CERES and GOES OLR Comparisons

Mamoudou B. Ba and Robert G. Ellingson
Cooperative Institute for Climate Studies (CICS)
Department of Meteorology
University of Maryland
College Park, MD 20742

Project Objectives

- Establish the accuracy of Outgoing Longwave Radiation (OLR) estimates being produced from the HIRS and the GOES sounders, and
- Improve the accuracy of existing operational and experimental OLR estimates by more explicitly accounting for the diurnal cycle.

OLR is estimated from radiance (N) observations as

$$OLR = \sum_{i=1}^{5} a_i N_i$$

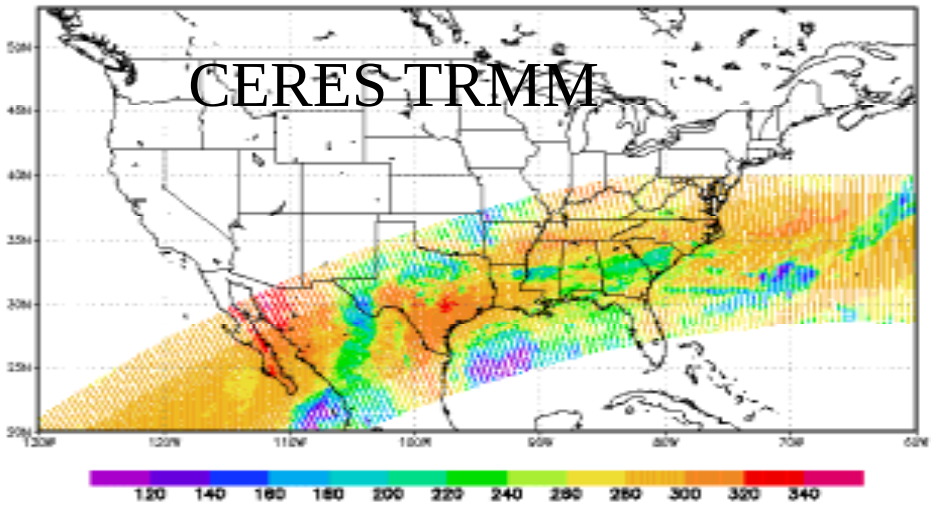
Where the coefficients are determined from regression analyses of radiation model calculations

Data and Procedures

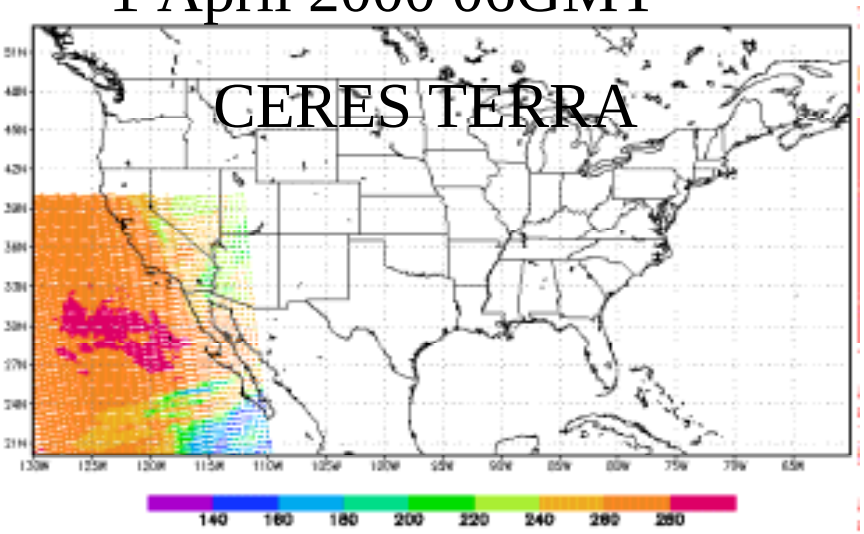
- Considered July 1998, and April 2000 for 20 - 40 N, 70 to 130 W
- GOES Data
  - mapped onto a 10x10 km grid
  - collected hourly (E & W - at 46 and 1 min past hour, respectively)
  - 130-105° - GOES W; 70-105° - GOES E
- CERES (TRMM and TERRA) ERBE -like instantaneous TOA estimates (ES-8) mapped to the identical grid using lat-lon, time information.
- Instantaneous comparisons allow 30 min window between GOES and CERES observations

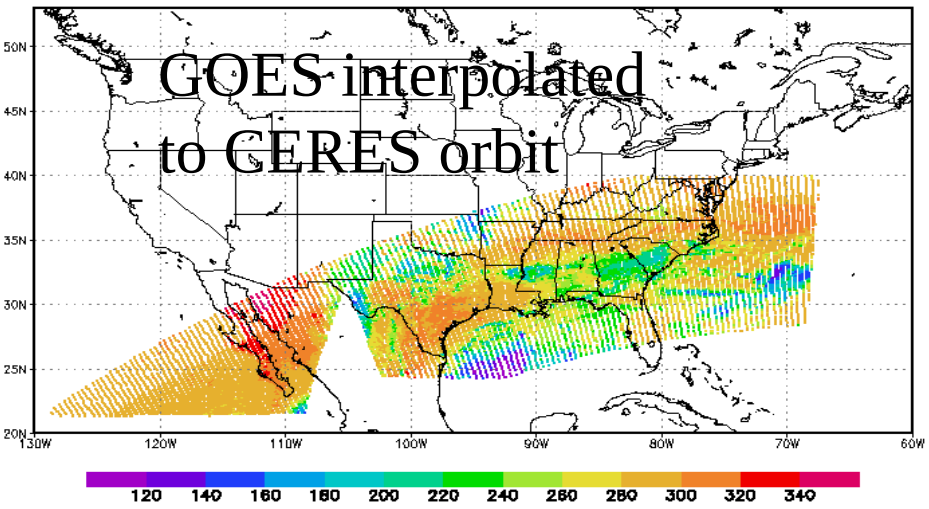
Example of GOES and CERES OLR Data

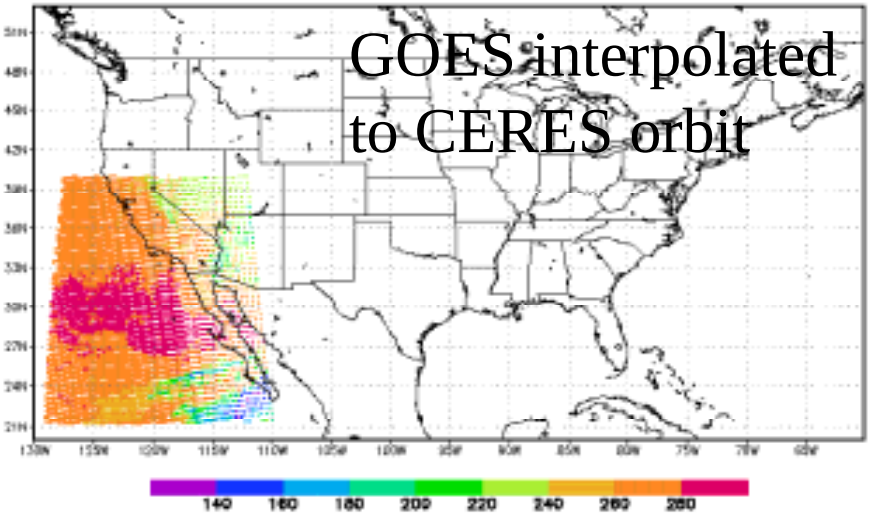
2 July 1998 16 GMT



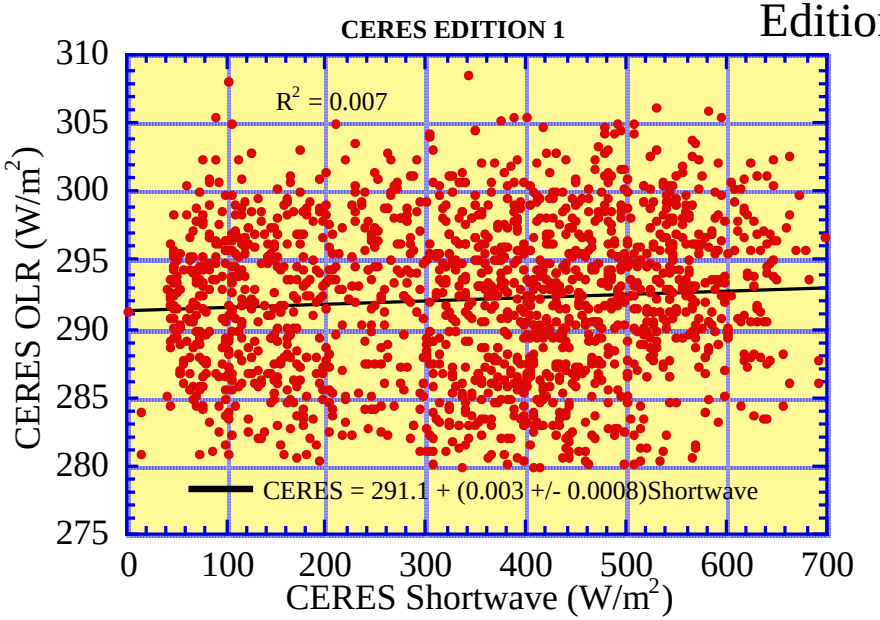
1 April 2000 06GMT

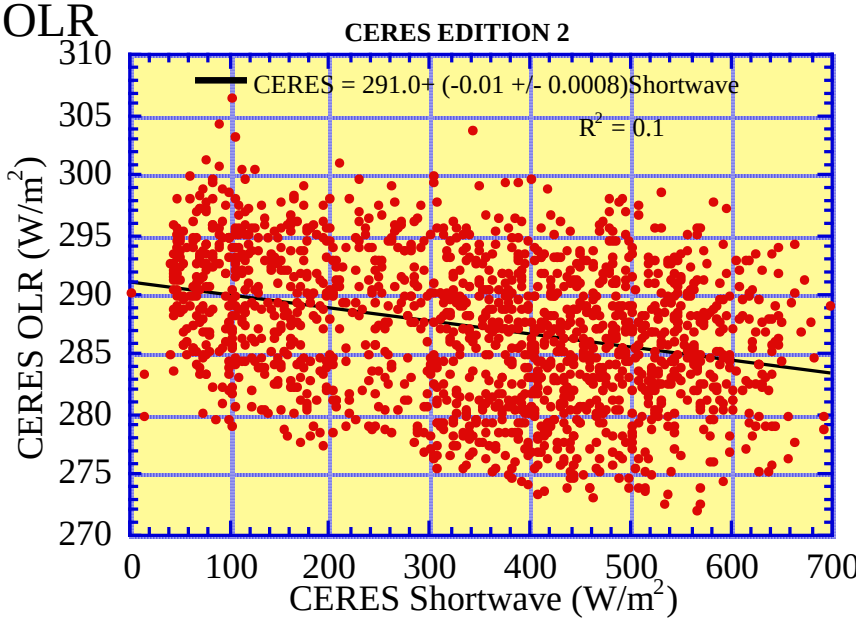


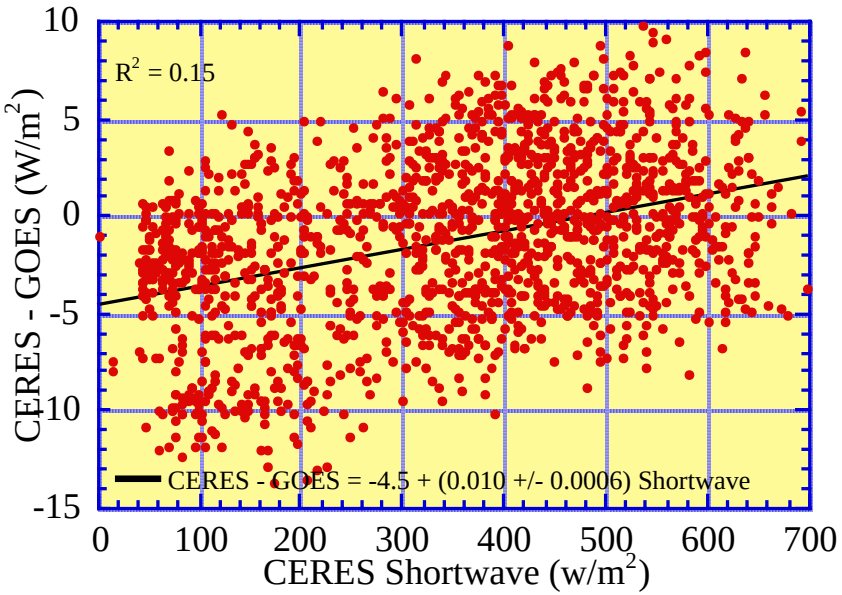


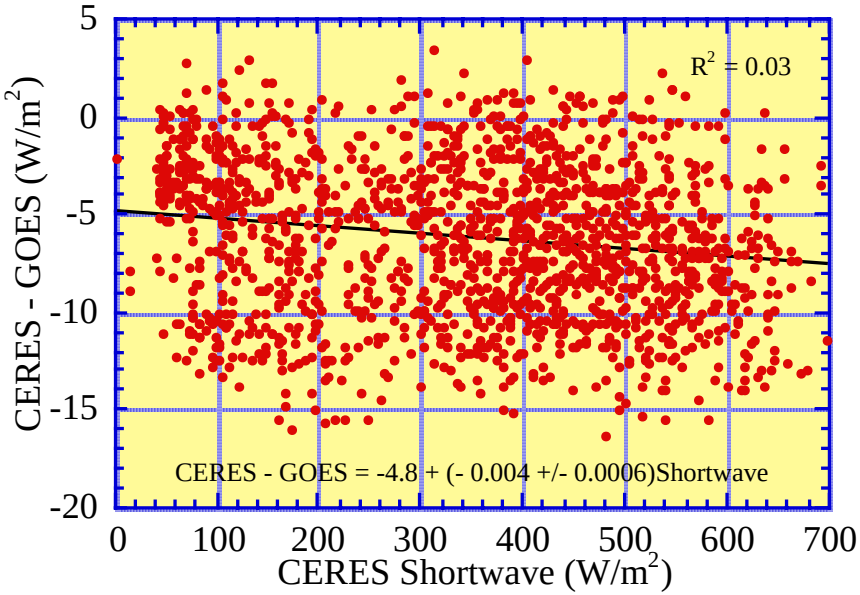


Data from Clear and Low Clouds Over the Pacific Show Solar Effects on CERES Edition 1 OLR





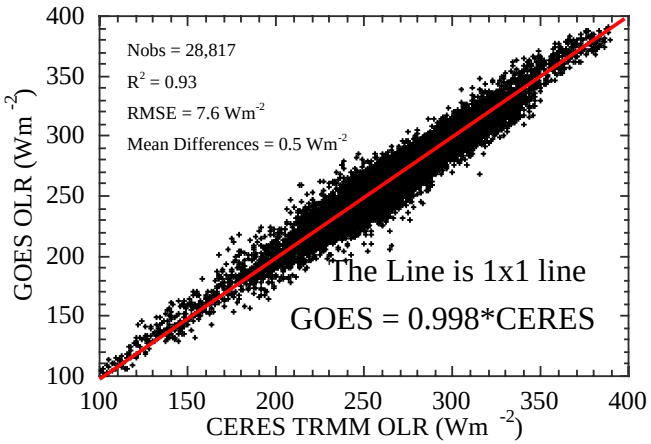




CERES-TRMM - GOES Comparison for 100 x 100 km^2 Homogeneous Scenes

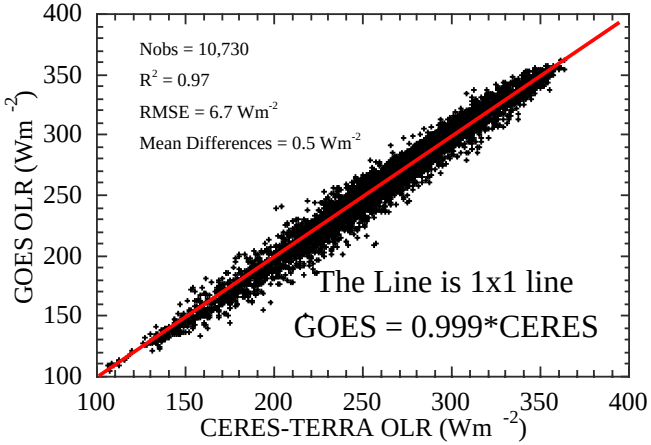
July 1998

CERES TRMM



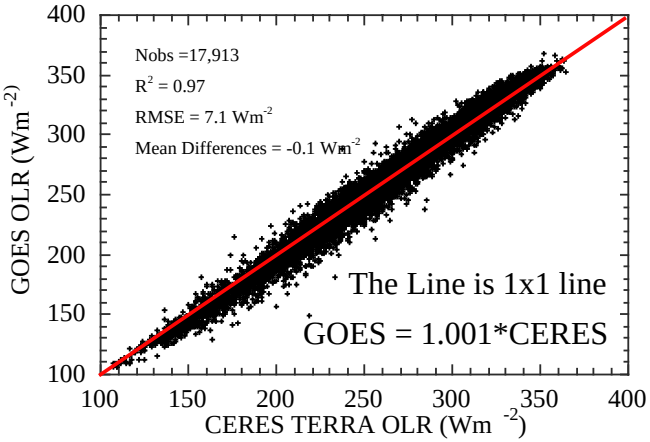
April 2000

CERES TERRA FM1



April 2000

CERES TERRA FM2



Statistics of Comparison of CERES OLR with GOES Estimates (Homogeneous Scenes). CERES TRMM

100x100 km^2	No pts	RMS Errors (W/m^2)	Bias (W/m^2)	Explained Variance (%)
All Data	28,817	7.6	0.5	0.93
All Night	12,893	7.1	0.3	0.93
All Day	15,924	8.0	0.7	0.93
Ocean (Day)	6,146	7.4	-0.5	0.92
Ocean (Night)	4,815	7.3	1.8	0.92
Land (Day)	7,796	8.3	1.8	0.93
Land (Night)	6,679	6.7	-1.1	0.95

Statistics of Comparison of CERES OLR with GOES Estimates (Homogeneous Scenes). CERES TERRA FM1

100x100 km^2	No pts	RMS Errors (W/m^2)	Bias (W/m^2)	Explained Variance (%)
All Data	10,730	6.7	0.5	97
All Night	5,470	6.0	0.3	97
All Day	5,260	7.3	0.7	97
Ocean (Day)	1,726	6.0	1.2	96
Ocean (Night)	2,345	5.5	0.5	97
Land (Day)	2,948	7.5	0.9	98
Land (Night)	2,400	6.4	0.1	96

Statistics of Comparison of CERES OLR with GOES Estimates (Homogeneous Scenes). CERES TERRA FM2

100x100 km^2	No pts	RMS Errors (W/m^2)	Bias (W/m^2)	Explained Variance (%)
All Scenes	17,913	7.1	-0.1	97
All Night	8,195	6.3	-0.7	97
All Day	9,718	7.6	0.3	97
Ocean (Day)	3,397	6.2	0.9	97
Ocean (Night)	3,614	5.6	-0.4	98
Land (Day)	5,223	8.2	0.4	98
Land (Night)	3,583	6.9	-0.8	97

Summary

GOES-CERES OLR Comparisons

- On average, GOES = CERES.
- No Scene dependence is apparent
- CERES OLR EDITION 1 appears to have a solar flux dependence, and EDITION 2 effectively removes this solar flux dependence.