Table 1. CERES launch dates and spacecraft information.

Spacecraft	TRMM	EOS-AM	EOS-PM
Instruments	Proto-Flight Model	Flight Models 1 and 2	Flight Models 3 and 4
Launch Date	1 November 1997	June 1998	December 2000
Inclination	35 deg	81 deg	81 deg
Altitude	350 km	705 km	705 km
Local Observation Time	precessing	10:30 AM	1:30 PM

Table 2. Spectral bands of interest for the study of Earth/atmosphere energetics.

Passband (μm)	**Scientific Perspective**
0.3 - 0.4	Sensitive to changing O_3 abundances
0.4 - 0.7	Drives biological systems; foliage amounts
0.7 - 1.6	Sensitive to changing H_2O abundances
1.6 - 4.5	Near IR, Far Solar effects
4.5 - 8.0	6.3 μm band of H_2O; upper tropospheric H_2O
8.0 - 12.0	CERES channel
12.0 - 17.0	Sensitive to changing CO_2 abundances
17.0 - 100	Sensitive to changing H_2O abundances
0.3 - 5.0	CERES channel
0.3 - 100	CERES channel
5.0 - 100	Continuity check for total - shortwave
8.0 - 9.1	Surface emissivity
9.1 - 10.2	Sensitive to changing O_3 abundances
10.2 - 12.0	Sensitive to cirrus clouds

Table 3. Nominal component values for the CERES PFM total channel pre-amplifier circuit.

Component	Nominal Value	Units
R_1	140.0	kΩ
R_2	140.0	kΩ
R_3	140.0	kΩ
R_4	140.0	kΩ
R_5	2.22	kΩ
R_6	10.0	kΩ
R_7	10.0	kΩ
R_8	10.0	kΩ
R_9	10.0	kΩ
R_{10}	10.0	kΩ
R_{11}	10.0	kΩ
R_{12}	2.843	kΩ
R_{13}	2.843	kΩ
R_{14}	500	kΩ
R_{15}	10.0	kΩ
R_{16}	10.0	kΩ
C_1	0.001	μf

Table 4. Nominal component values for the CERES PFM total channel Bessel filter circuit.

Component	Nominal Value	Units
R_1	20.0	kΩ
R_2	10.0	kΩ
R_3	20.0	kΩ
R_4	10.0	kΩ
R_5	108.43	kΩ
R_6	100.02	kΩ
R_7	1.29	MΩ
R_8	100.02	kΩ
R_9	8.4074	kΩ
R_{10}	156.9	kΩ
R_{11}	89.219	kΩ
R_{12}	206.83	kΩ
R_{13}	89.219	kΩ
R_{14}	67.680	kΩ
C_1	0.05	μf
C_2	0.05	μf
C_3	0.05	μf
C_4	0.05	μf

Table 5. Nominal and modeled specifications for the detector module assembly.

Layer	Thermal Conductivity W/mK	Volumetric Mass kg/m^3	Specific Heat J/kgK	Nominal Thickness μm	Modeled Thickness μm
Absorber	0.209	1400	668.8	10.6	10.0
Epoxy/Varnish	0.1	1150	1000.0	7.5	4.90
Gold Pads	292.9	19320	129.6	0.5	0.5
Thermistor	8.36	5000	752.4	15.0	15.0
Upper Epoxy	0.1254	1200	1045.0	1.0	0.75
Kapton	0.1200	1420	1091.0	7.62	7.62
Lower Epoxy	0.1254	1200	1045.0	1.0	0.25
Aluminum	237.0	2700	903.0	3668.0	3668
Indium	80.84	11480	240.3	2.54	2.54

Table 6. Predicted time constant and responsivity sensitivities, $\partial A/\partial B$, where A equals either time constant, τ, or Responsivity, R, and B equals layer thickness, δ, of the CERES detector module assembly.

Detector Layer	**Predicted Time Constant Sensitivity,** $\frac{\partial\tau}{\partial\delta}$ **(ms/μm)**	**Predicted Responsivity Sensitivity,** $\frac{\partial R}{\partial\delta}$ **(V/W/μm)**
Absorber	0.24	0.01
Epoxy/Varnish	0.35	0.04
Thermistor	0.39	0.13
Upper Epoxy	1.35	7.35
Kapton	1.43	10.87
Bottom Epoxy	1.37	10.38

Table 7. Narrow Field Black body (NFBB) temperatures, unfiltered and filtered radiances from the CERES ground calibration.

NFBB Temperature K	Unfiltered Radiances W/m^2sr	Filtered Radiances W/m^2sr
206.40	32.864	28.314
216.03	39.443	34.027
230.37	51.007	44.082
246.06	66.385	57.476
253.04	74.243	64.329
264.98	89.277	77.452
278.04	108.221	94.009
284.86	119.236	103.646
290.74	129.391	112.536
297.61	142.063	123.637
304.95	156.609	136.388
311.84	171.255	149.236

Table 8. Comparison of gains determined during the CERES ground calibration to the predicted values determined with the end-to-end model.

Gain Term	CERES Ground Calibration	Numerical Simulation	Percent Difference	units
$\mathbf{A_V}$	0.1499	0.1464	2.33	$Wm^{-2}sr^{-1}$/count
$\mathbf{A_S}$	-	0.1464	-	$Wm^{-2}sr^{-1}$/count
$\mathbf{A_H}$	-	1.6174	-	$Wm^{-2}sr^{-1}$/K
$\mathbf{A_B}$	-	0.0	-	$Wm^{-2}sr^{-1}$/V
$\mathbf{A_D}$	-	0.0	-	$Wm^{-2}sr^{-1}$/V

Table 9. Slow-mode numerical algorithm coefficient values in Eqs. 5.14 and 5.15 determined using the model.

Coefficient	Value	Units
C_1	0.99	-
C_2	0.01	-
C_3	0.00726	-
τ_1	8.5	ms
τ_2	43	ms
τ_3	310	ms
p_0	0.9968	-
p_1	2.3563×10^{-5}	-

Table 10. Results of a study where the thermal impedance between the compensating thermistor and aluminum substrate was varied.

Epoxy thickness μm	**Responsivity V/W**	**Time Constant ms**
0.25	63.97	9.27
0.75	62.34	8.97
1	61.54	8.82
1.25	60.76	8.68
1.5	59.99	8.54
1.75	55.70	8.40

Table 11. Overall number of footprints sorted by cloud categories for two weightings of the point spread function. Row and Column values correspond to the point spread function weightings displayed in Figures 5.33(a) and (b), respectively.

		2-by-2 bins				
	categories	**clear**	**partly cloudy**	**mostly cloudy**	**overcast**	**total**
16-by-16 bins	**clear**	5480	121	0	1	5602
	partly cloudy	4862	3066	907	419	9254
	mostly cloudy	326	1444	1809	4982	8561
	overcast	275	9	74	8269	8627
	total	10943	4640	2790	13671	32044

Table 12. Overall number of footprints sorted by surface type for two weightings of the point spread function. Row and Column values correspond to the point spread function weightings displayed in Figures 5.33(a) and (b), respectively.

		2-by-2 bins					
	categories	**ocean**	**land**	**snow**	**desert**	**coast**	**total**
16-by-16 bins	**ocean**	23250	12	0	0	19	23281
	land	4	7229	14	0	13	7260
	snow	2	20	734	0	4	760
	desert	0	0	0	22	0	22
	coast	301	260	9	0	151	721
	total	23559	7521	757	22	187	32044

Table 13. Comparison of the recovered **shortwave** TOA flux (Wm^{-2}) for the two point spread function weightings displayed in Figure 5.33. The statistical mean difference in Wm^{-2} (2-by-2 minus 16-by-16), standard deviation of the differences (std), and number of footprints (count) used in the comparison are presented.

	categories	2-by-2 bins: **clear**	**partly cloudy**	**mostly cloudy**	**overcast**	
16-by-16 bins	**clear**	-0.05	6.49	0.00	0.00	mean
		3.20	15.84	0.00	0.00	std
		4447	92	0	0	count
	partly cloudy	-11.13	-0.22	12.08	20.05	mean
		18.11	3.47	16.29	26.96	std
		3124	2010	565	254	count
	mostly cloudy	-34.11	-12.51	-0.04	9.63	mean
		49.95	27.51	1.21	17.15	std
		211	992	1280	3410	count
	overcast	-6.20	-68.48	-20.26	0.00	mean
		20.88	64.3	22.25	0.08	std
		4	6	54	5912	count

Table 14. Comparison of the recovered **longwave** TOA flux (Wm^{-2})for the two point spread function weightings displayed in Figure 5.33. The statistical mean difference in Wm^{-2} (2-by-2 minus16-by-16), standard deviation of the differences (std), and number of footprints (count) used in the comparison are presented.

		2-by-2 bins				
	cloudiness	**clear**	**partly cloudy**	**mostly cloudy**	**overcast**	
16-by-16 bins	**clear**	0.00	0.23	0.00	-3.09	mean
		.31	0.63	0.00	0.00	Std
		5480	121	0	1	count
	partly cloudy	-0.28	-0.01	0.15	-0.27	mean
		0.78	0.16	1.00	1.25	std
		4862	3066	907	419	count
	mostly cloudy	-0.25	0.26	0.00	-0.43	mean
		1.55	1.13	0.04	0.50	std
		326	1444	1809	4982	count
	overcast	-0.70	0.83	0.51	0.00	mean
		4.60	1.02	0.56	0.01	std
		275	9	74	8269	count

Table 15. Autoregression coefficients determined for four combinations of n, N, and frequency content, ω. All units are in $Wm^{-2}sr^{-1}$/count.

Coefficient	n=4 N=5 ω=20 Hz	n=4 N=12 ω=10 Hz	n=4 N=12 ω=20 Hz	n=4 N=12 ω=30 Hz
A_1	-2.6855×10^{-6}	-5.5767×10^{-6}	-4.2493×10^{-6}	1.8792×10^{-6}
A_2	-5.7803×10^{-6}	-5.5923×10^{-6}	-4.8840×10^{-6}	4.5437×10^{-7}
A_3	-7.0164×10^{-6}	-9.3568×10^{-7}	-4.2011×10^{-6}	-1.3222×10^{-5}
A_4	-1.9232×10^{-6}	1.1504×10^{-6}	-4.1307×10^{-6}	-2.2797×10^{-5}