Temporal Interpolation Using Geostationary Data: Getting Closer to Reality

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

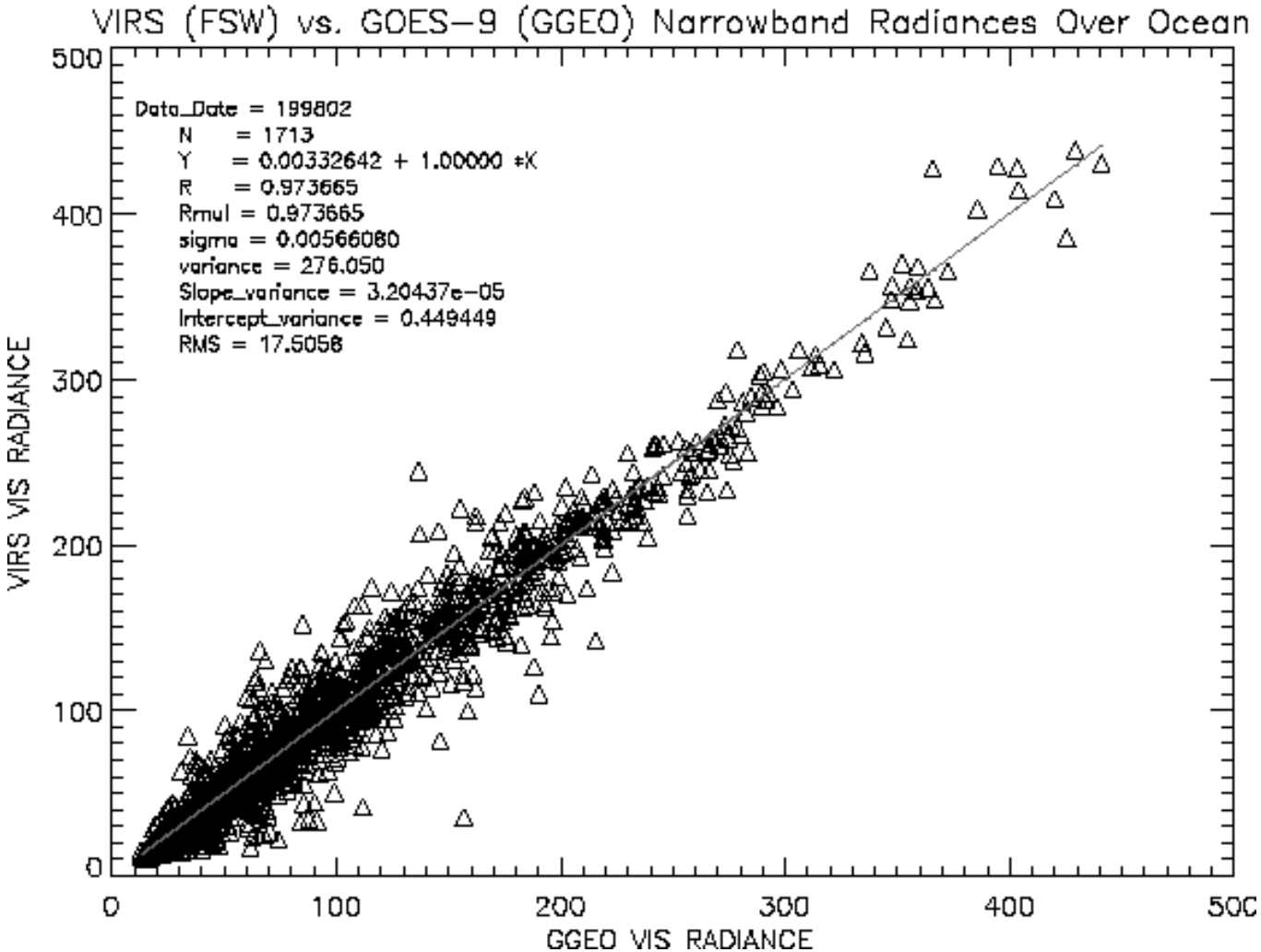
Objectives

- Status of Subsystem 10 (Data Product: SRBAVG)
  - Two Interpolation Methods (GGEO & non-GGEO)
  - Now Uses Cloud Properties from GGEO Data
  - Clear Sky Interpolation Using GGEO
  - Total-sky Fluxes Derived Using ERBE-like ADMs
- Validation
  - Clouds
    - Calibration
    - VIRS comparisons
    - Climatology Comparisons
  - Fluxes
    - ERBE-like Comparisons
    - Compare Monthly Means w/ and w/o GGEO
    - Surface Flux Comparisons

GGEO Cloud Property Retrievals

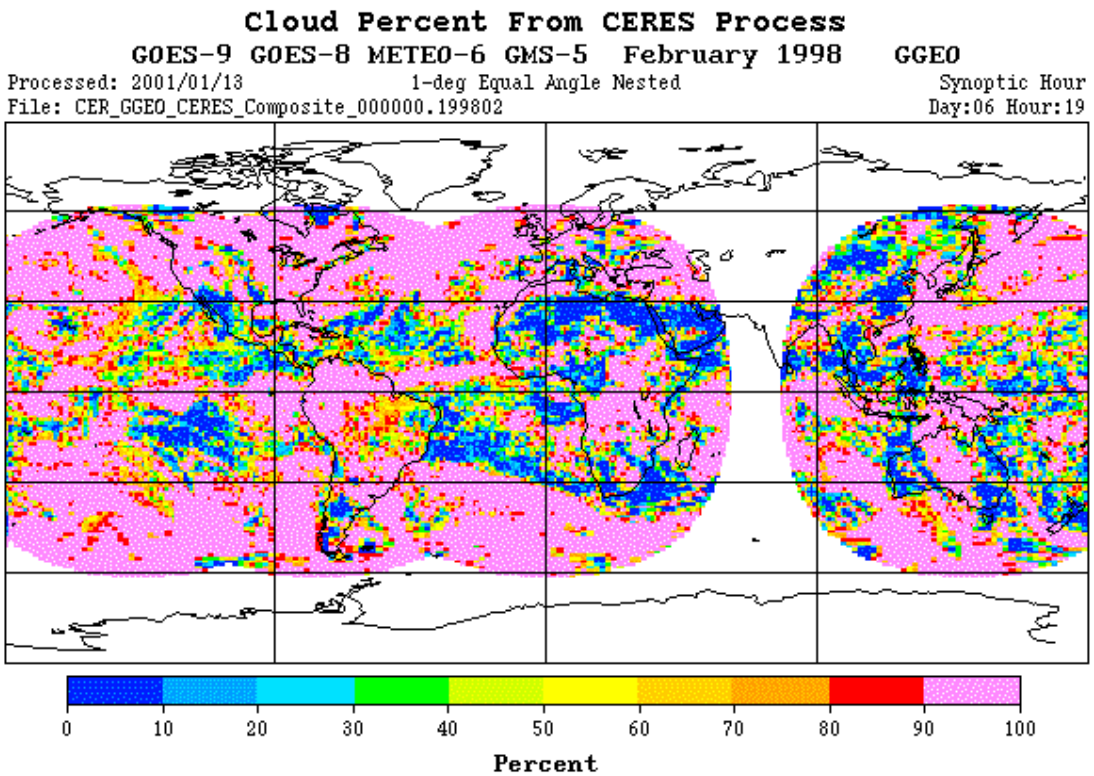
- GGEO Calibration Tied to VIRS
- Uses IR/VIS LBTM Retrievals (Run as Subset of CERES Cloud Algorithm)
- Uses CERES Surface Property Maps and MOA Soundings
- Properties
  - Cloud Amount
  - Cloud Temperature
  - Cloud Height (using standard 4 CERES layers)
  - Optical Depth/Emittance (Daytime Only)

Recalibrated GOES-9 Visible Data



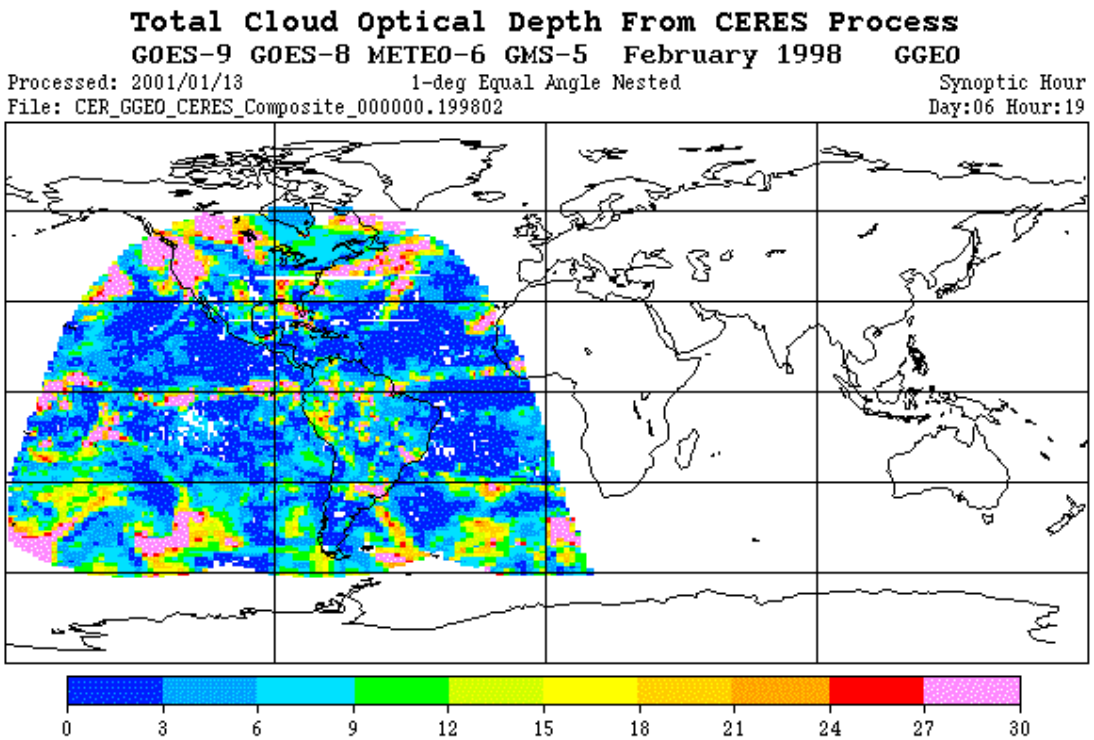
GGEO Cloud Amount

18 GMT February 6, 1998



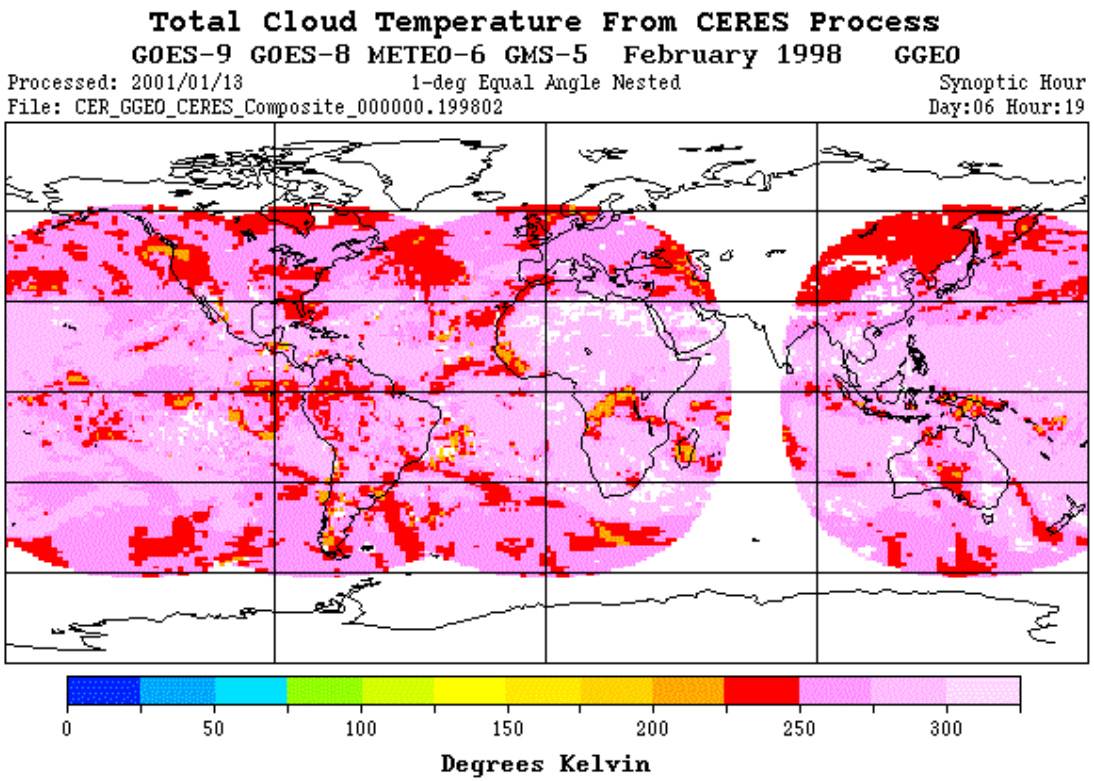
GGEO Optical Depth

18 GMT February 6, 1998



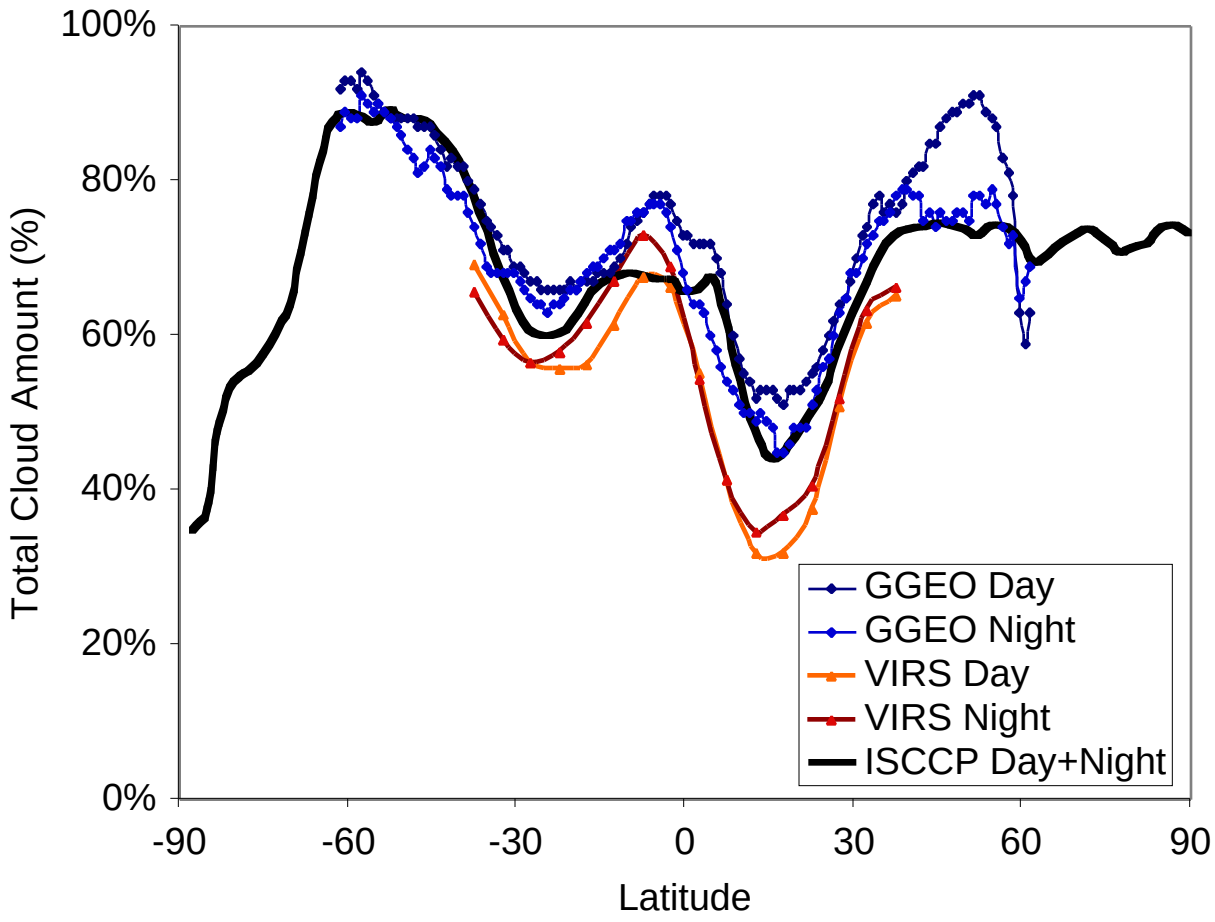
GGEO Cloud Temperature

18 GMT February 6, 1998



Zonal Mean Cloud Amount Comparison

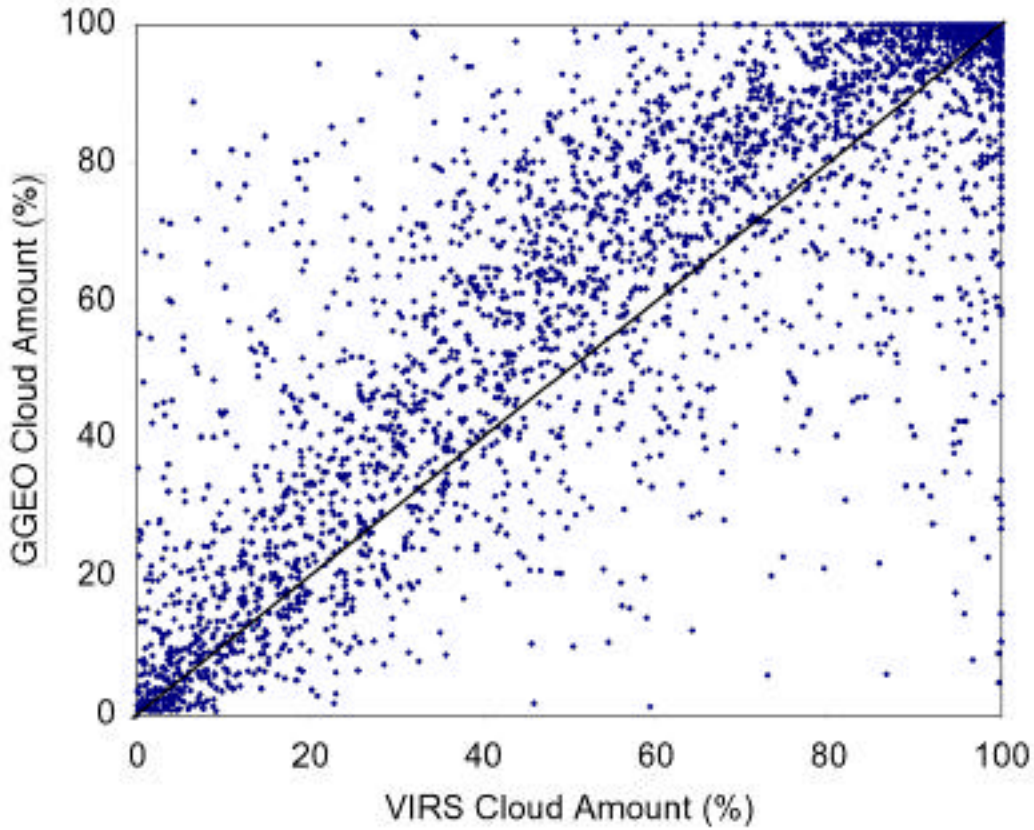
GEO & VIRS: February 1998 ISCCP: February 1986-1993



Mean Cloud Amount from GEO, VIRS, and ISCCP
40°N - 40°S

	Day	Night	Total
GGEO Feb 1998	0.68	0.65	0.66
VIRS Feb 1998	0.54	0.57	0.56
ISCCP Feb 1986-1993			0.63

Instantaneous VIRS-GOES-9 Comparison
5-Minute Matching



VIRS

Mean = 67.5

Sigma = 33.3

GGEO

Mean = 72.1

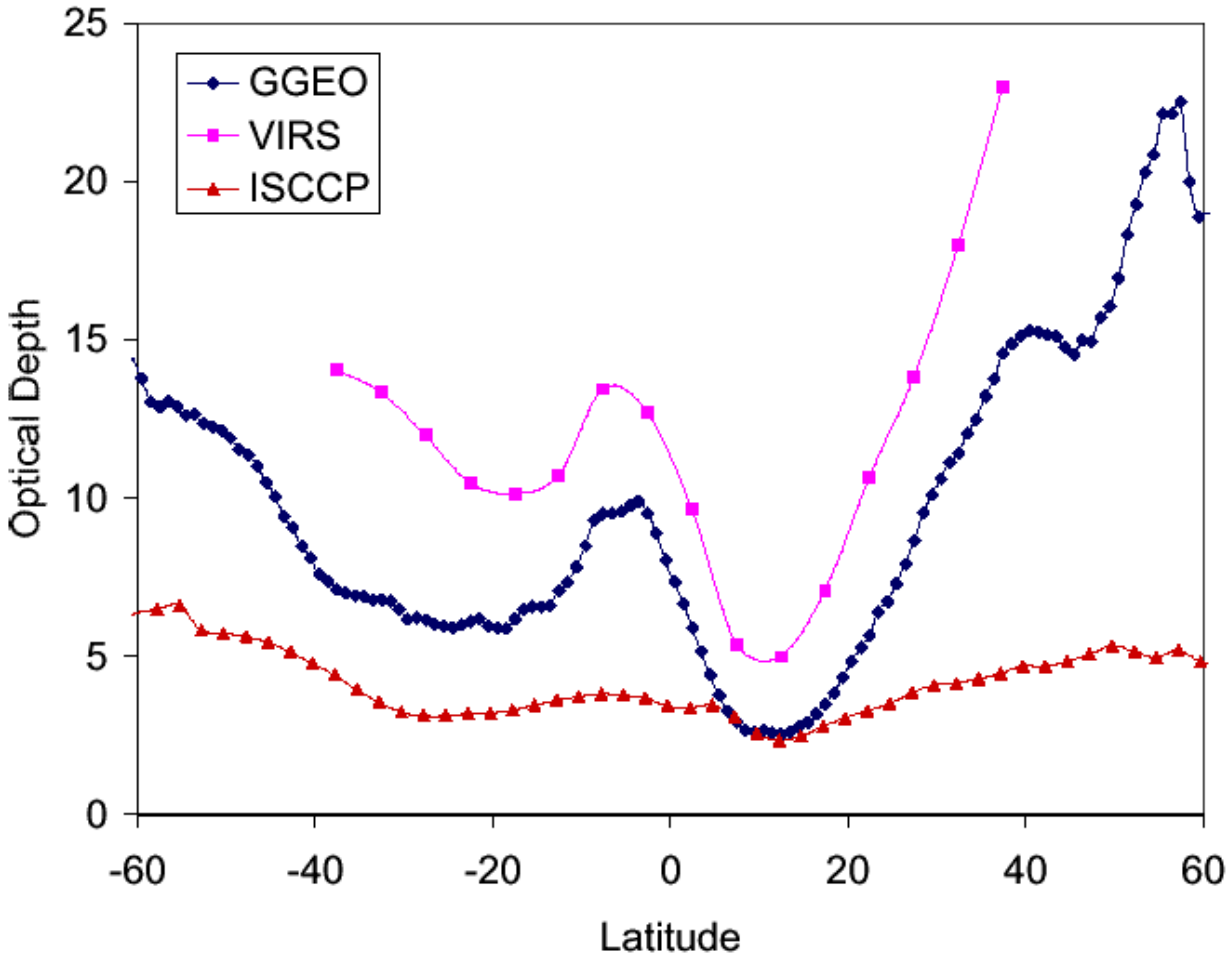
Sigma = 31.4

Summary of GGEO-VIRS Instantaneous Cloud Amount (%) Comparison

	Day		Night	
	Ocean	Land	Ocean	Land
GGEO	72.1	70.8	78.6	72.0
VIRS	67.5	68.9	71.4	67.6
GGEO - VIRS	4.6	1.9	7.2	4.4

Zonal Mean Optical Depth Comparison

GEO & VIRS: February 1998 ISCCP: February 1986-1993



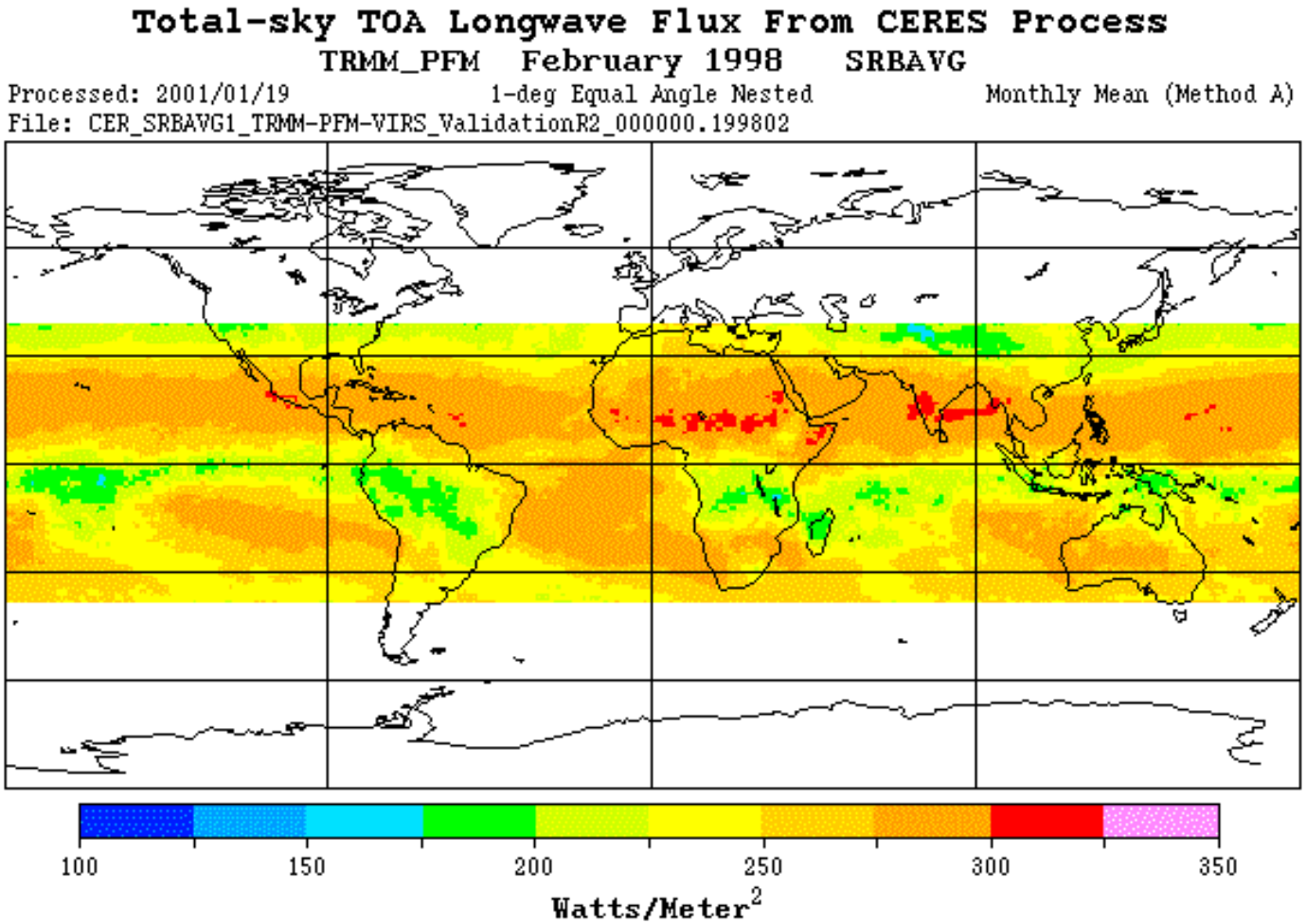
Future GGEO Cloud Property Validation

- Standard QC Reports
  - Parameters
    - Cloud Amount
    - Optical Depth
    - Temperature / Height
  - Zonal Means
  - Viewing and Solar Zenith Dependence
  - Deep Convective Cloud Albedos
- Intercomparisons
  - VIRS / MOSIS
  - Overlapped GGEO Satellites
  - ARM Satellite & Surface Observations
  - Climatology (ISCCP)

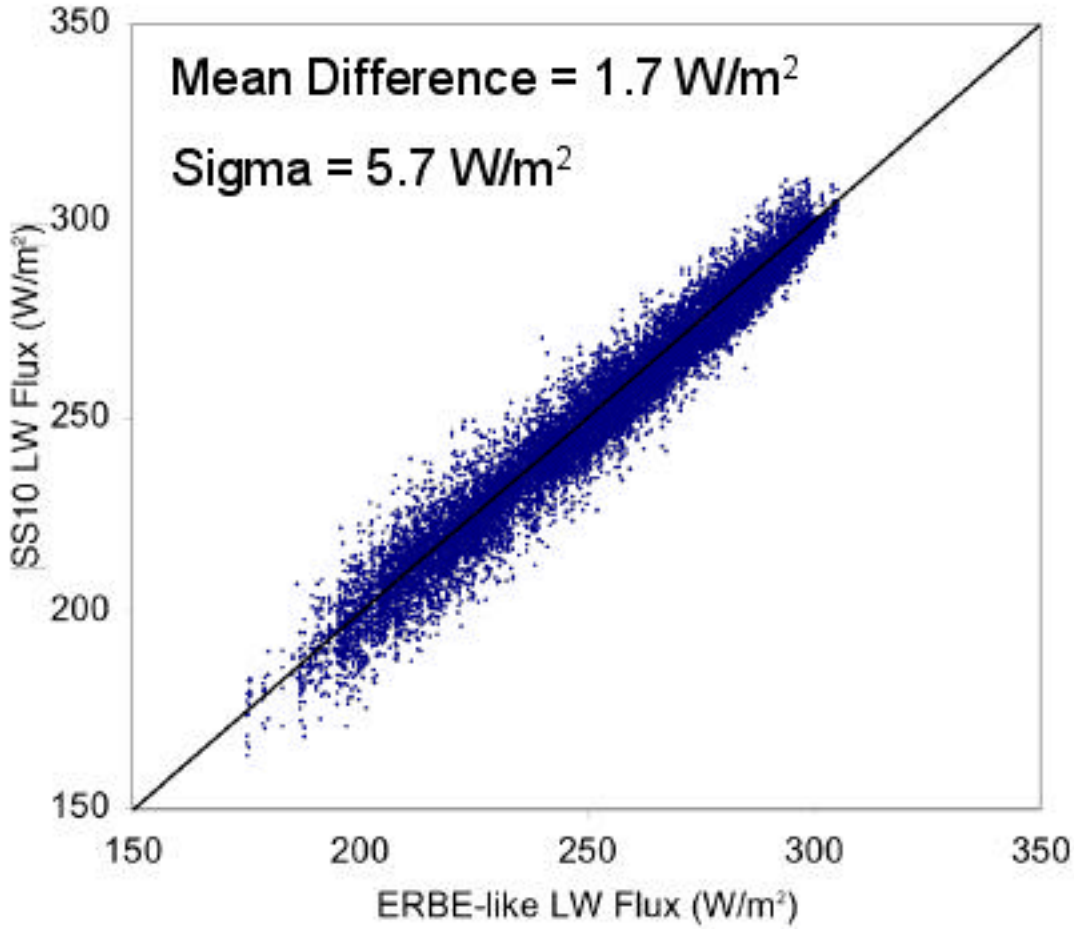
Flux Comparisons

- ERBE-like
  - 2.5° Grid
  - VZ < 70 °
  - Scene Identification by MLE
  - Old ERBE ADM
- SS10 ERBE TSA
  - 1.0° Grid
  - VZ < 45 °
  - Scene Identification from VIRS
  - New ERBE ADM (Total-Sky Fluxes not on SSF)
- Comparison Method
  - Scatter Plots of SS10 Data Matched to ERBE-like 2.5° Data
  - Compare Histograms of Fluxes

Monthly Mean Total-sky LW Flux (non-GGEO Method)



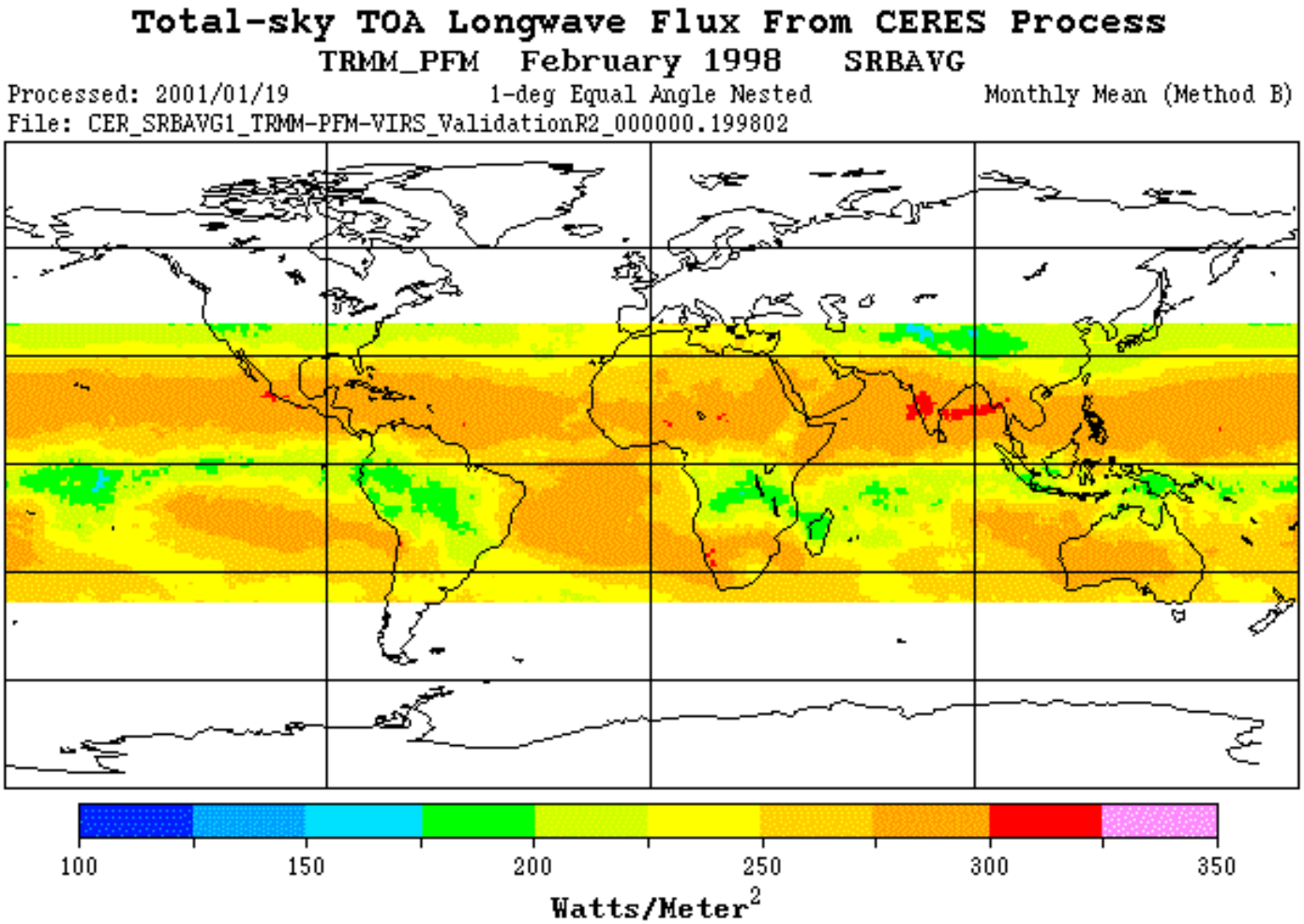
Comparison of ERBE-like and SS10 non-GGEO Total Sky LW Fluxes



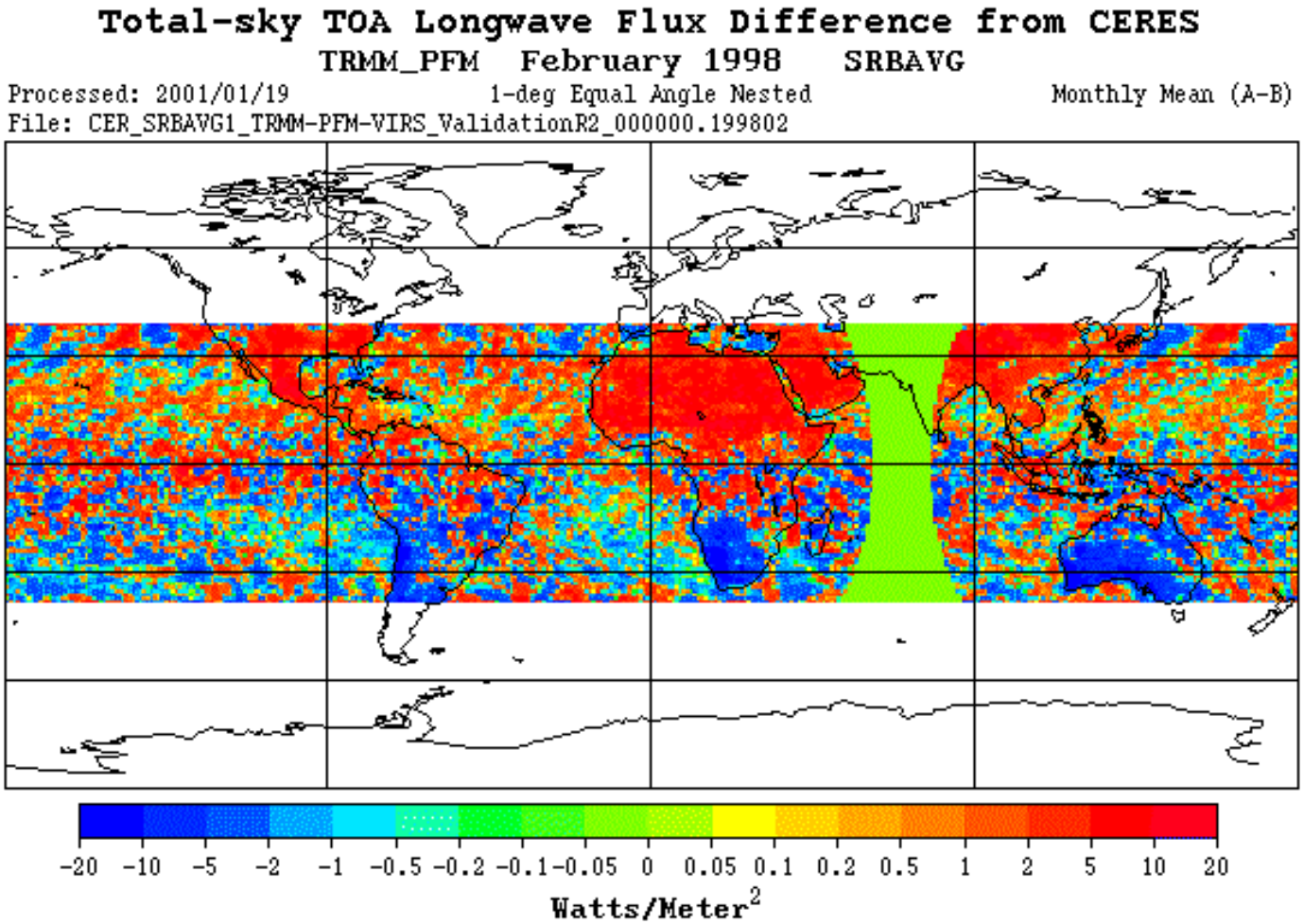
ES4 ERBE-like and SRBAVG Flux Summary

40°N - 40°S W/m²		ERBE-like (ES-4)	SRBAVG nonGGEO	ES4 - SRBAVG
Total-Sky LW Flux	Mean	257.4	255.7	1.7
	Sigma	28.7	28.8	5.7
Total-Sky SW Flux	Mean	97.1	96.6	0.5
	Sigma	29.9	33.2	12.1
Clear-Sky LW Flux	Mean	285.9	283.6	2.3
	Sigma	14.2	14.3	4.7
Clear-Sky SW Flux	Mean	50.1	49.0	1.1
	Sigma	18.2	19.0	8.5

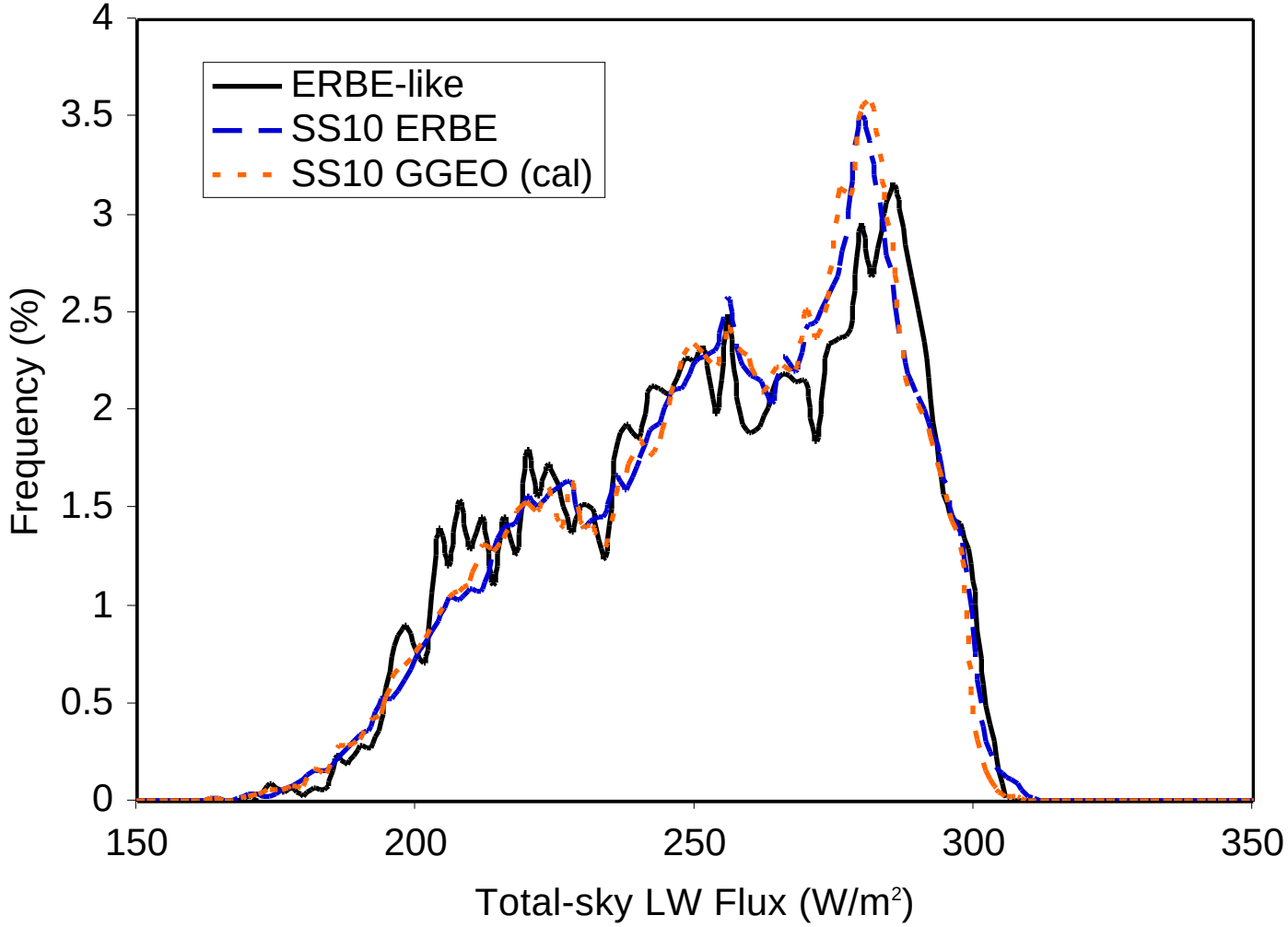
Monthly Mean Total-sky LW Flux (GGEO Method)



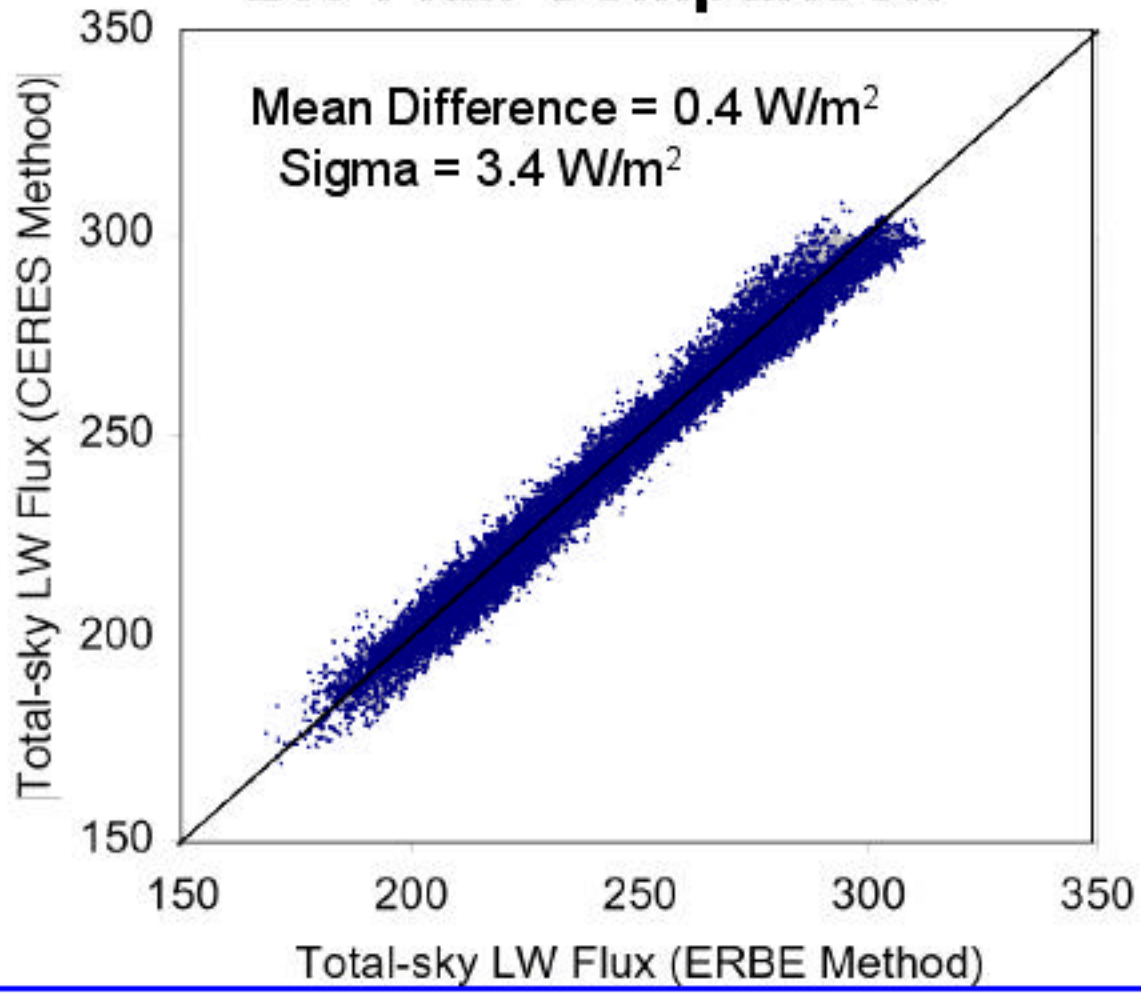
Monthly Mean Total-sky LW Flux Difference (non-GGEO Method - GGEO Method)



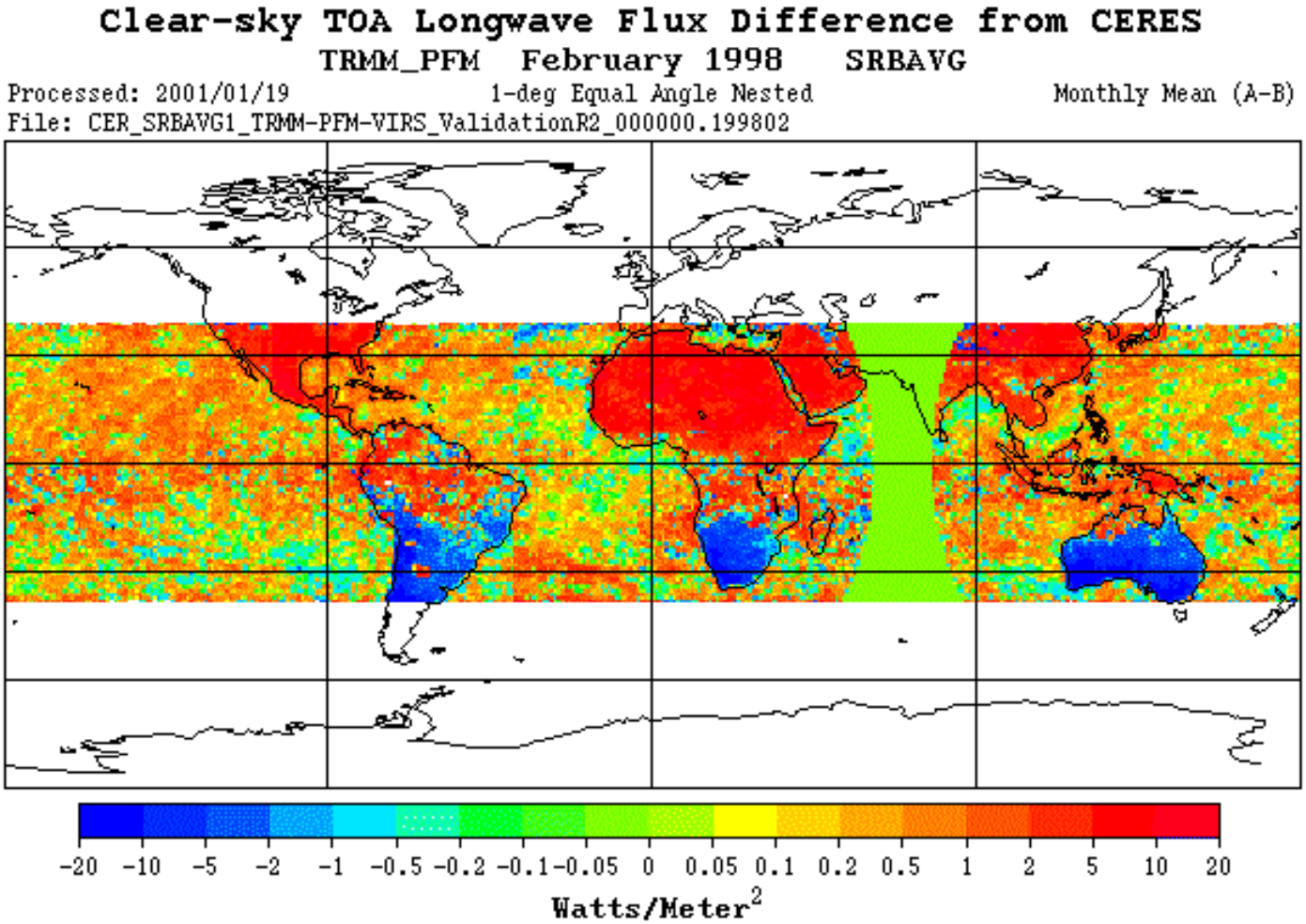
Histogram of ERBE-like and SS10 Total-Sky LW Fluxes



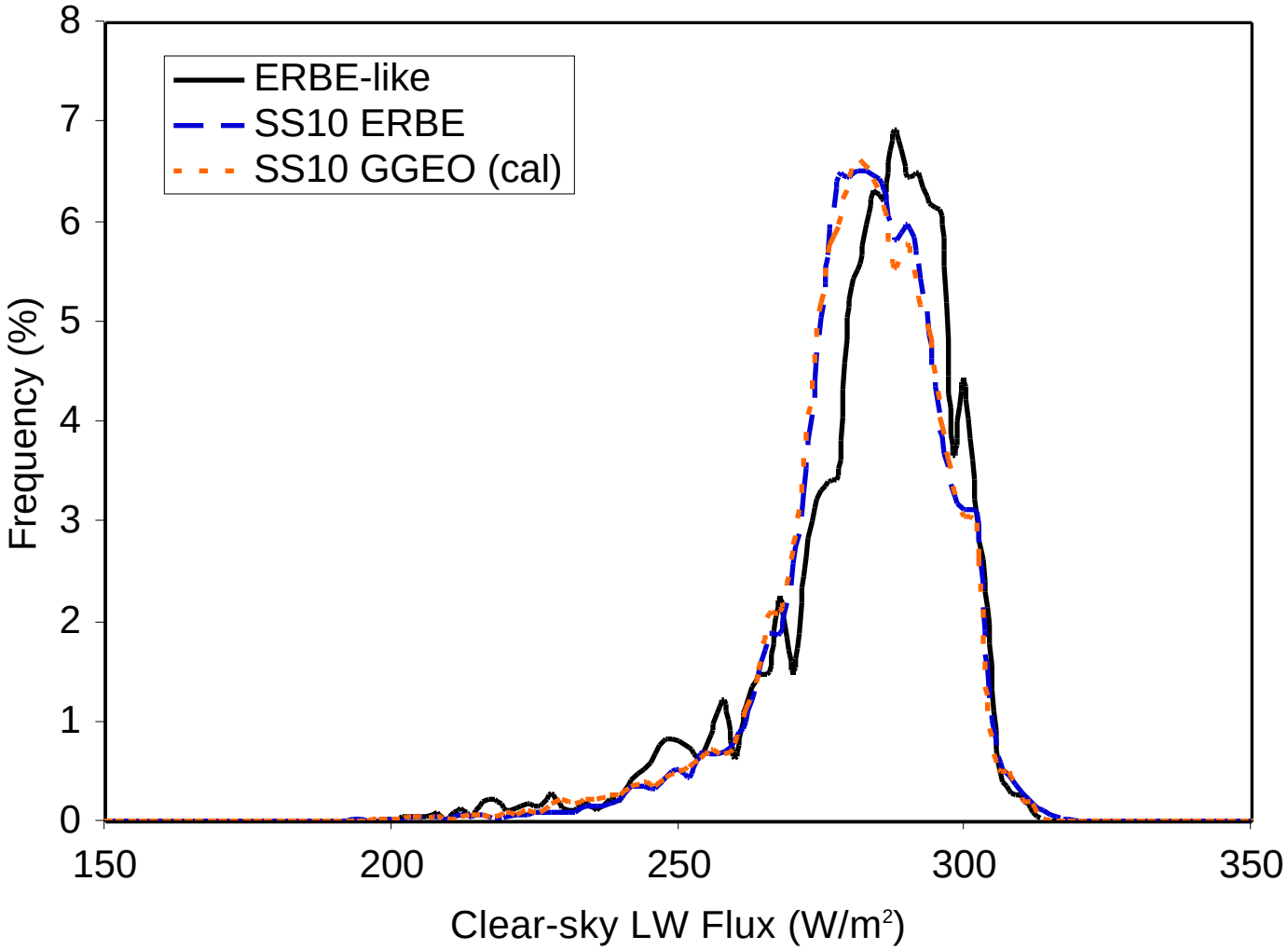
SRBAVG non-GGEO and GGEO Total-Sky LW Flux Comparison



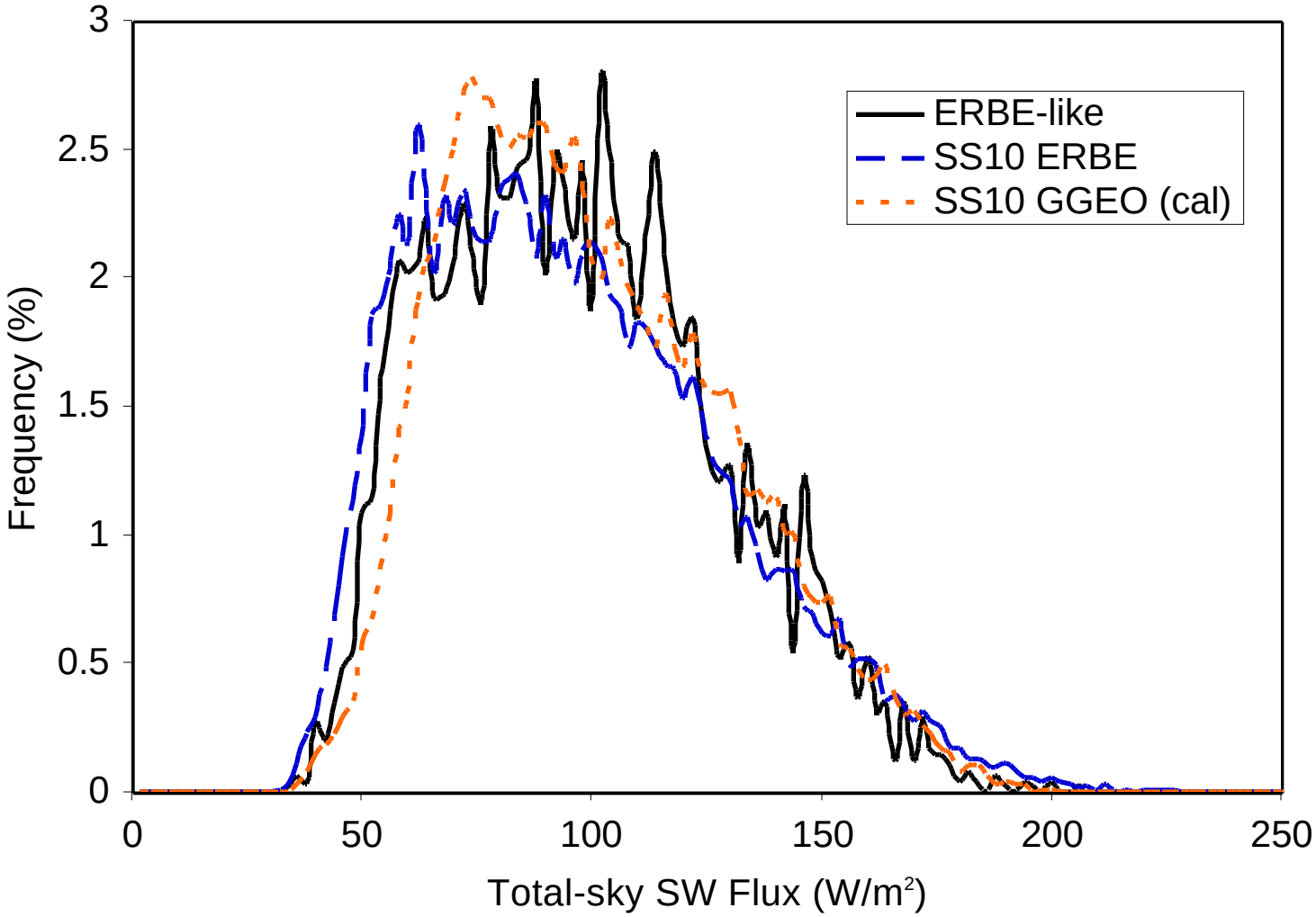
Monthly Mean Clear-sky LW Flux Difference (non-GGEO Method - GGEO Method)



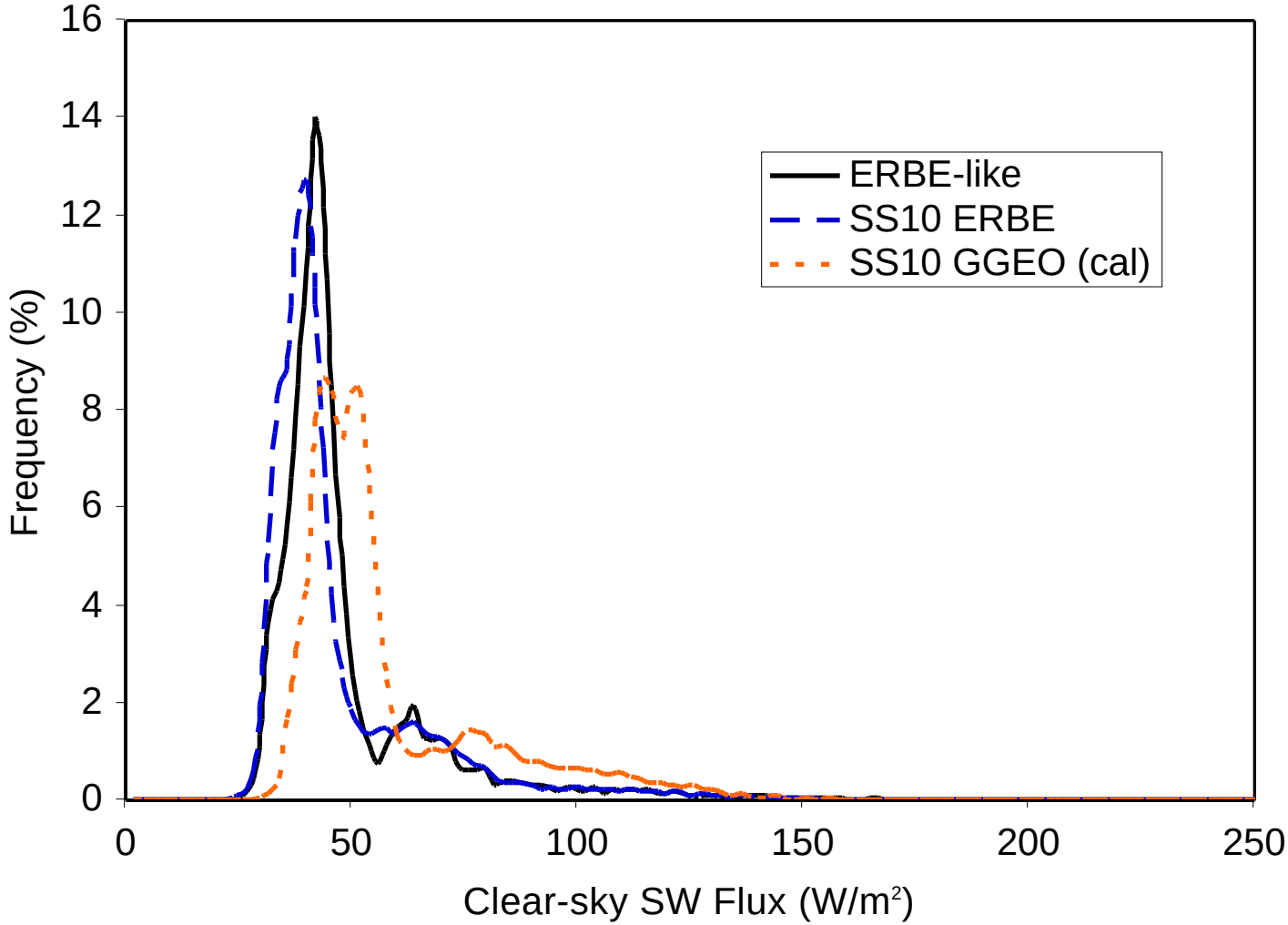
Histogram of ERBE-like and SS10 Clear-Sky LW Fluxes



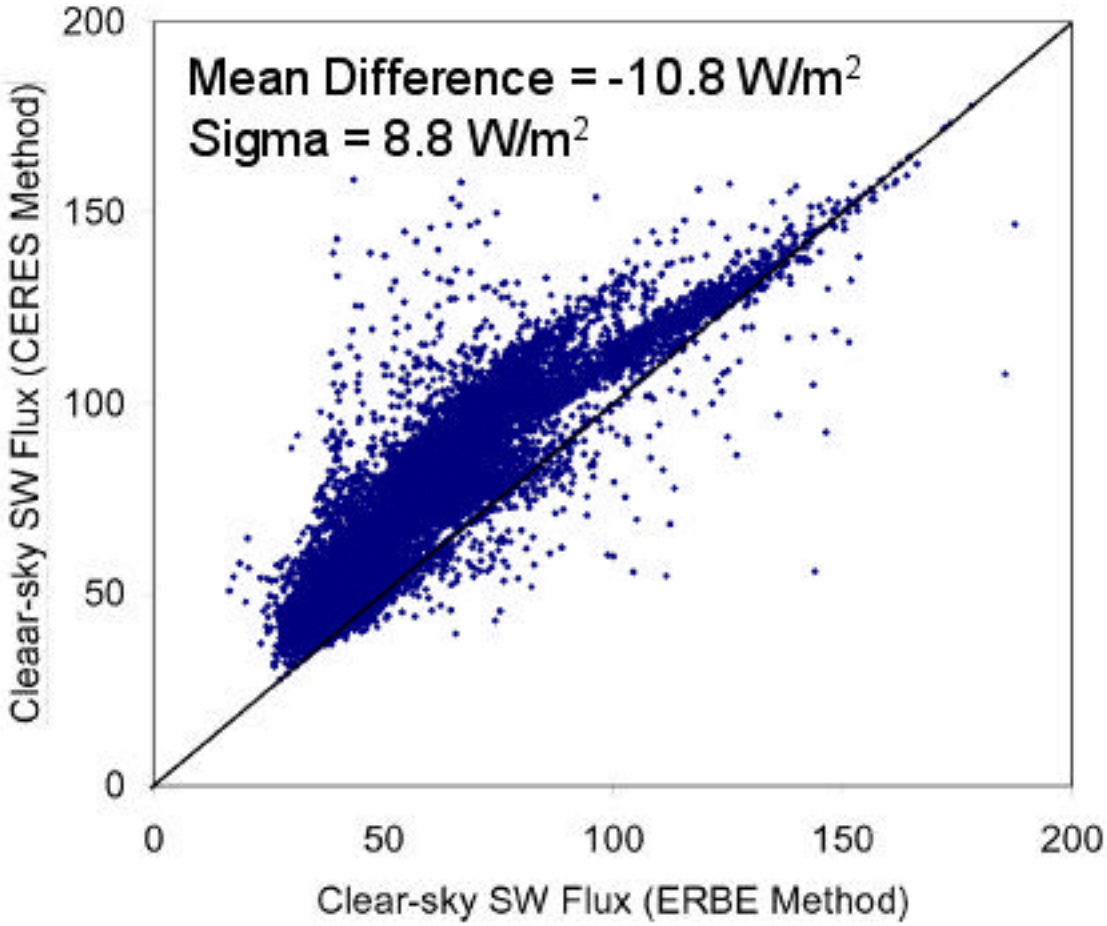
Histogram of ERBE-like and SS10 Total-Sky SW Fluxes



Histogram of ERBE-like and SS10 Clear-Sky SW Fluxes



SRBAVG ERBE and GGEO Clear-Sky SW Flux Comparison



SRBAVG nonGGEO and GGEO Flux Summary

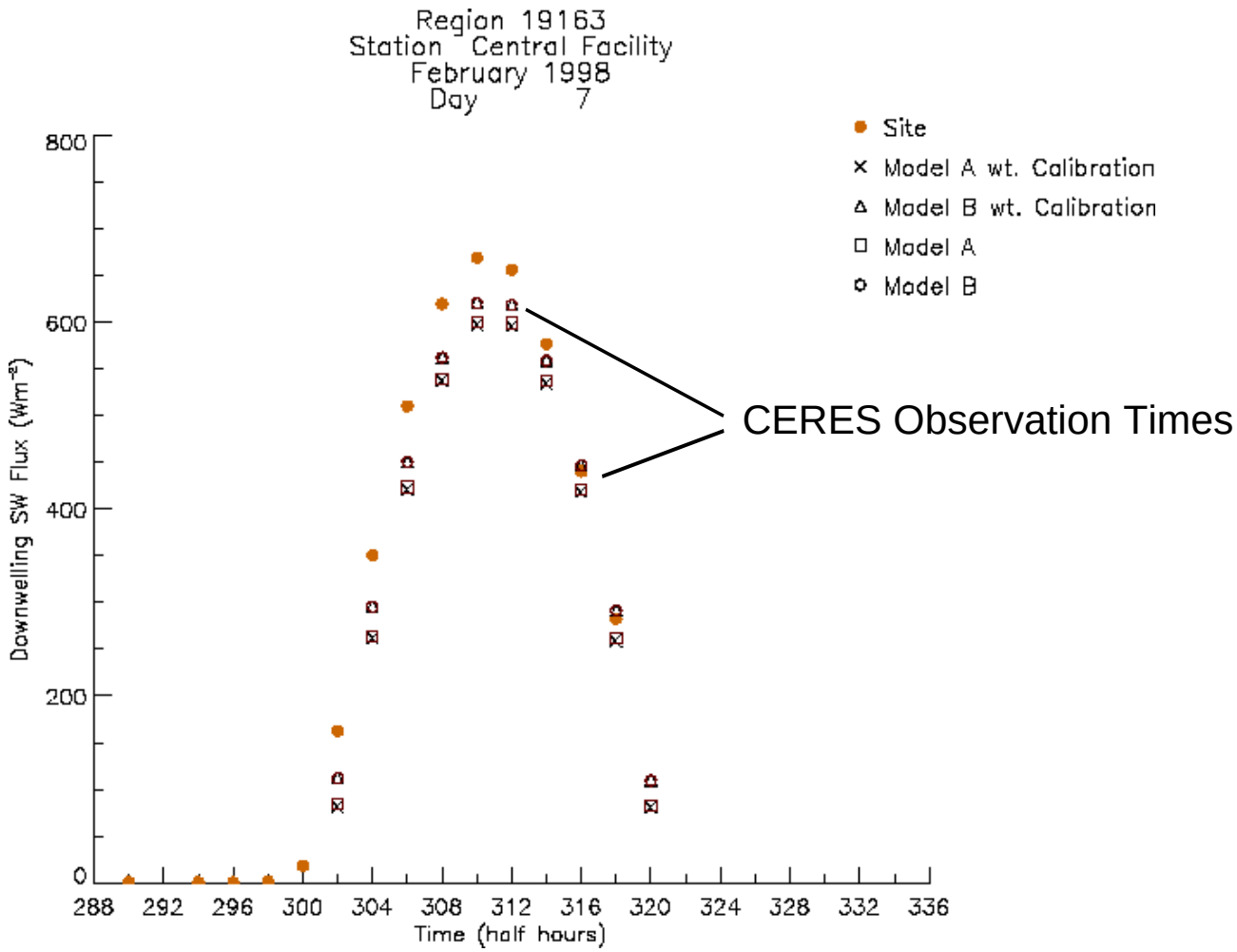
40°N - 40°S W/m²		SRBAVG nonGGEO	SRBAVG GGEO	nonGGEO - GGEO
Total-Sky LW Flux	Mean	255.7	255.1	0.4
	Sigma	28.8	28.7	3.4
Total-Sky SW Flux	Mean	96.6	100.4	-3.6
	Sigma	33.2	29.9	13.3
Clear-Sky LW Flux	Mean	283.6	282.5	0.8
	Sigma	14.3	14.9	2.8
Clear-Sky SW Flux	Mean	49.0	59.7	-10.8
	Sigma	19.0	21.7	8.8

Comparison of SS10 and Surface Fluxes

- Use GGEO-interpolated 1°x1° Gridded Fluxes
- TOA Flux interpolated to all hours of Month
- Surface Fluxes Computed Using CERES TOA-Surface Algorithms
  - Downwelling Clear-sky SW
  - Downwelling Total-Sky LW
- Match with Hourly Averaged Data From ARM Central Facility
- Compare Bias and rms of Interpolated Comparison with Instantaneous Results of Kratz

Surface Downwelling Clear-sky SW Time Series

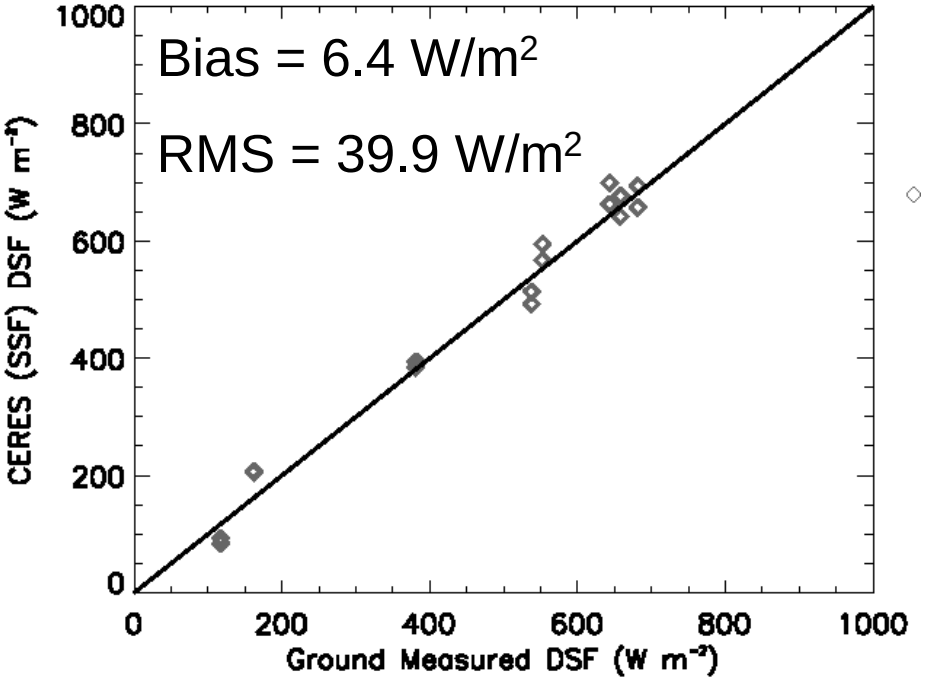
ARM Central Facility February 7, 1998



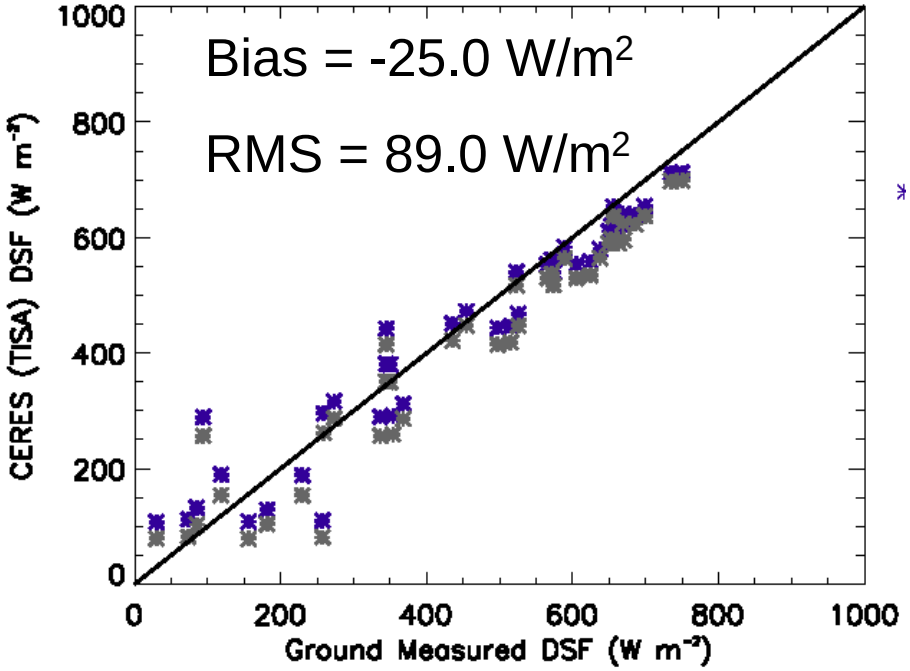
Instantaneous & Interpolated Downwelling Surface Clear-Sky SW Flux

ARM Central Facility February 1998

CERES Footprint vs. Surface



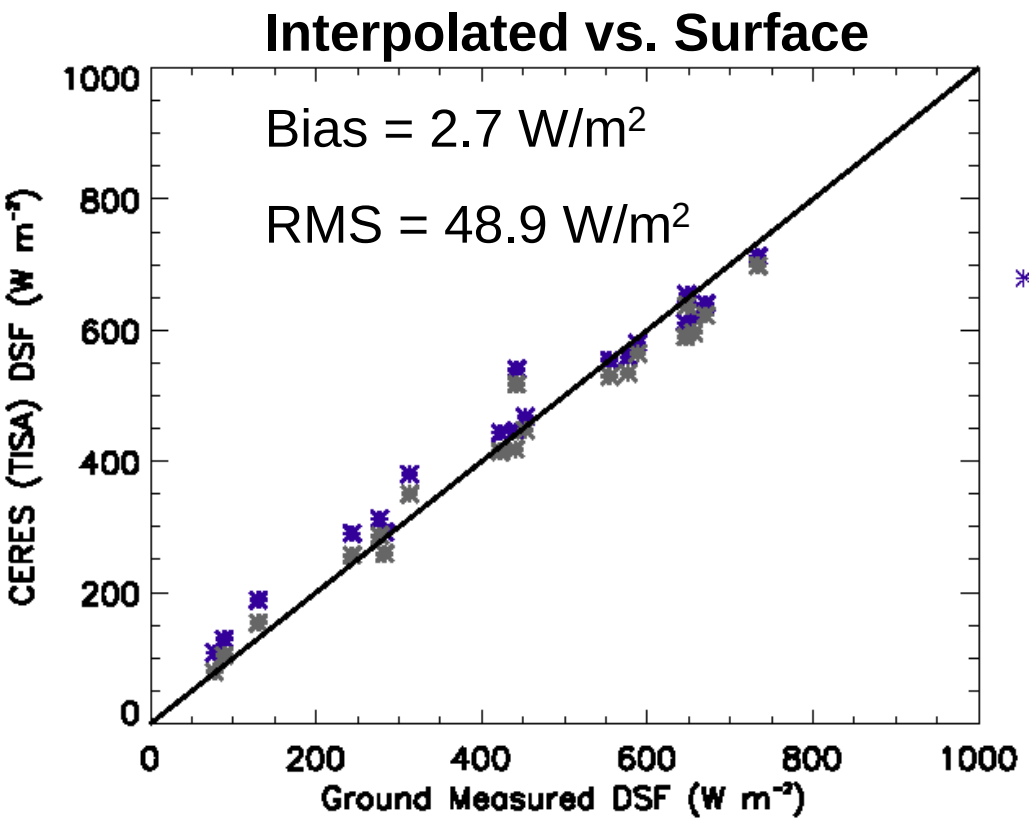
Interpolated vs. Surface



Instantaneous & Interpolated Downwelling Surface Clear-Sky SW Flux

ARM Central Facility February 1998

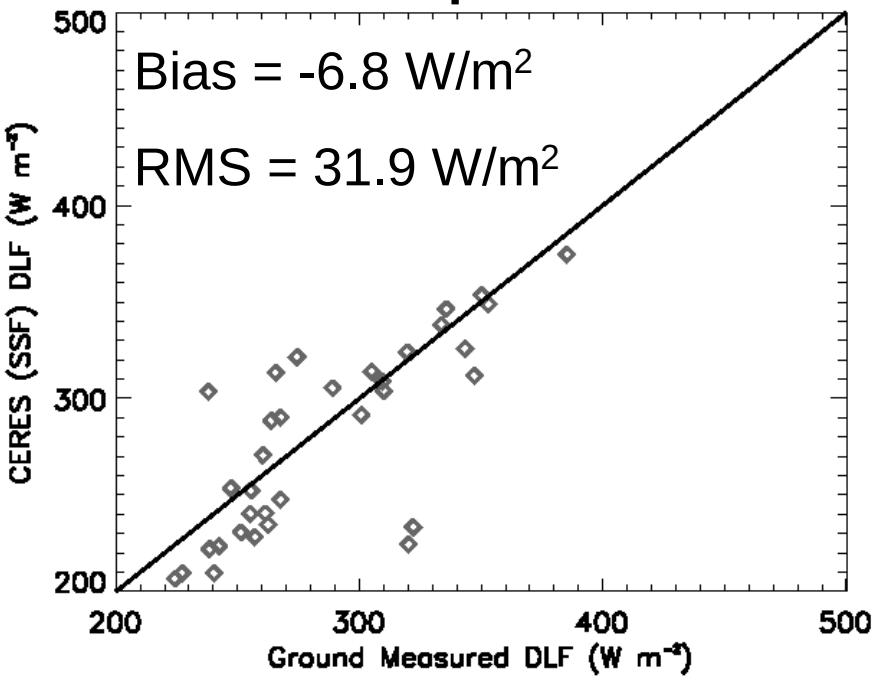
Afternoon Data Only



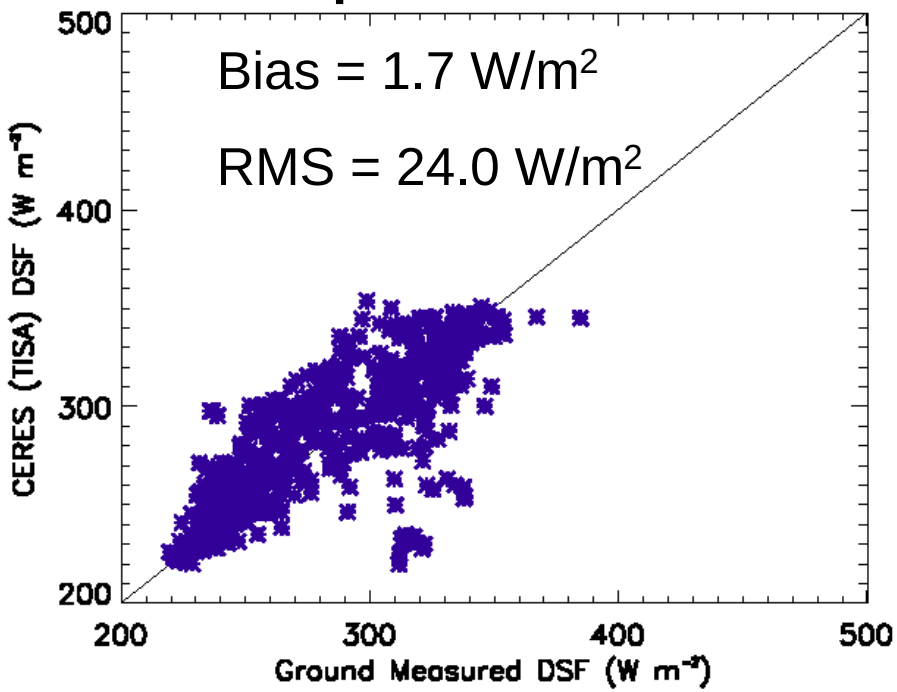
Instantaneous & Interpolated Downwelling Surface Total-Sky LW Flux

ARM Central Facility February 1998

CERES Footprint vs. Surface



Interpolated vs. Surface



Future Plans

- Create More Realistic Total-Sky Validation Product
  - ERBE-like Fluxes + VIRS Clouds
  - Preliminary ADM's
- Continued Validation
  - Cloud Comparisons
  - Calibration
  - Flux Comparisons
  - DRM Construction
- Study Cloud and SW Flux Normalization
- Finalize Error Analysis
- Compare SW Algorithms
- Scheduled Archival in Fall 2001