Energy Budget over Tropical Western Pacific

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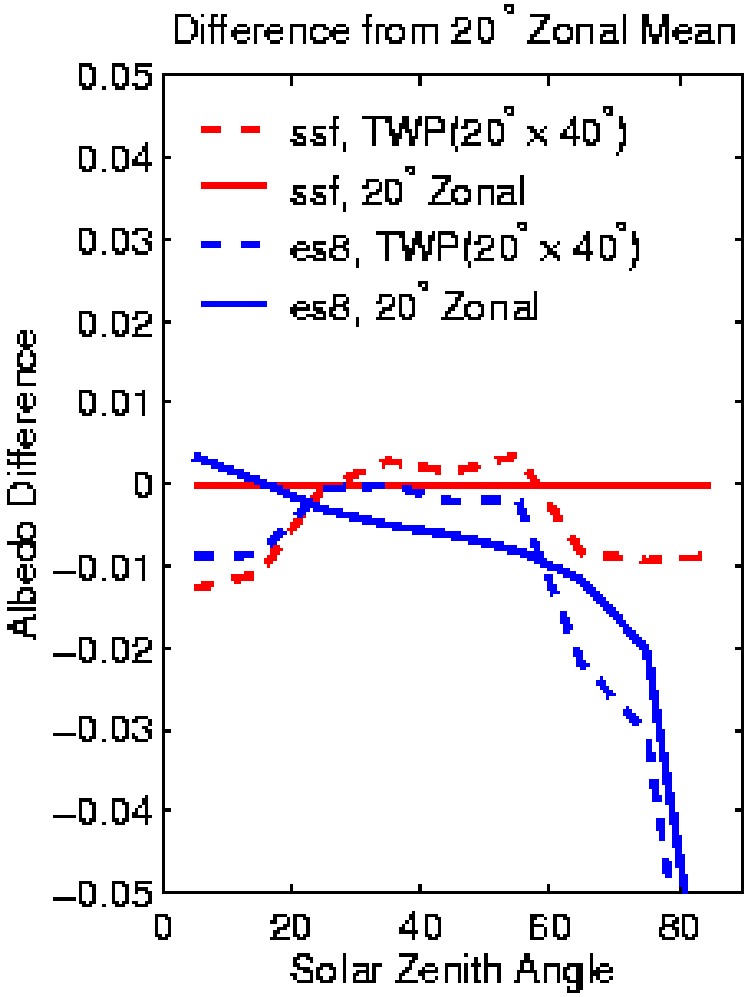
Objective

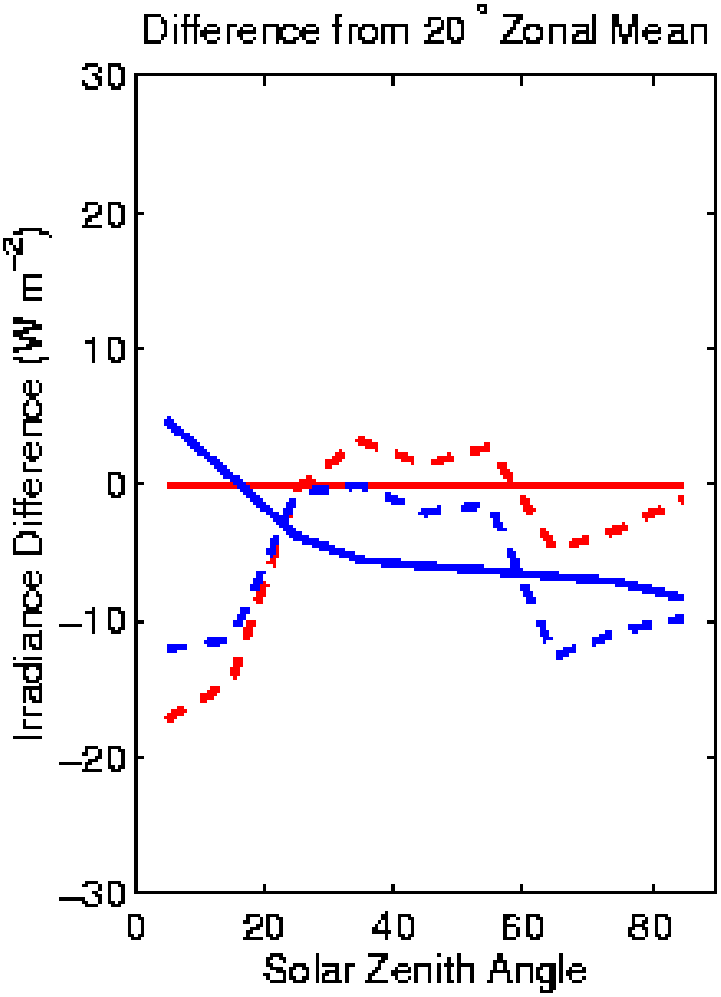
- Evaluate the difference in irradiances derived from new ADMs and ERBE ADMs when these are applied to a limited region.
- Estimate net radiation at TOA and surface over the ARM Manus site.

SSF – ES8 Comparison

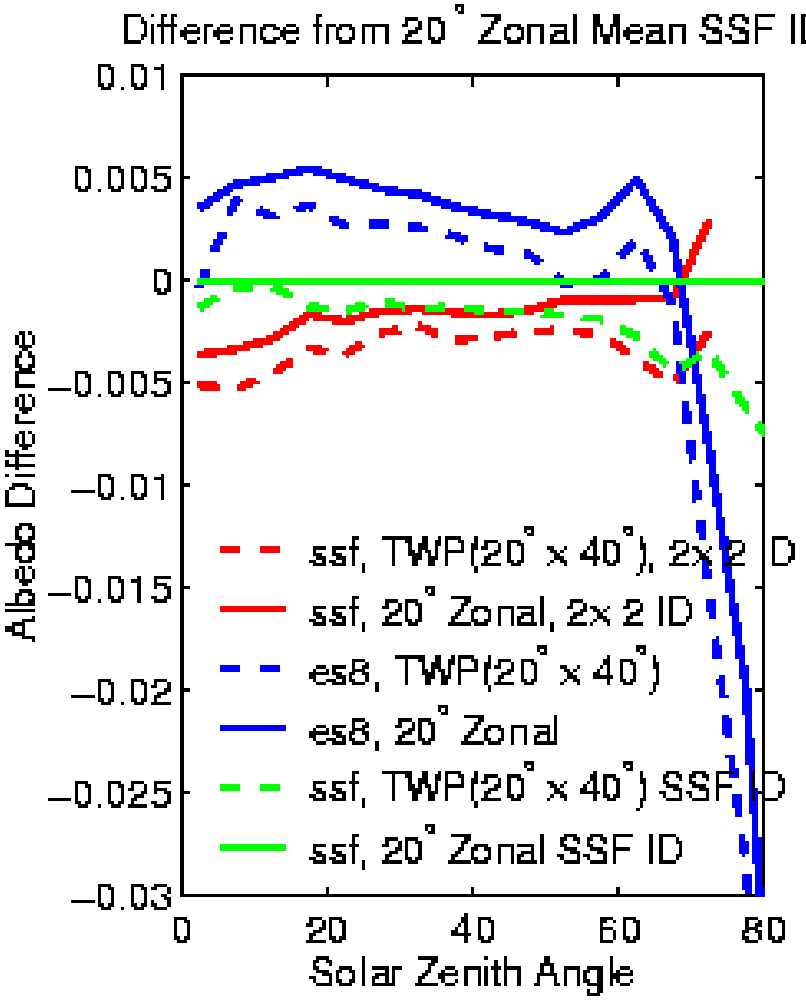
- Area
  - Zonal (10 N – 10 S)
  - TWP (10 N – 10 S, 127 E – 167 E)
- File
  - SSF
  - subES8

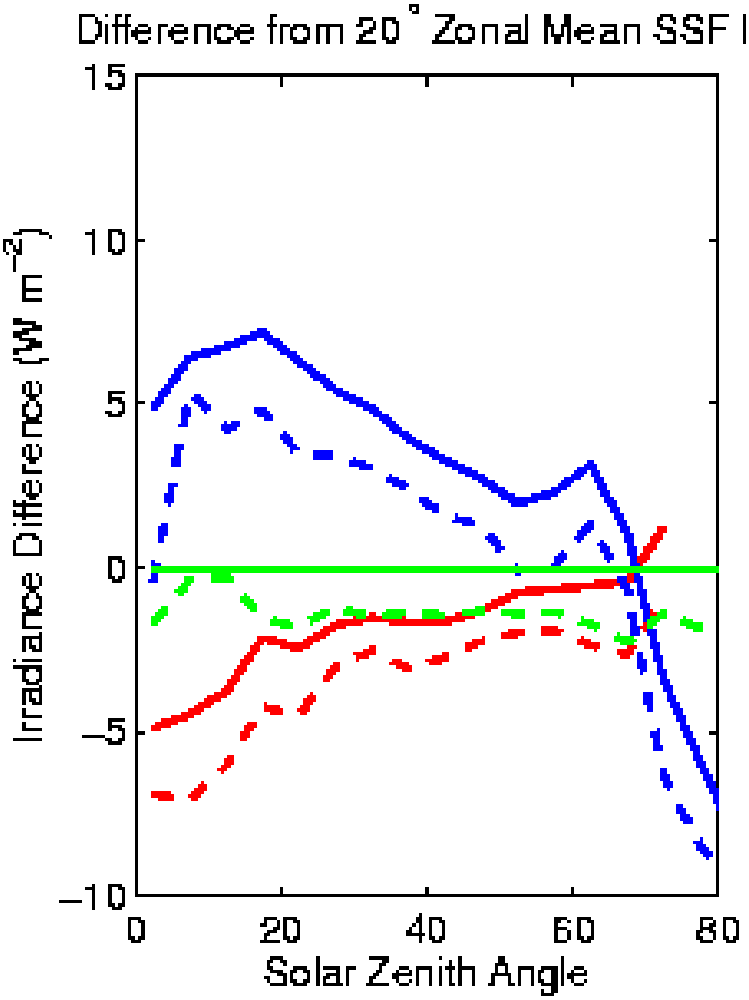
All sky Ocean Albedo



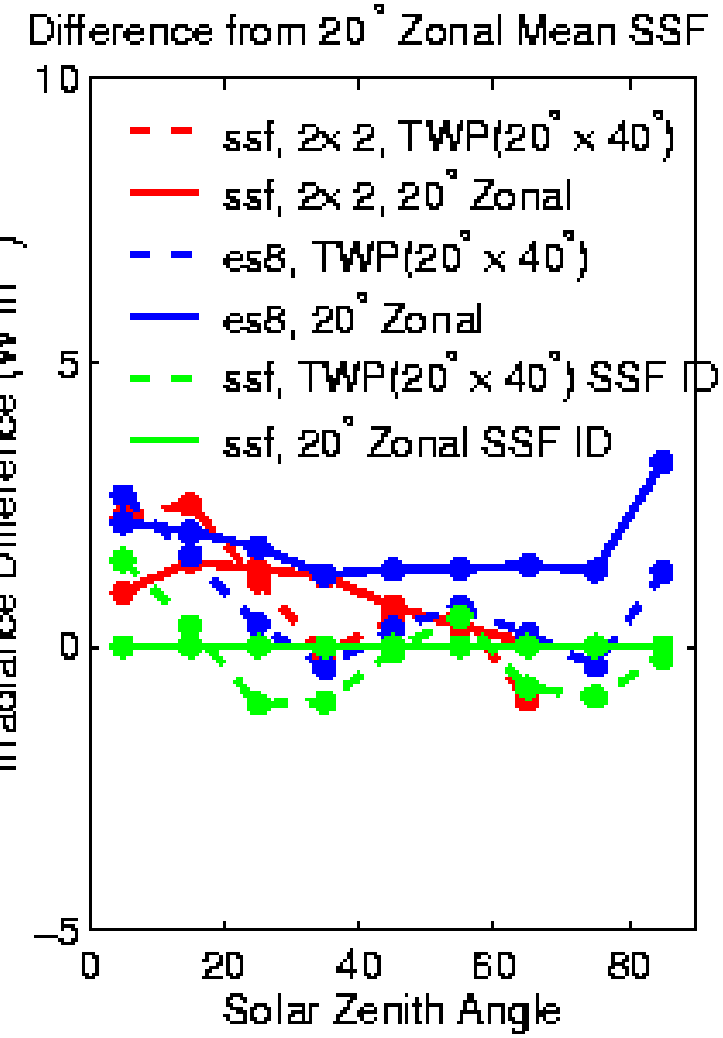


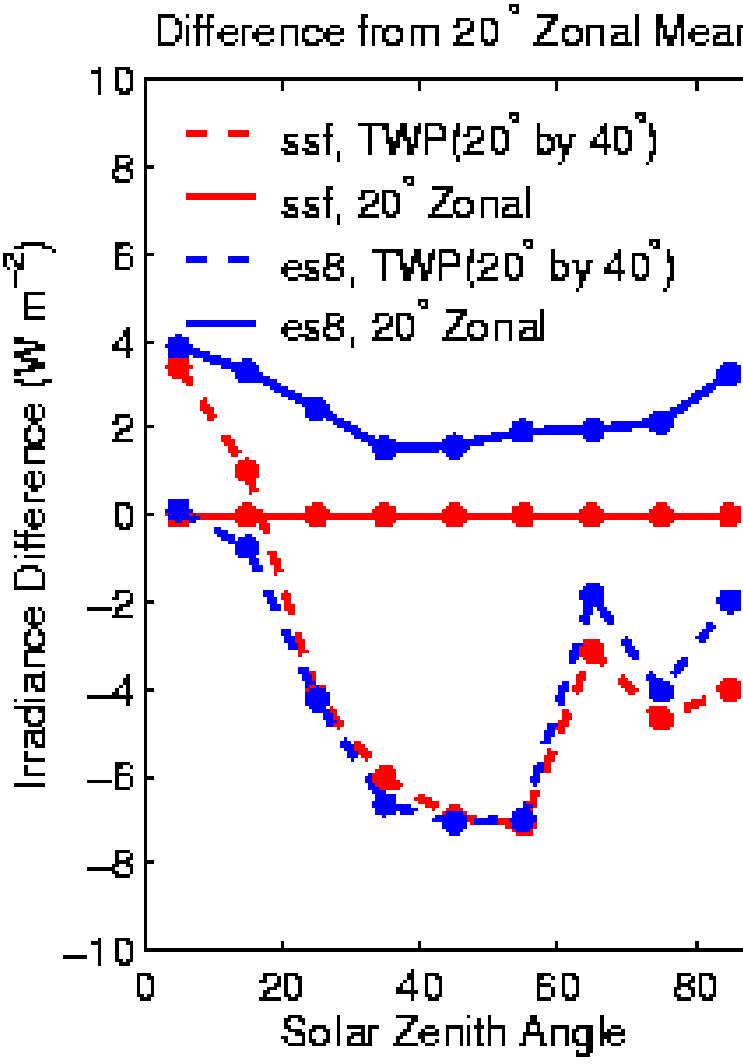
Clear-sky Ocean Albedo



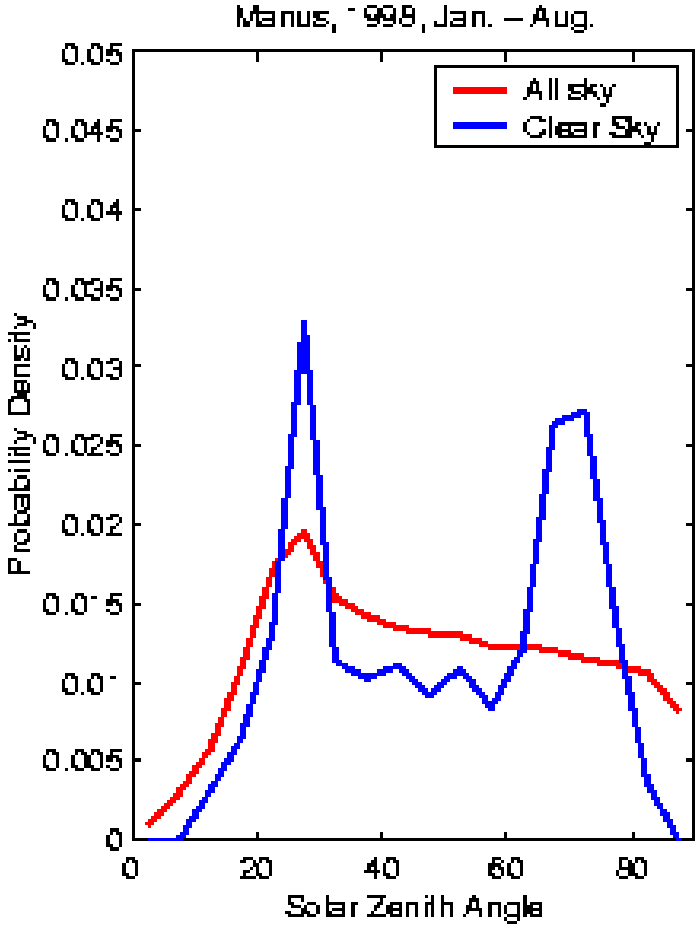


Longwave


Difference from 20° Zonal Mean SSF ID
ssf, 2x 2, TWP(20° x 40°)
ssf, 2x 2, 20° Zonal
es8, TWP(20° x 40°)
es8, 20° Zonal
ssf, TWP(20° x 40°) SSF ID
ssf, 20° Zonal SSF ID
10
5
0
−5
0
20
40
60
80
Solar Zenith Angle


Difference from 20° Zonal Mean
ssf, TWP(20° by 40°)
ssf, 20° Zonal
es8, TWP(20° by 40°)
es8, 20° Zonal
Irradiance Difference (W m−2)
10
8
6
4
2
0
−2
−4
−6
−8
−10
0
20
40
60
80
Solar Zenith Angle

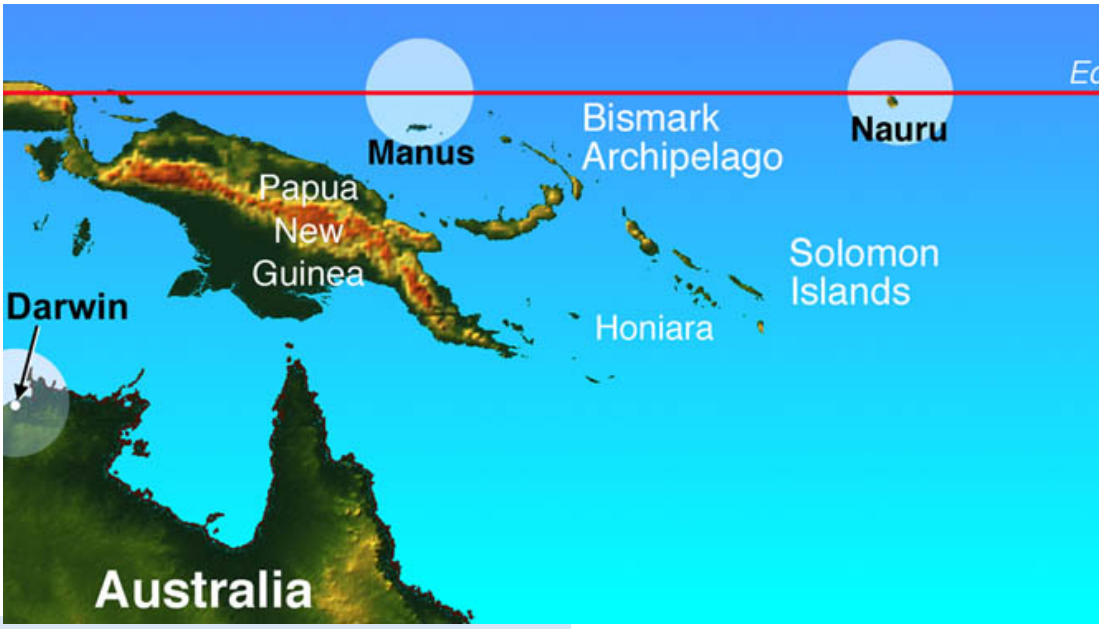
Solar Zenith Angle PDF Msnus site

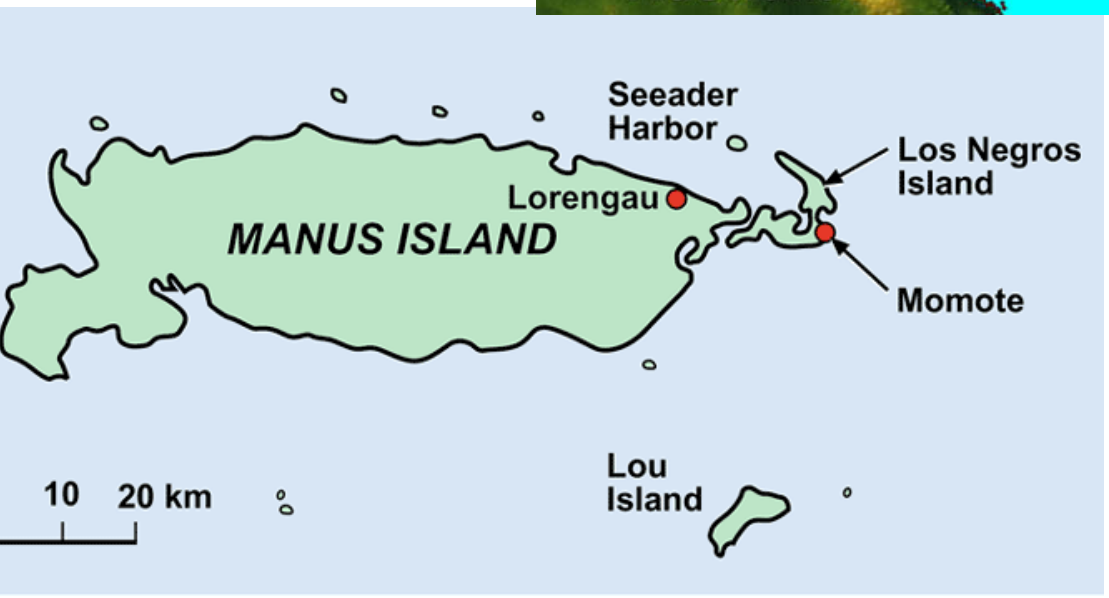


Cloud Forcing over Manus Ocean

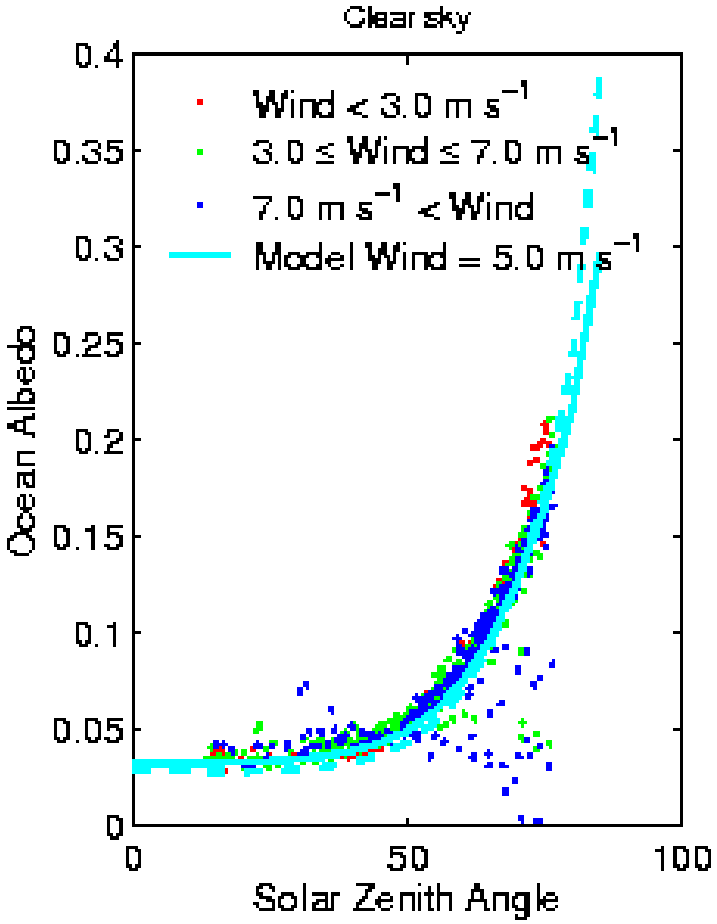
	Shortwave			Longwave		
	All Sky	Clear Sky	Cloud Forcing	All Sky	Clear Sky	Cloud Forcing
			W m^-2	W m^-2	W m^-2	W m^-2
SSF	0.216	0.088	-55.3	249	294	44.5
subES8	0.211	0.091	-52.1	249	294	44.5
Cess et al.			-55			45
TISA FEB.			-55.1			35.3

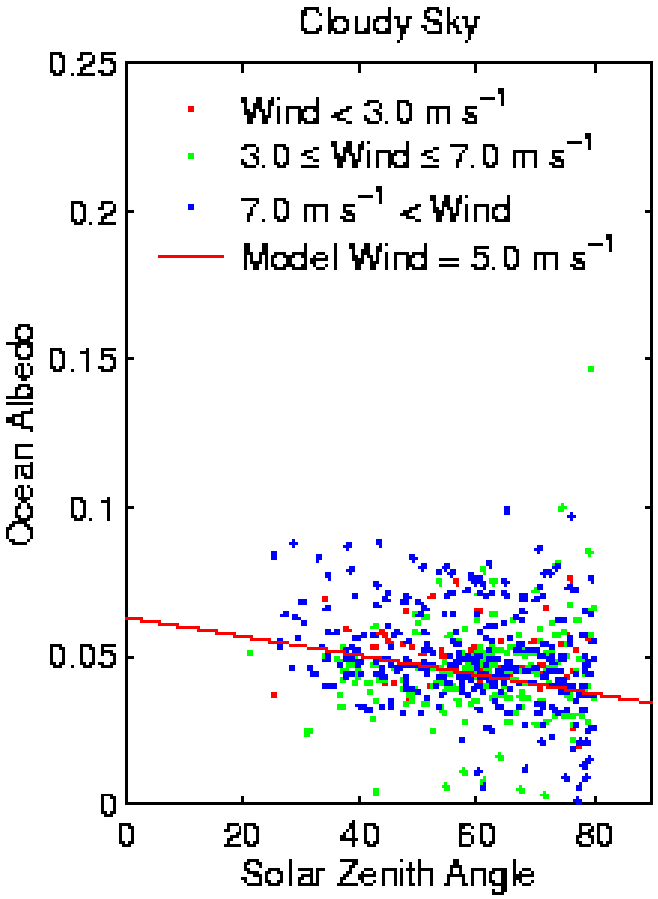
Manus Site


Manus
Bismark
Archipelago
Nauru
Papua
New
Guinea
Solomon
Islands
Darwin
Honiara
Australia

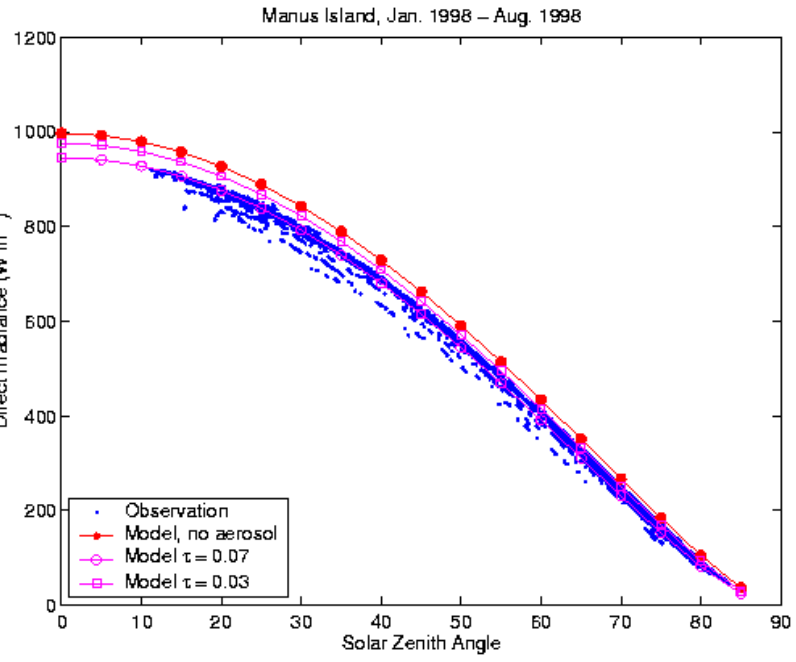

Seeader
Harbor
Los Negros
Island
Lorengau
MANUS ISLAND
Momote
10 20 km
Lou
Island

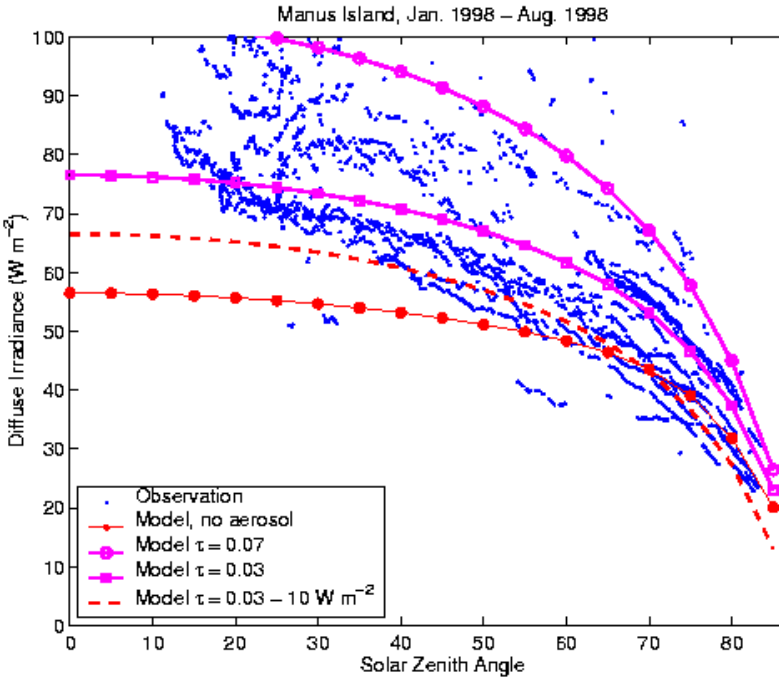
Ocean Albedo, Surface





Clear-Sky Irradiance

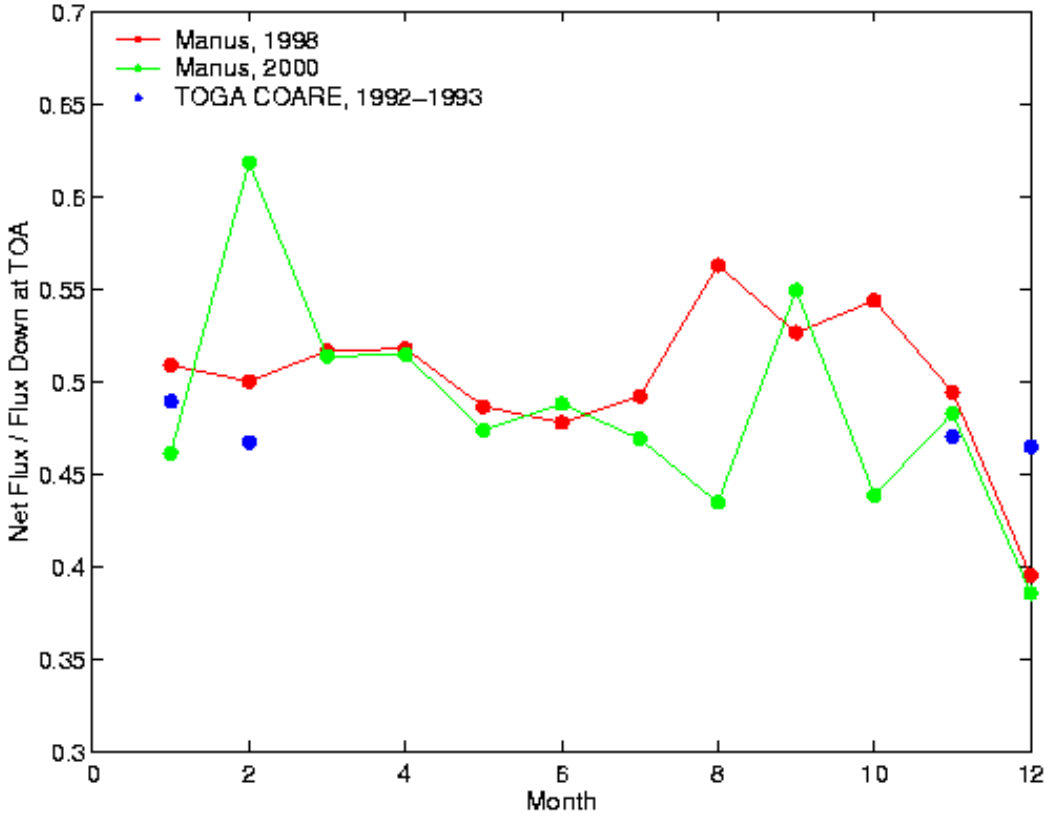




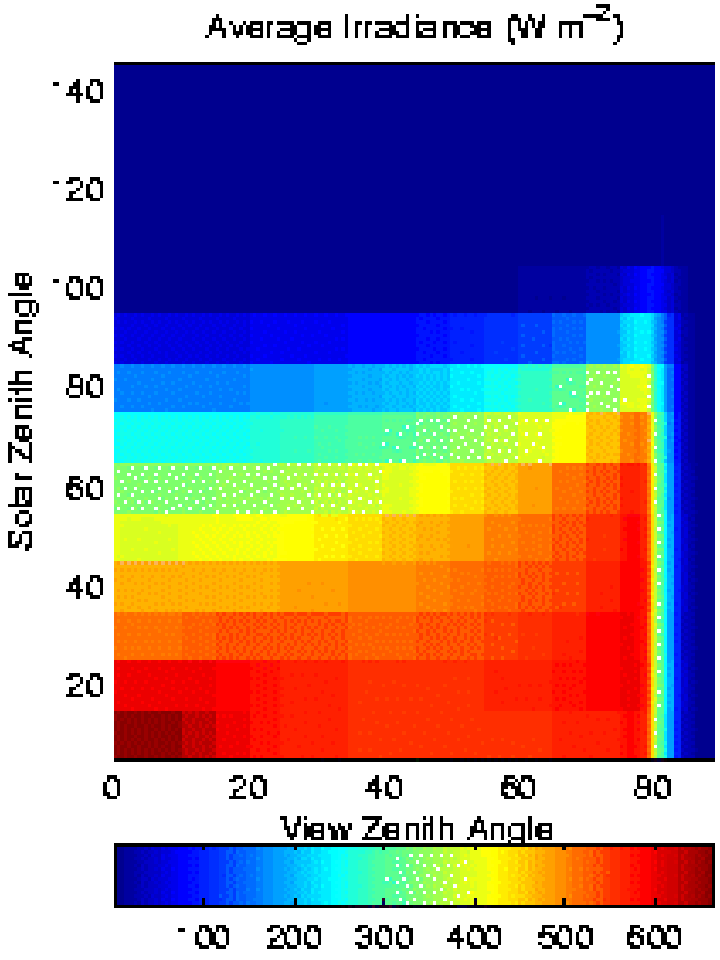
Radiation Budget over Manus Ocean

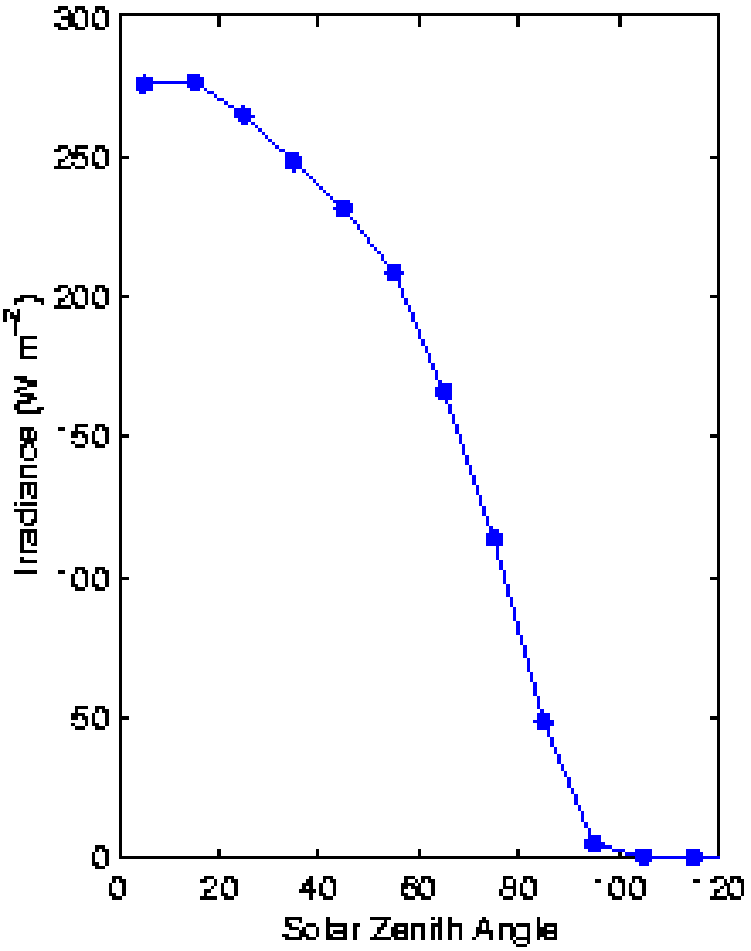
		All Sky		Clear Sky	
		1998 CERES	TOGA COARE	1998 CERES	TOGA COARE
		Jan. – Aug.		Jan. – Aug.	
Shortwave	Albedo	21	28	9	10
	Absorbed by Atm.	28	25	24	21
	Absorbed by Ocean	51	47	67	69
Longwave loss	OLR	57		67	
	NET Atm.	47		53	
	NET Sfc.	10		14	
100 = 435 W m^-2			Chou et al.		Chou et al.

Surface Irradiance Comparison

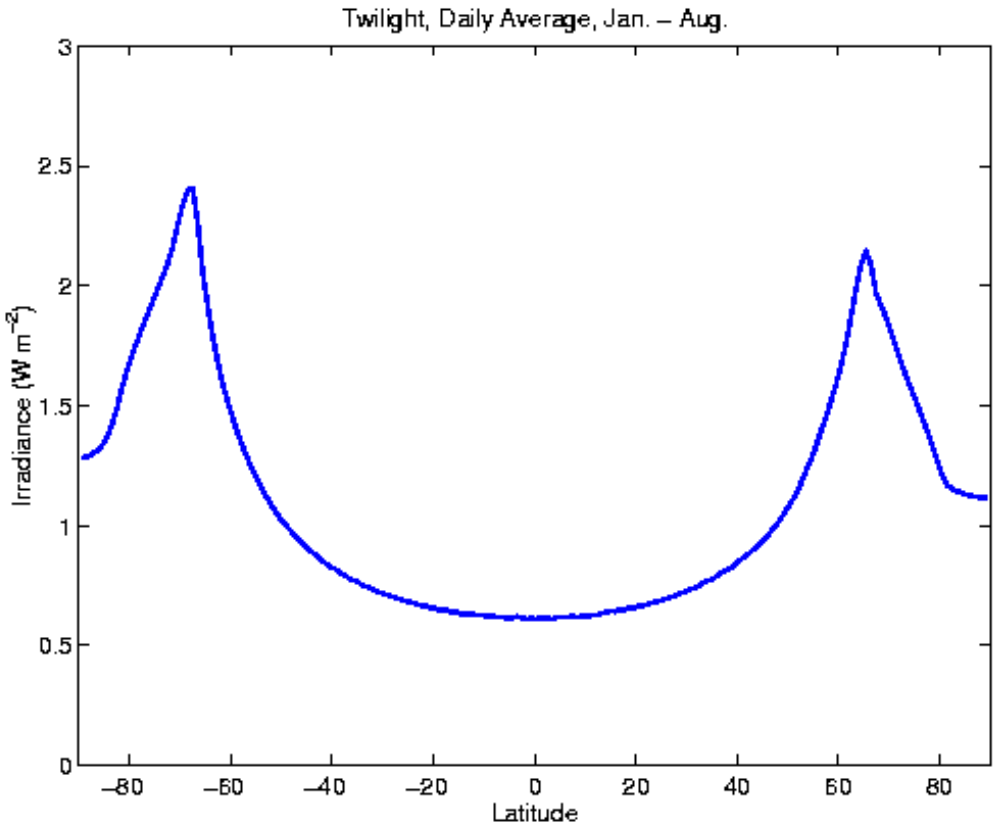


Average Radiance / Irradiance

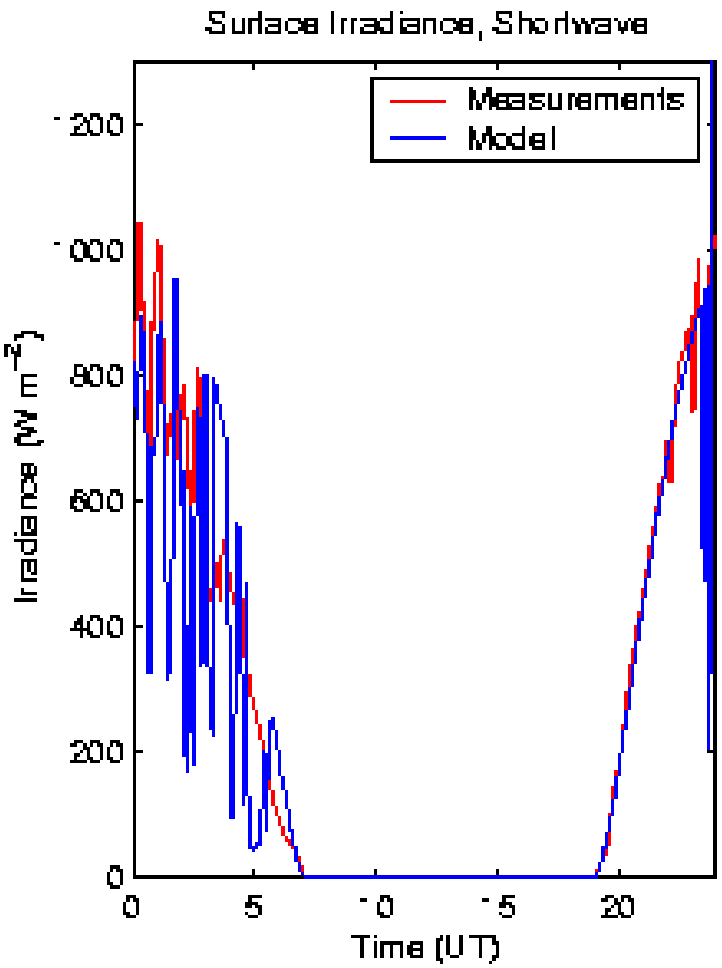


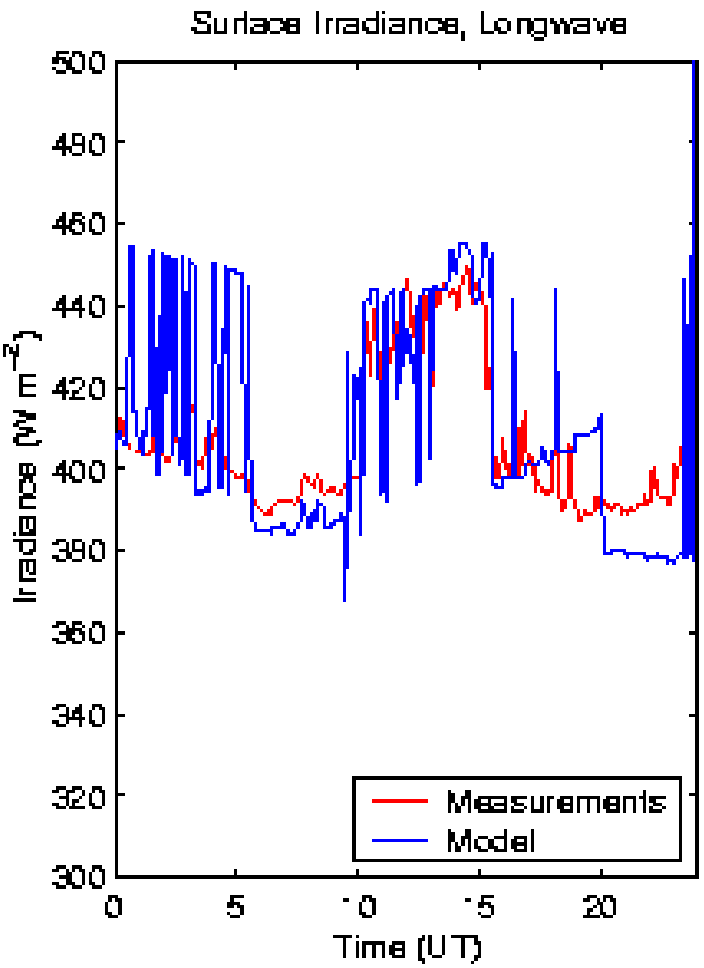


Irradiance after sunset

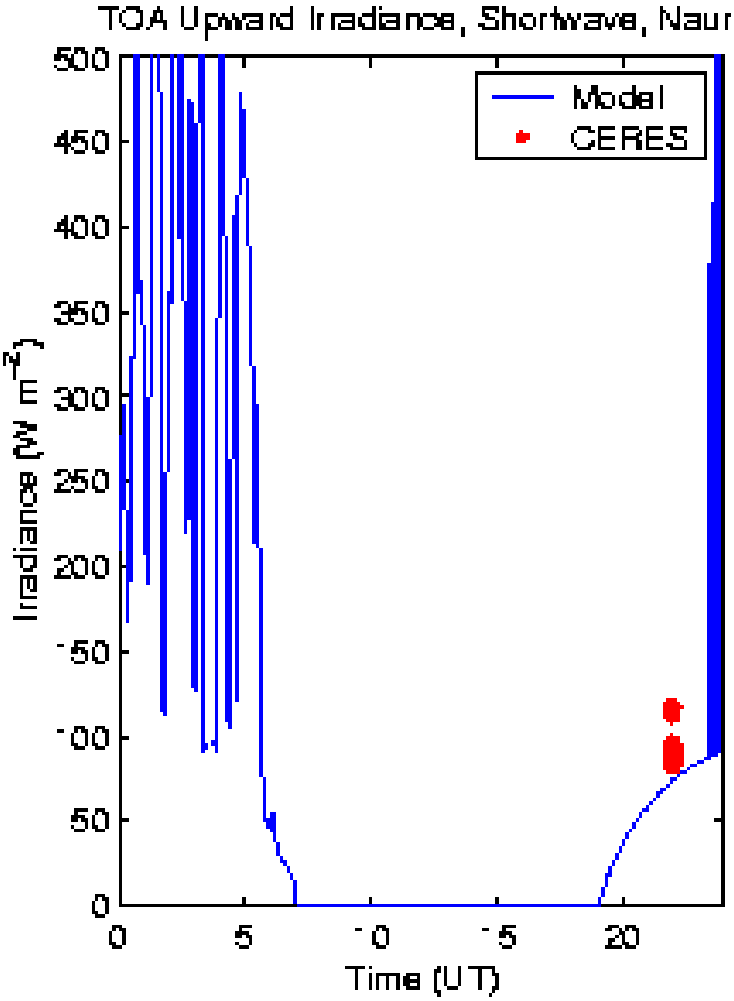


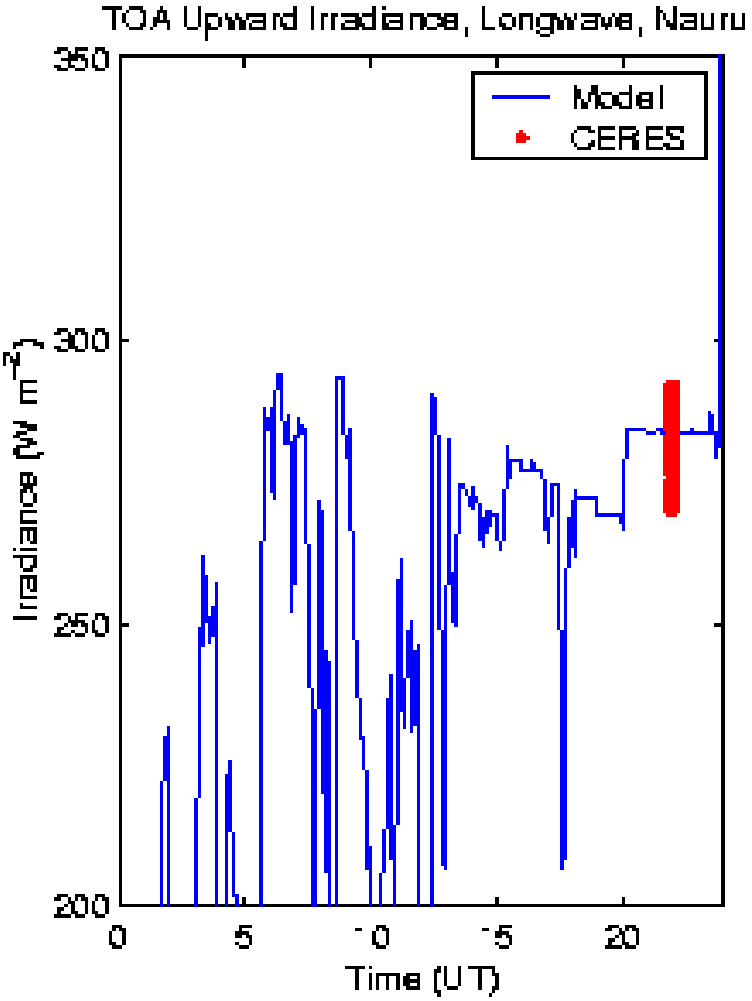
Irradiance Computation,Surface



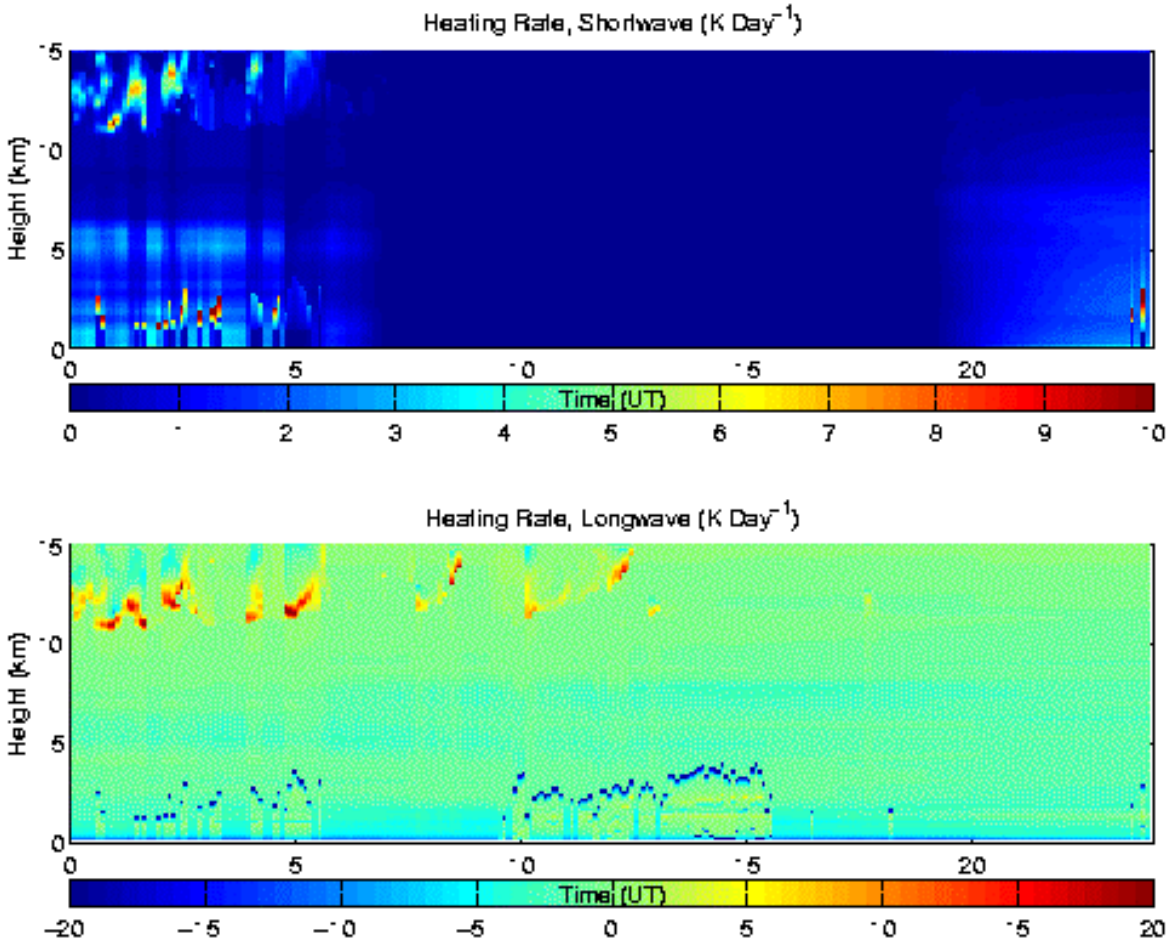


Irradiance Computation, TOA





Heating Rate



Conclusions

- Difference of the cloud forcing from SSF and ES8 is negligible for both shortwave and longwave
- Both shortwave absorption by the atmosphere and surface appear to be increased in 1998 compared with a “normal” year.
- Clouds cooled the system and warmed the atmosphere over Manus during the 8-month period.
- Daily averaged irradiance after sunset is about 1 W m^-2.