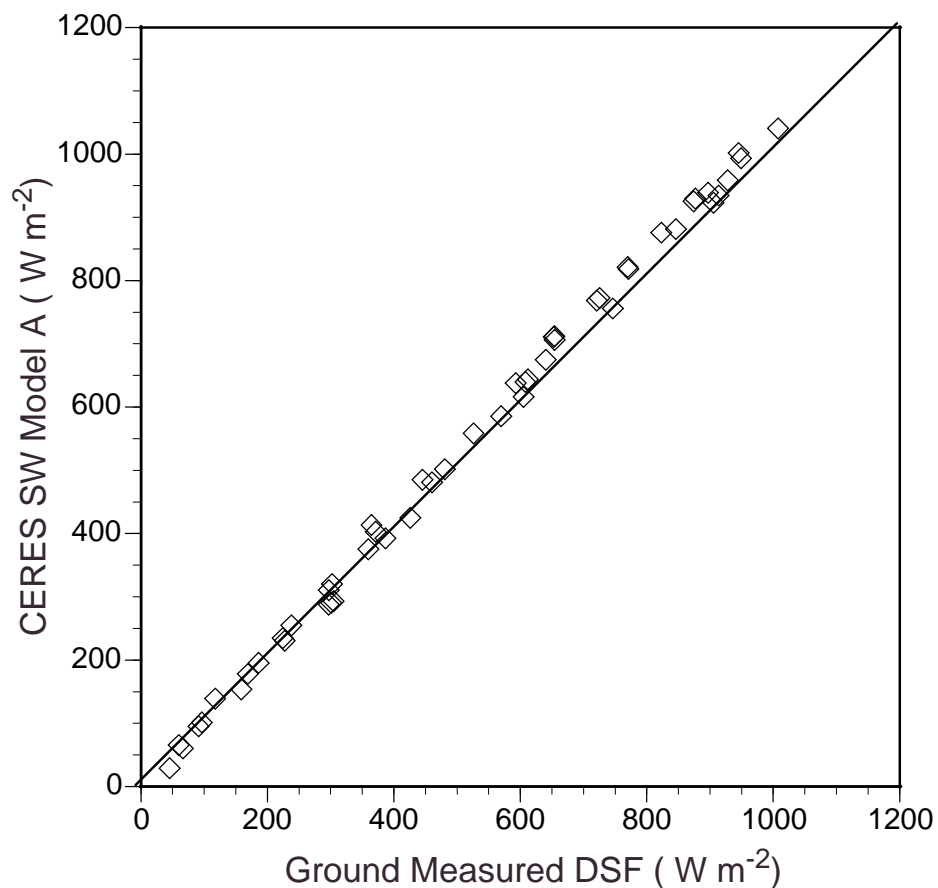
- Validation of TRMM Ed. 2A Indicated Some Changes
  - SW Model A (Li *et al.*):
    - Low AOD Caused Overestimation of Insolation
    - AOD From GFDL Climatology Improved Insolation
  - SW Model B (LPSA; Staylor *et al.*):
    - No Changes Required.
  - LW Model A (Inamdar and Ramanathan):
    - Changes to Land Algorithm; Now Works Globally
  - LW Model B (LPLA; Gupta *et al.*):
    - No Changes Required
- Changes to be Implemented for TRMM Ed. 2B (and Terra Beta 4)
- Present Results From Offline Implementation of Changes (2A/2B)



Surface  
-only  
Fluxes

# Shortwave Clear-sky Comparison

Model A Central Facility    TRMM Edition 2A



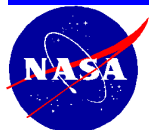
(Li *et al.*)

1 minute data

Npoints = 51

Bias = 25 Wm<sup>-2</sup>

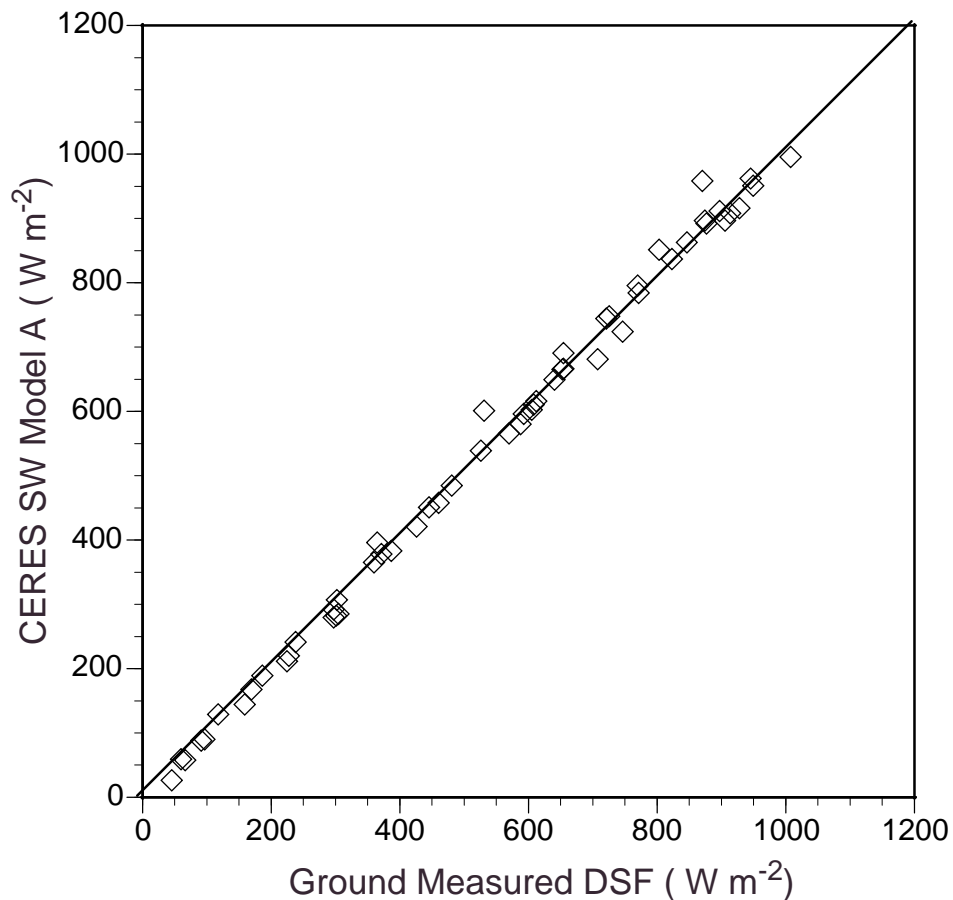
RMSD = 32 Wm<sup>-2</sup>



Surface  
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Fluxes

# Shortwave Clear-sky Comparison

Model A Central Facility TRMM Edition 2A/2B



(Li *et al.*)

1 minute data

Npoints = 51

Bias = 3 Wm<sup>-2</sup>

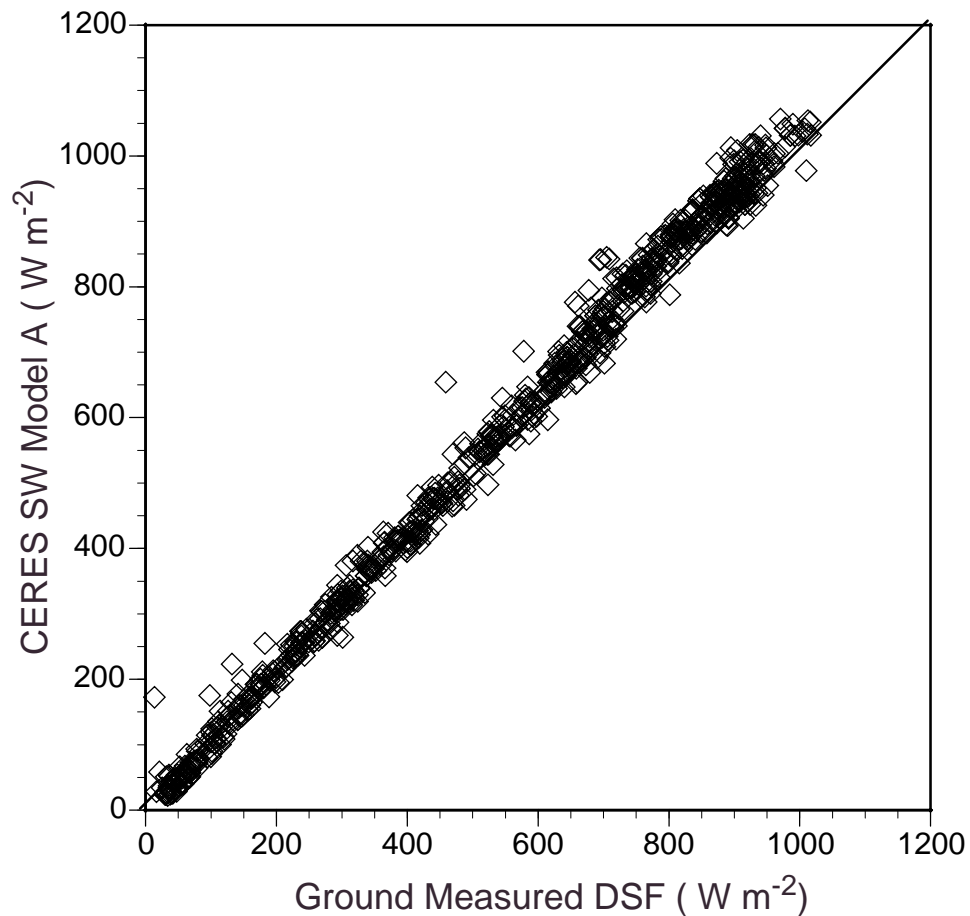
RMSD = 14 Wm<sup>-2</sup>



Surface  
-only  
Fluxes

# Shortwave Clear-sky Comparison

Model A Extended Facilities TRMM Edition 2A



(Li *et al.*)

1 minute data

Npoints = 878

Bias =  $34 \text{ Wm}^{-2}$

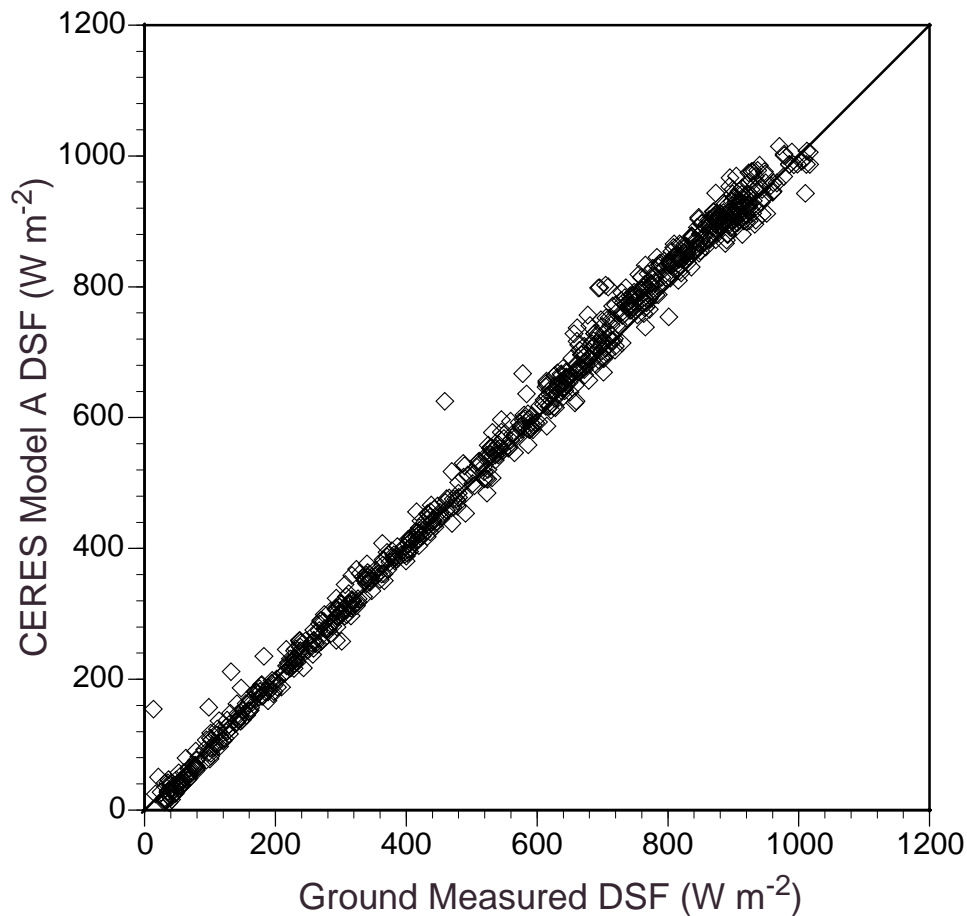
RMS =  $45 \text{ Wm}^{-2}$



Surface  
-only  
Fluxes

# Shortwave Clear-sky Comparison

Model A Extended Facilities TRMM Edition 2A/2B



(Li *et al.*)

1 minute data

Npoints = 878

Bias = 11 Wm<sup>-2</sup>

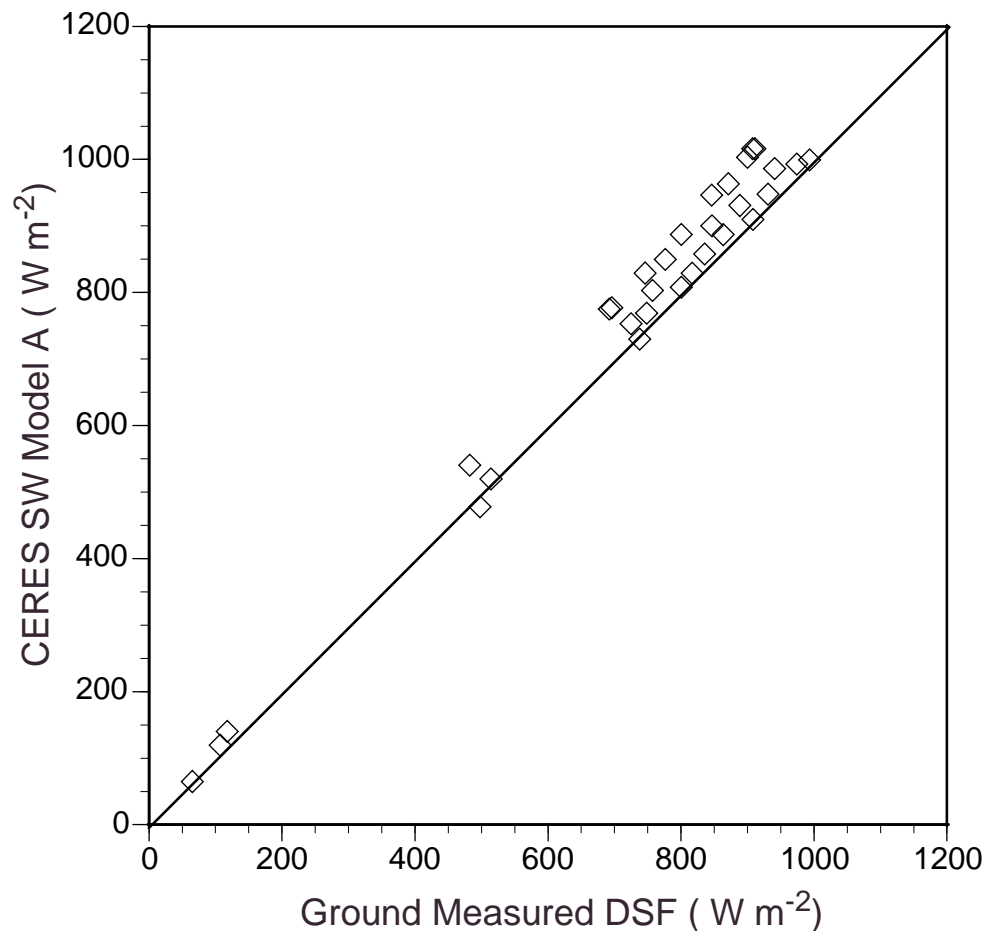
RMS = 25 Wm<sup>-2</sup>



Surface  
-only  
Fluxes

# Shortwave Clear-sky Comparison

Model A CMDL TRMM Edition 2A (Li *et al*)



1 minute data

Sites:

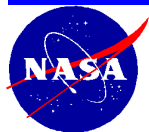
Bermuda

Kwajalein

Npoints = 31

Bias =  $43 \text{ Wm}^{-2}$

RMS =  $57 \text{ Wm}^{-2}$

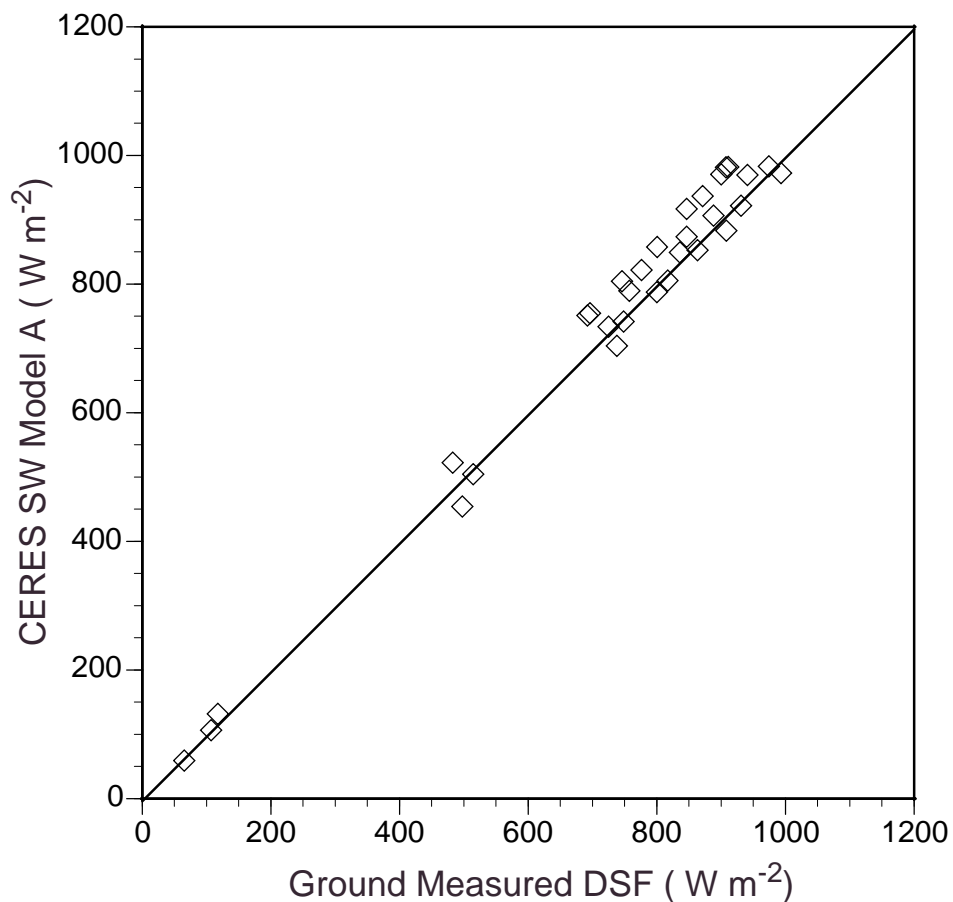




Surface  
-only  
Fluxes

# Shortwave Clear-sky Comparison

Model A    CMDL    TRMM Edition 2A/2B    (*Li et al*)



1 minute data

Sites:

Bermuda

Kwajalein

Npoints = 31

Bias = 20 Wm<sup>-2</sup>

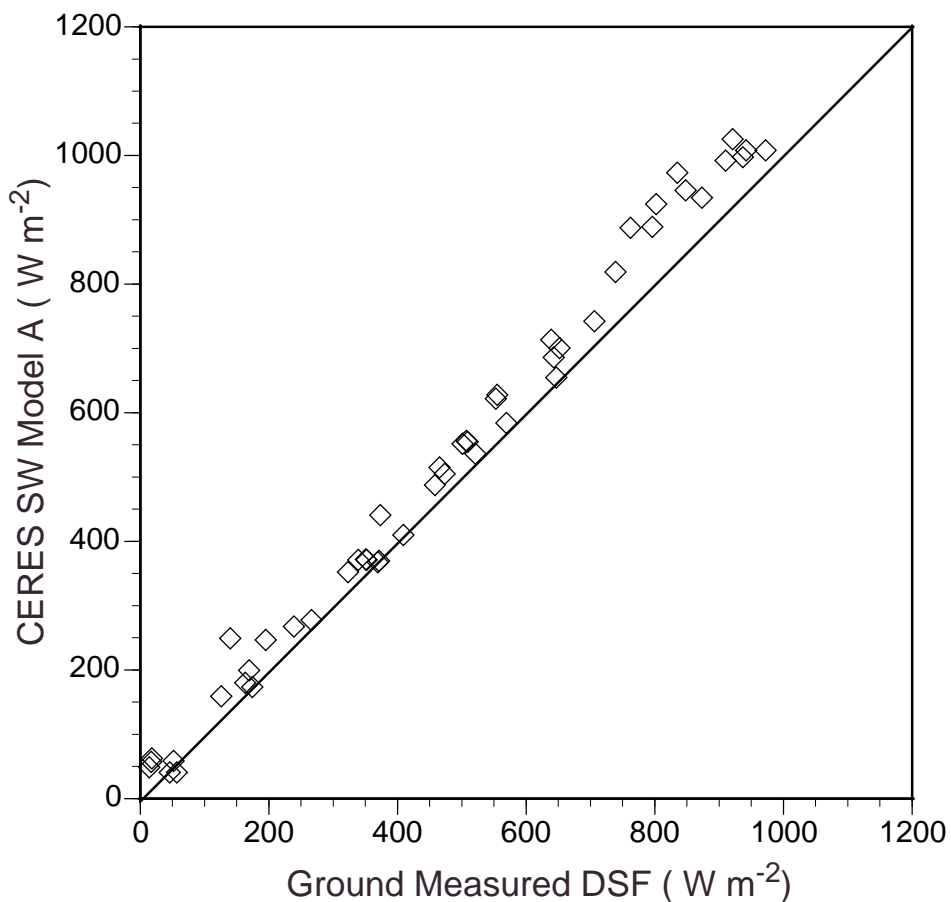
RMS = 40 Wm<sup>-2</sup>



Surface  
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Fluxes

# Shortwave Clear-sky Comparison

Model A BSRN TRMM Edition 2A (Li *et al*)



1 minute data

Sites:

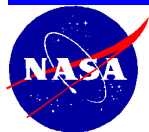
Tateno

Florianopolis

Npoints = 49

Bias = 46 Wm<sup>-2</sup>

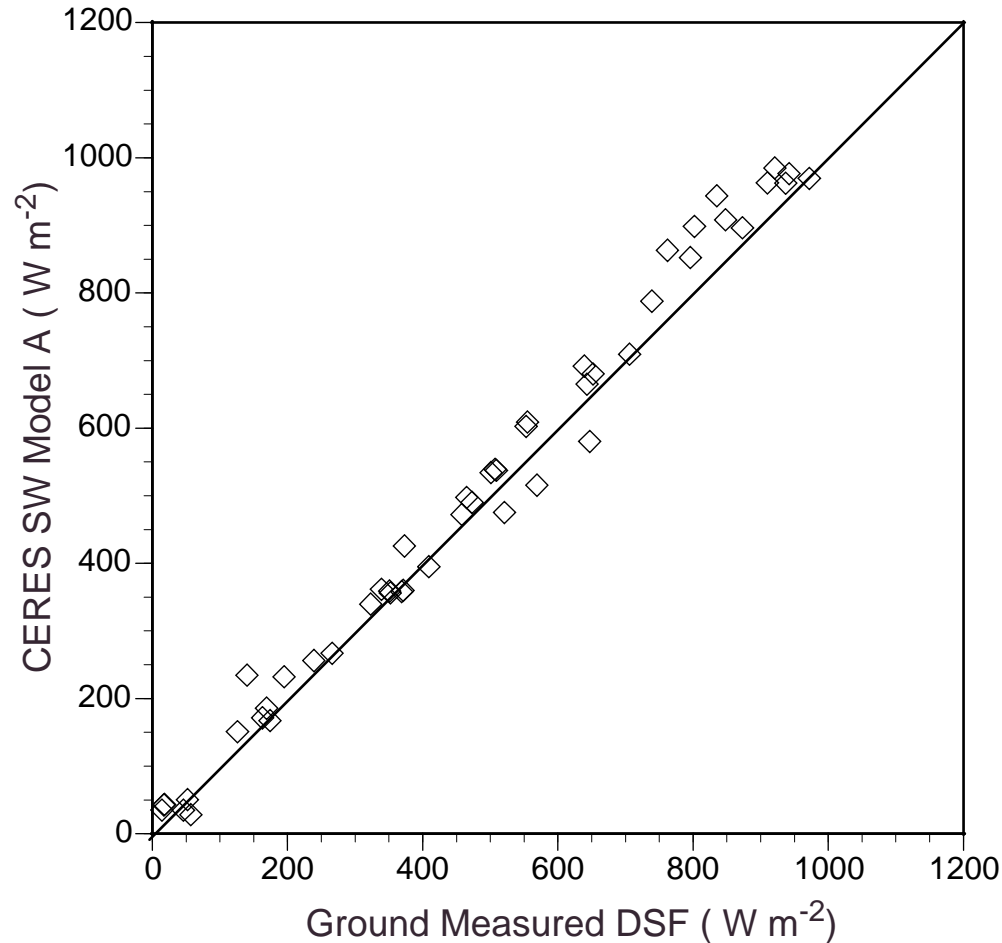
RMS = 58 Wm<sup>-2</sup>



Surface  
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# Shortwave Clear-sky Comparison

Model A BSRN TRMM Edition 2A/2B (Li *et al*)



1 minute data

Sites:

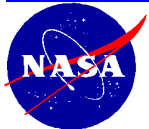
Tateno

Florianopolis

Npoints = 49

Bias = 23 Wm<sup>-2</sup>

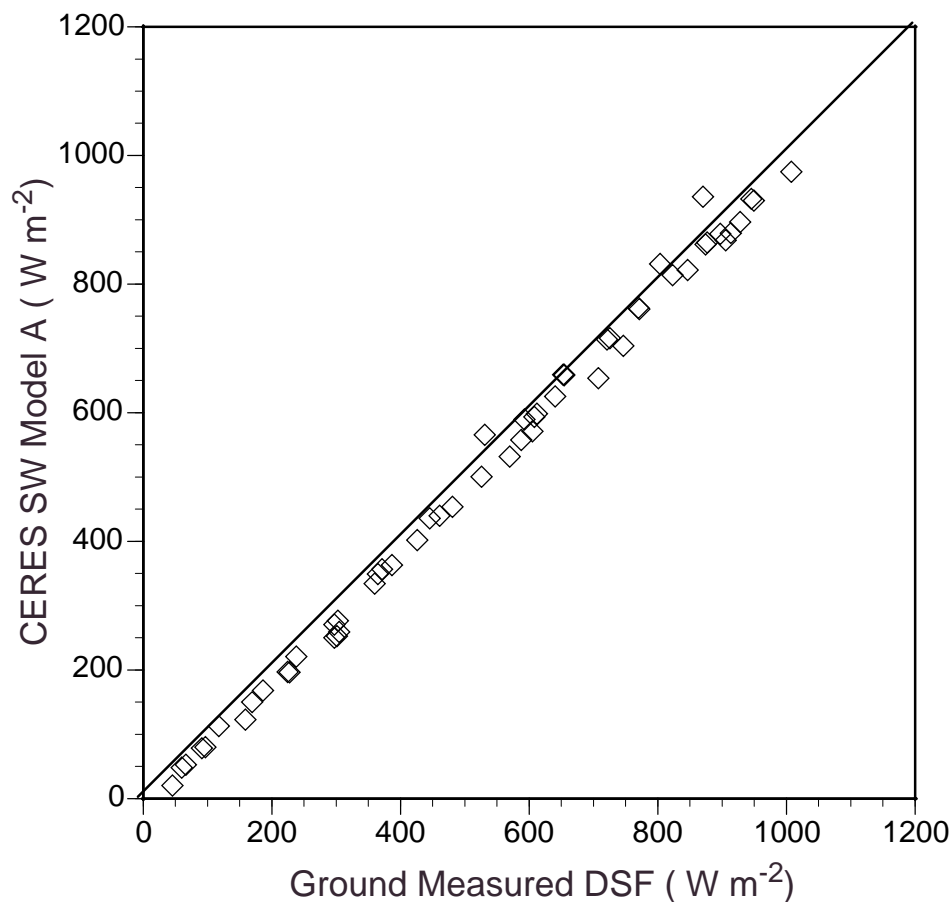
RMS = 43 Wm<sup>-2</sup>



Surface  
-only  
Fluxes

# Shortwave Clear-sky Comparison

Model B Central Facility TRMM Edition 2A



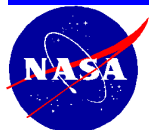
(LPSA)

1 minute data

Npoints = 51

Bias =  $-17 \text{ Wm}^{-2}$

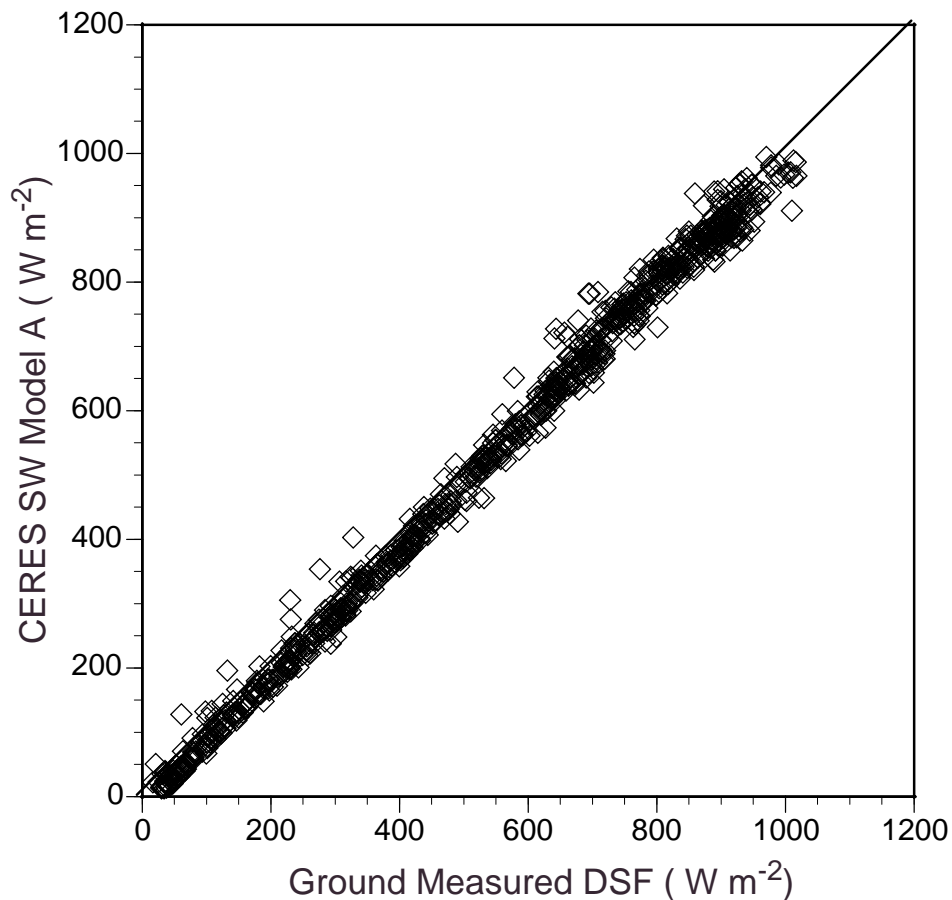
RMSD =  $26 \text{ Wm}^{-2}$



Surface  
-only  
Fluxes

# Shortwave Clear-sky Comparison

Model B Extended Facilities TRMM Edition 2A



(LPSA)

1 minute data

Npoints = 878

Bias =  $-11 W m^{-2}$

RMS =  $24 W m^{-2}$



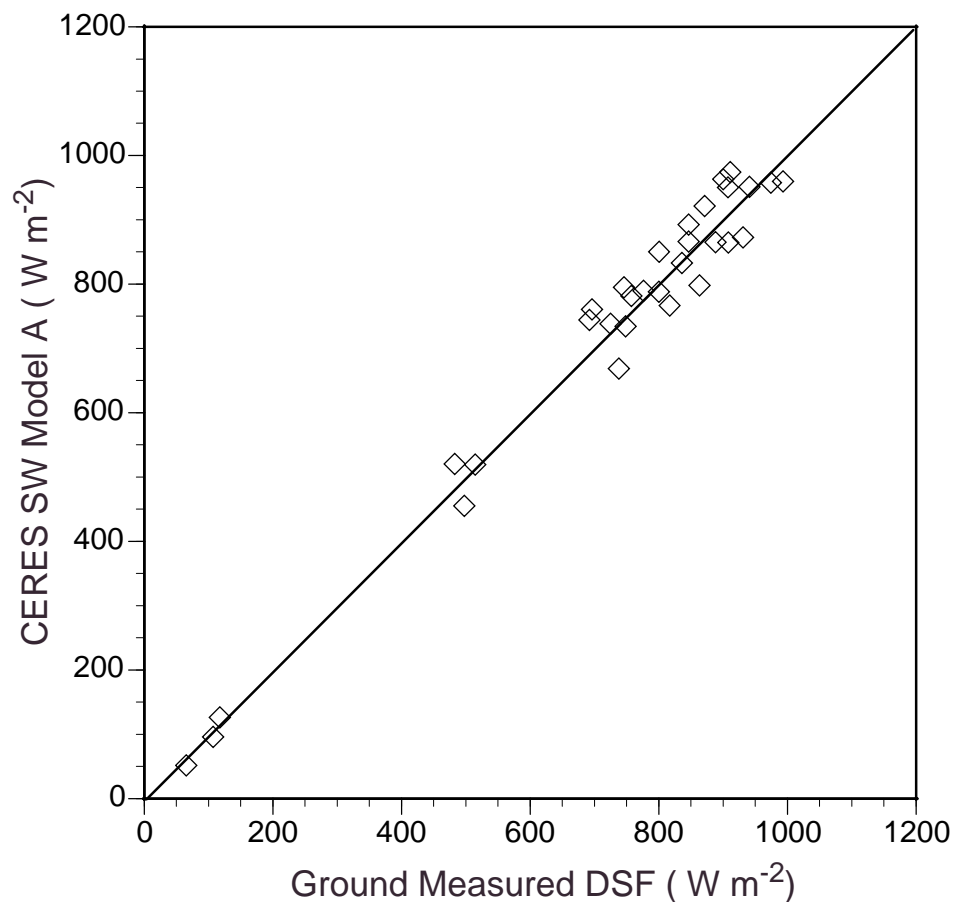
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Surface  
-only  
Fluxes

# Shortwave Clear-sky Comparison

Model B CMDL TRMM Edition 2A (LPSA)



1 minute data

Sites:

Bermuda

Kwajalein

Npoints = 31

Bias =  $5 \text{ Wm}^{-2}$

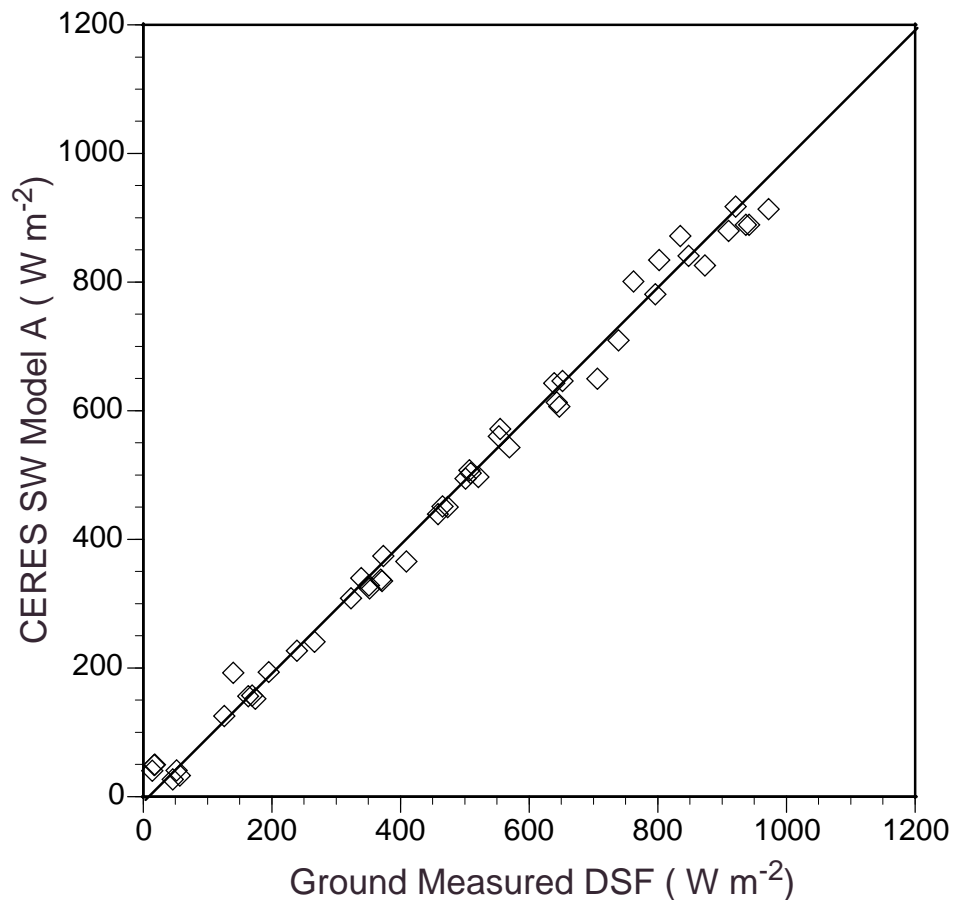
RMS =  $40 \text{ Wm}^{-2}$



Surface  
-only  
Fluxes

# Shortwave Clear-sky Comparison

Model B BSRN TRMM Edition 2A (LPSA)



1 minute data

Sites:

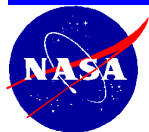
Tateno

Florianopolis

Npoints = 49

Bias = -11 Wm<sup>-2</sup>

RMS = 28 Wm<sup>-2</sup>



## Clear-sky Comparisons (Summary Statistics)

### SW Model A - TRMM Edition 2A/2B

Sites	# Points	Mean Bias ( $\text{W m}^{-2}$ ) 2A/2B (2A)	RMS D iff. ( $\text{W m}^{-2}$ ) 2A/2B (2A)
AR M/ CF	51	3 (25)	14 (32)
AR M/E F	878	11 (34)	25 (45)
CMDL	31	20 (43)	40 (57)
BSRN	49	23 (46)	43 (58)

### SW Model B - TRMM Edition 2A

Sites	# Points	Mean Bias ( $\text{W m}^{-2}$ )	RMS D iff. ( $\text{W m}^{-2}$ )
AR M/ CF	51	-17	26
AR M/E F	878	-11	24
CMDL	31	5	40
BSRN	49	-11	28





Surface  
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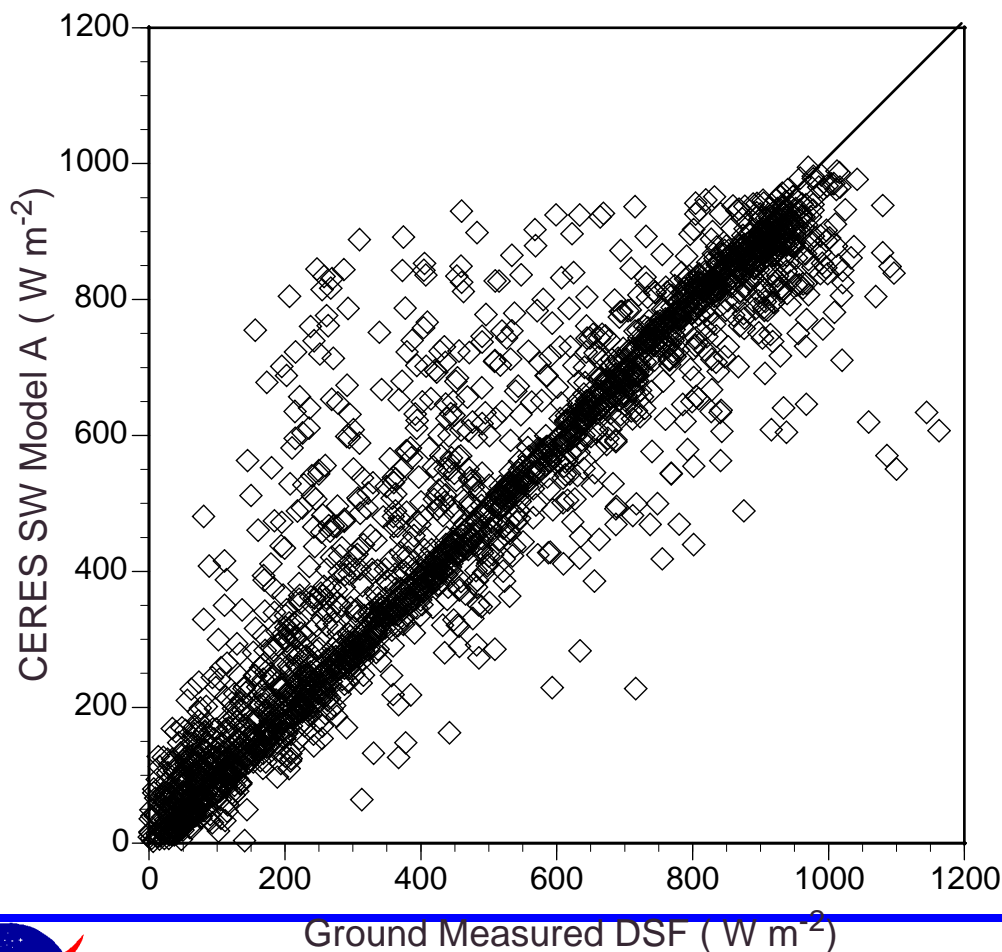
# Shortwave All-sky Comparison

Model B Extended Facilities

TRMM Edition 2A

(LPSA)

1 minute data



Npoints = 2226

Bias =  $12 W m^{-2}$

RMS =  $109 W m^{-2}$



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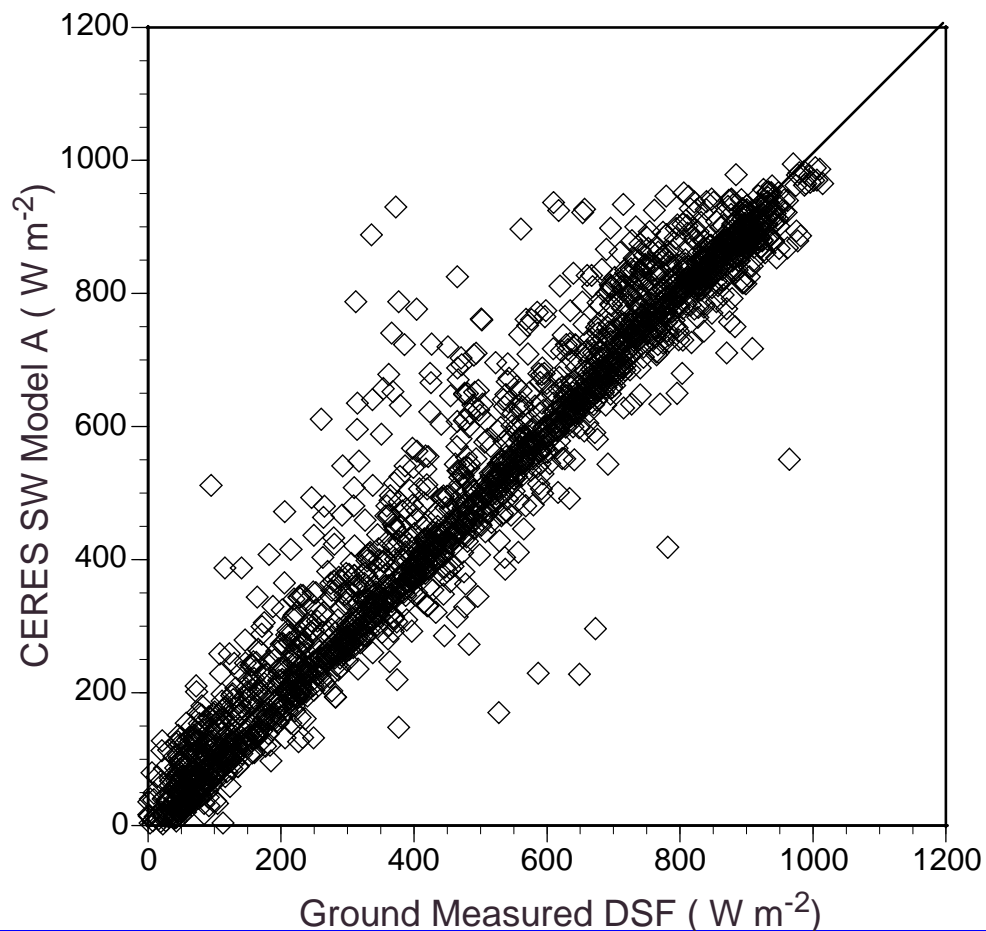


Surface  
-only  
Fluxes

# Shortwave All-sky Comparison

Model B Extended Facilities

TRMM Edition 2A



(LPSA)

60 minute data

Npoints = 2138

Bias =  $13 W m^{-2}$

RMS =  $72 W m^{-2}$



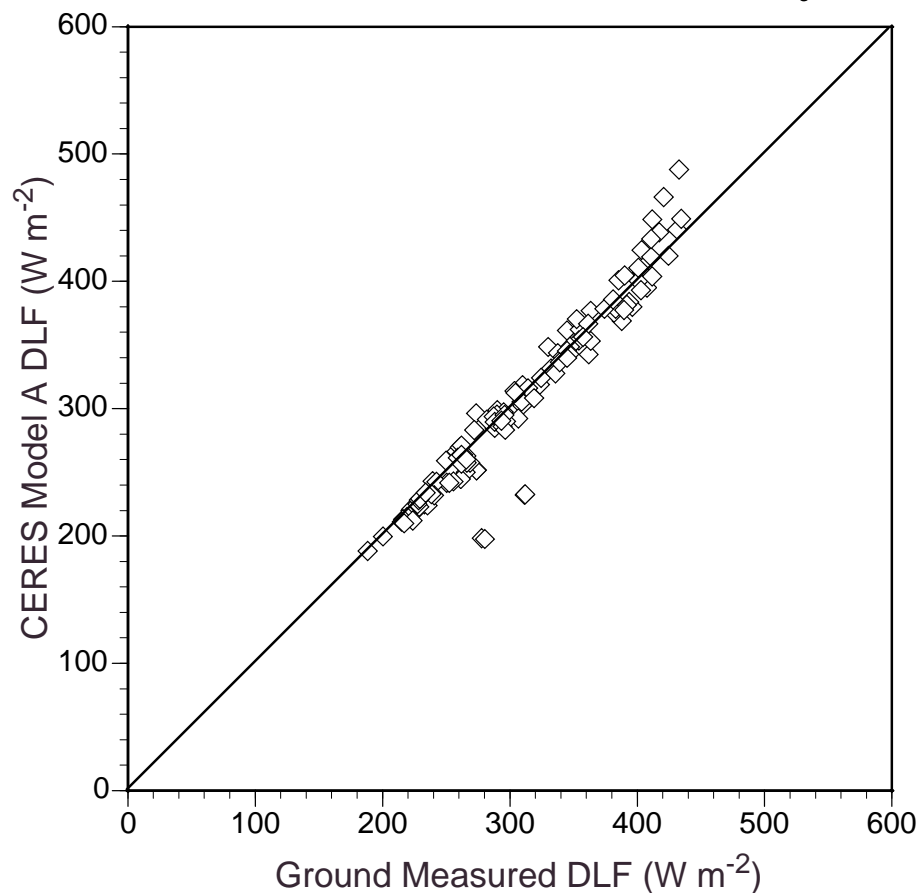
NASA Langley Research Center / Atmospheric Sciences



Surface  
-only  
Fluxes

# Longwave Clear-sky Comparison

Model A Central Facility TRMM Edition 2A/2B



(Inamdar and Ramanathan)

1 minute data

Npoints = 117

Bias = -2 Wm<sup>-2</sup>

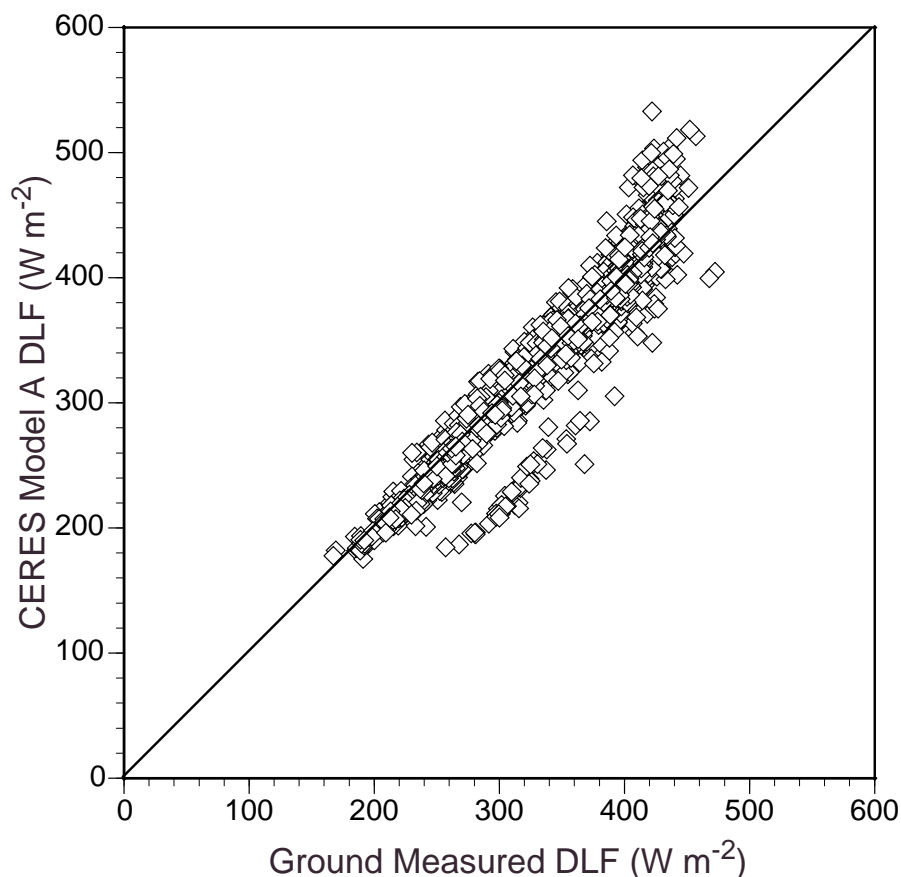
RMS = 19 Wm<sup>-2</sup>



Surface  
-only  
Fluxes

# Longwave Clear-sky Comparison

Model A Extended Facilities TRMM Edition 2A/2B



(Inamdar and Ramanathan)

1 minute data

Npoints = 1809

Bias = -3 Wm<sup>-2</sup>

RMS = 22 Wm<sup>-2</sup>

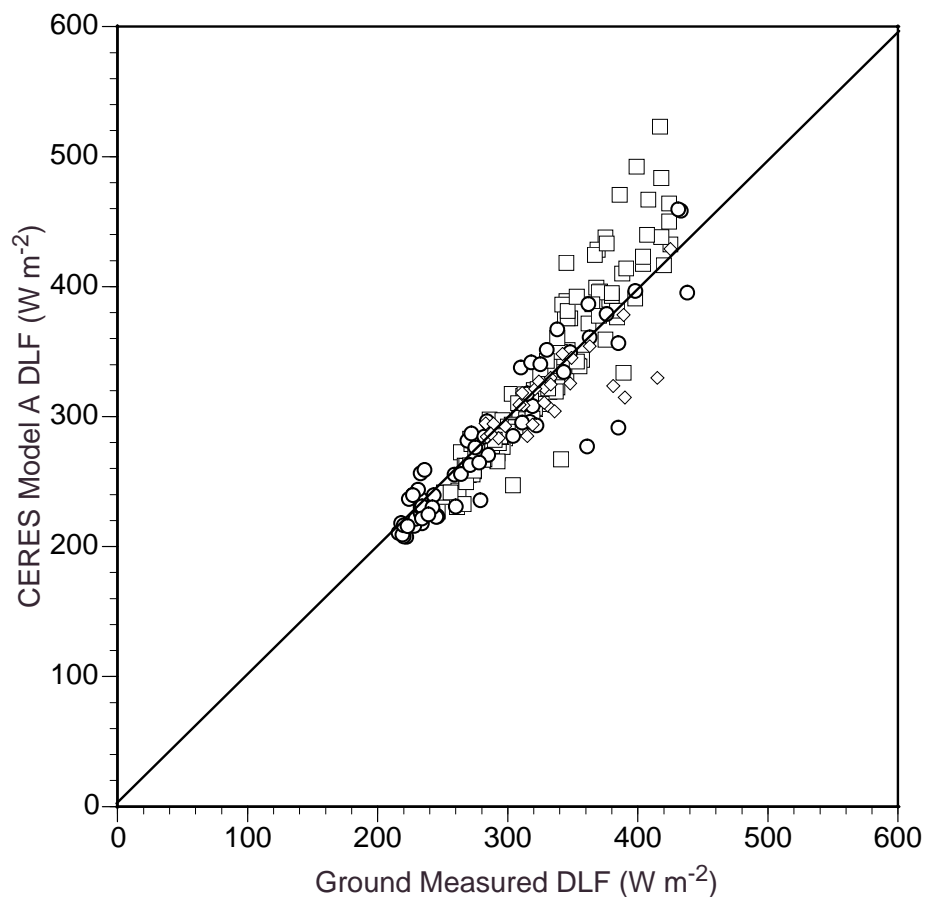


Surface  
-only  
Fluxes

# Longwave Clear-sky Comparison

Model A BSRN TRMM Edition 2A/2B

(Inamdar and Ramanathan)



1 minute data

- Alice Springs
- Tateno
- ◇ Florianopolis (2minute)

Npoints = 231

Bias =  $-1.9 \text{ Wm}^{-2}$

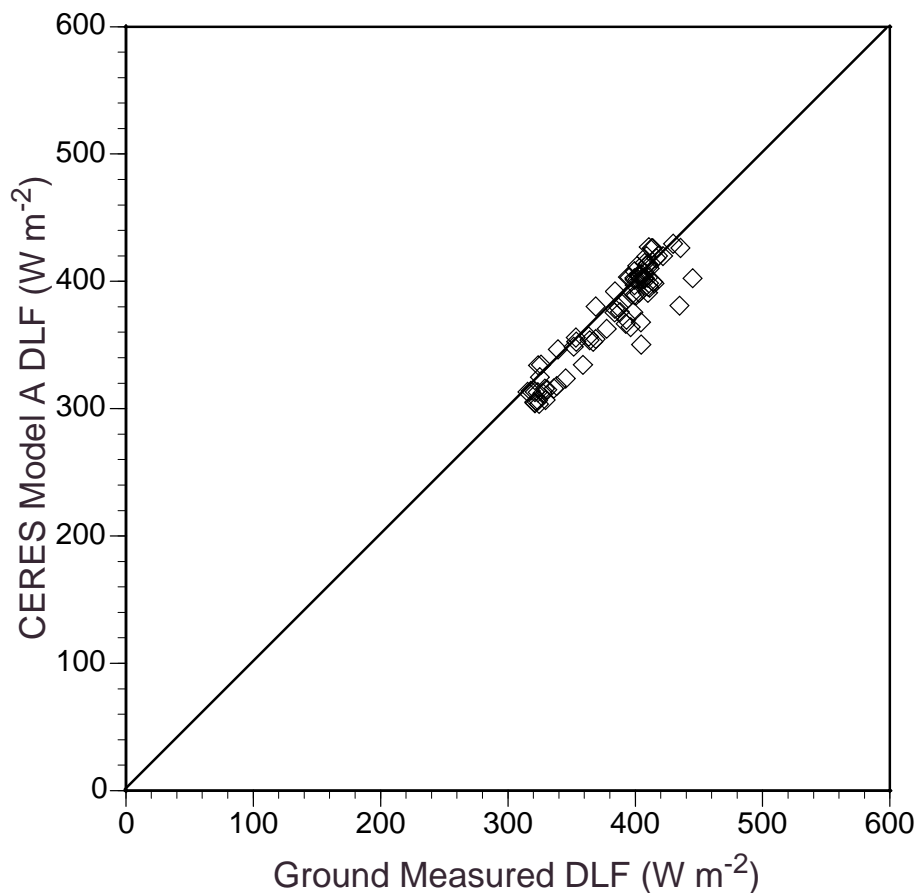
RMS =  $26 \text{ Wm}^{-2}$



Surface  
-only  
Fluxes

# Longwave Clear-sky Comparison

Model A CMDL TRMM Edition 2A/2B



(Inamdar and Ramanathan)

1 minute data

Npoints = 88

Bias = - 8 Wm<sup>-2</sup>

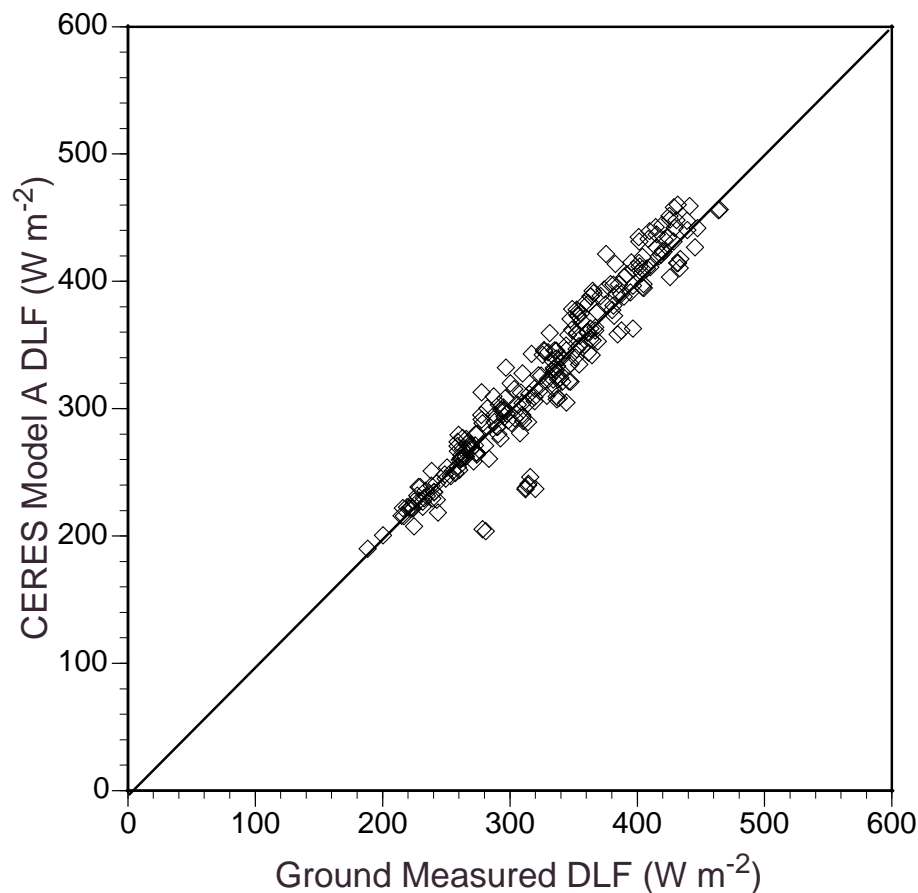
RMS = 16 Wm<sup>-2</sup>



Surface  
-only  
Fluxes

# Longwave All-sky Comparison

Model B Central Facility TRMM Edition 2A



(LPLA; Gupta *et al.*)

1 minute data

Npoints = 253

Bias =  $-0.6 \text{ Wm}^{-2}$

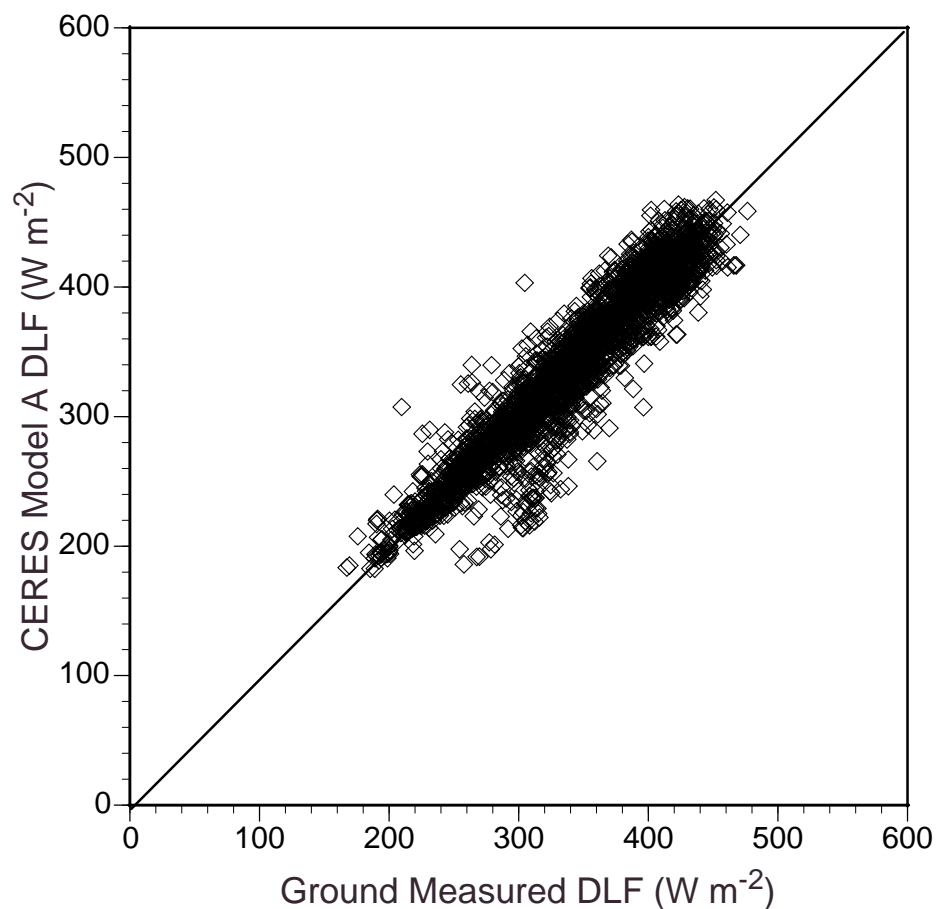
RMS =  $20 \text{ Wm}^{-2}$



Surface  
-only  
Fluxes

# Longwave All-sky Comparison

Model B Extended Facilities TRMM Edition 2A



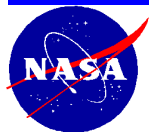
(LPLA; Gupta *et al.*)

1 minute data

Npoints = 3058

Bias = -2 Wm<sup>-2</sup>

RMS = 21 Wm<sup>-2</sup>

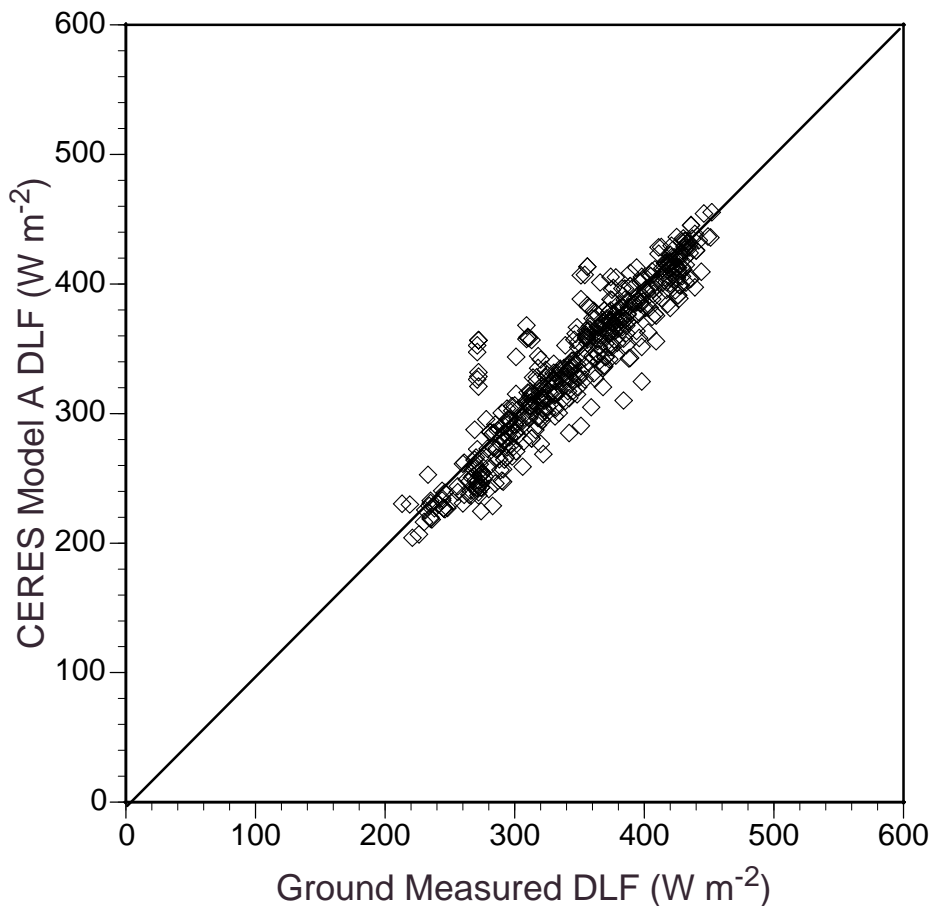




Surface  
-only  
Fluxes

# Longwave All-sky Comparison

Model B BSRN TRMM Edition 2A



(LPLA; Gupta *et al.*)

1 minute data

Sites:

Tateno

Alice springs

Florianopolis

Npoints = 505

Bias =  $-8 \text{ Wm}^{-2}$

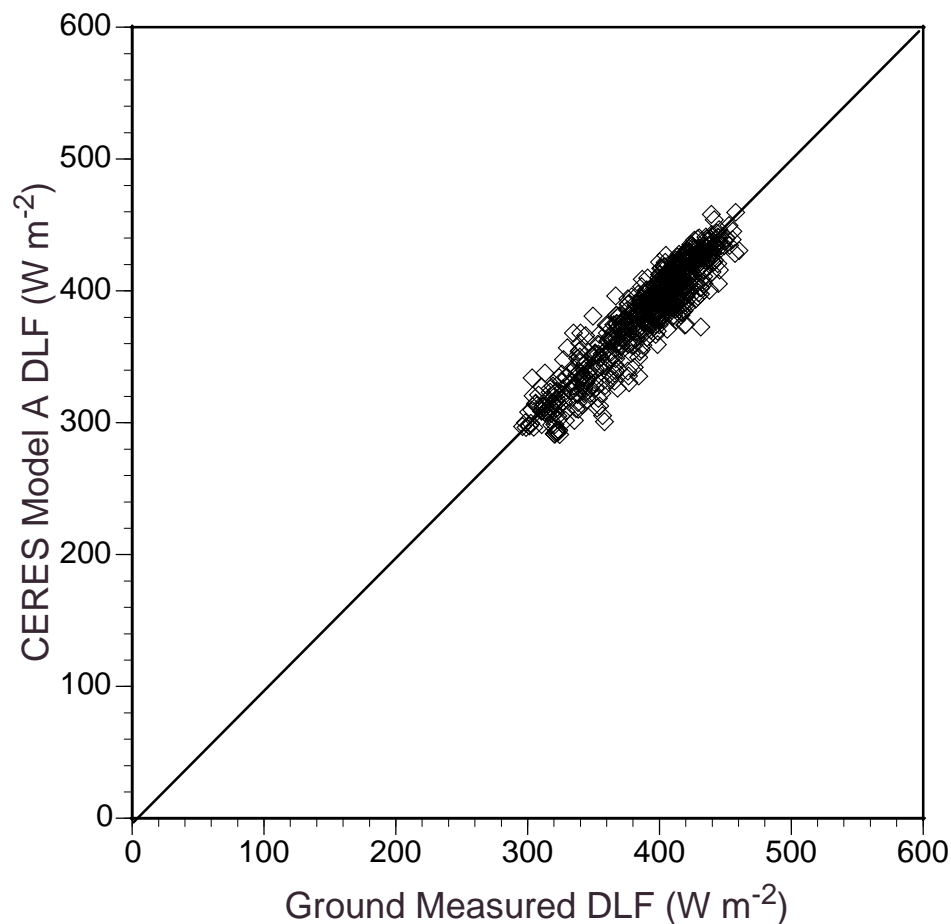
RMS =  $22 \text{ Wm}^{-2}$



Surface  
-only  
Fluxes

# Longwave All-sky Comparison

Model B    CMDL    TRMM Edition 2A



(LPLA; Gupta *et al.*)

1 minute data

Sites:

Bermuda

Kwajalein

Npoints = 696

Bias = - 6 Wm<sup>-2</sup>

RMS = 15 Wm<sup>-2</sup>



## Summary

- Clear-sky results presented from SW and LW Models A and B
- All-sky results available only from Models B
- LW Model C (Zhou and Cess) will be introduced shortly

		Model A	Model B	Model C
SW	Clear	Li et al.	LPSA	-
	All-sky	-	LPSA	-
LW	Clear	Inamdar and Ramanathan	LPLA	Zhou & Cess
	All-sky	-	LPLA	Zhou & Cess

