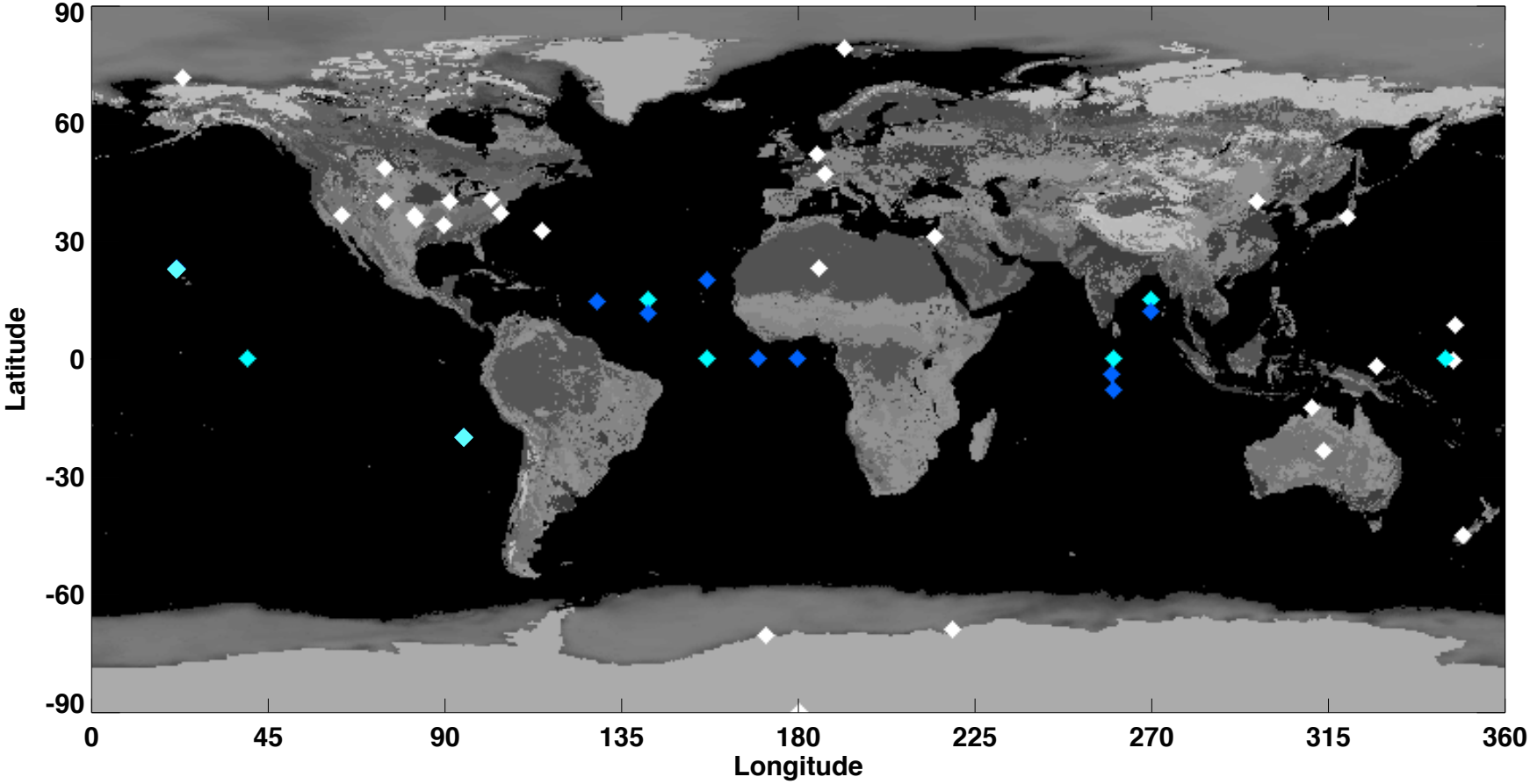
Surface Validation of Proto-Edition 4 SYN

Contributors: Entire TISA & SARB working groups.

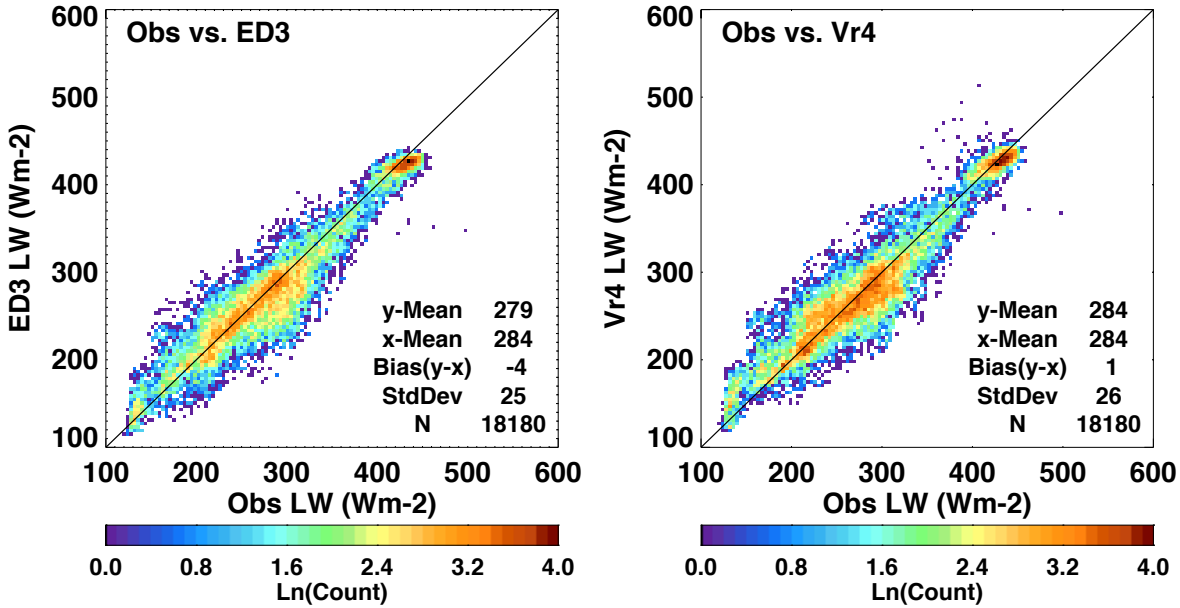
- Comparisons are for Jan 2010 only.
- Considering TSI (TOA observation), SYNI (calculations) CAVE (Surface observation).
- 27 Land Sites, 16 Ocean Buoy Sites.
- TSI & SYNI provide 1 hour temporal resolution.

Surface Sites Used for Edition 3/Proto Edition 4 Surface Validation

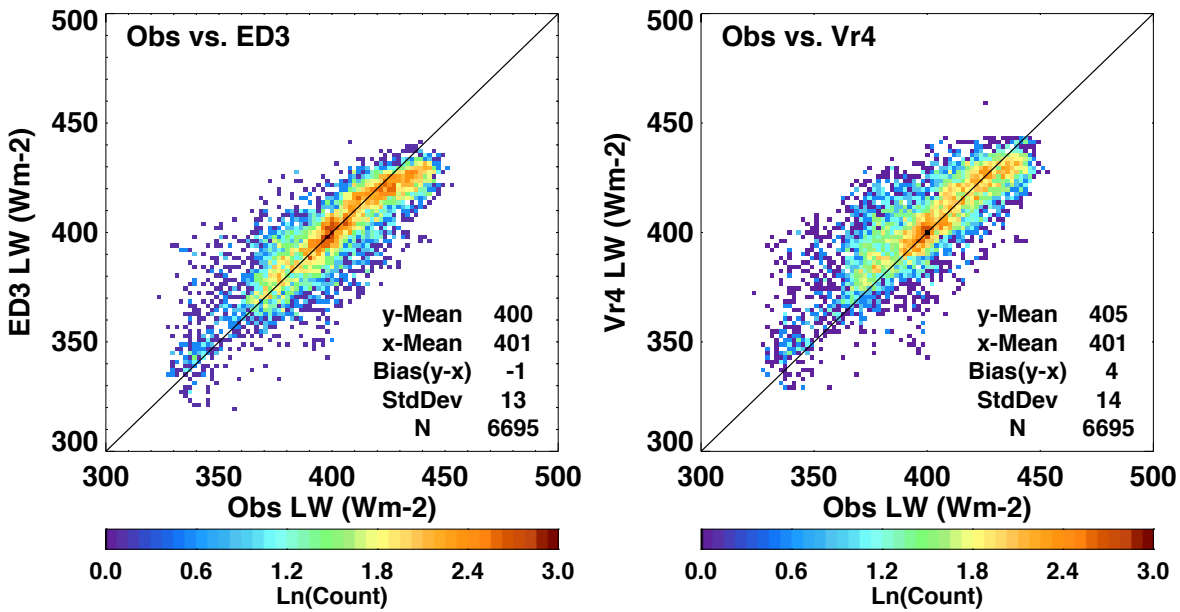


Land Based Surface Site
Buoy Site Including LW & SW Observation
Buoy Site SW Observation Only

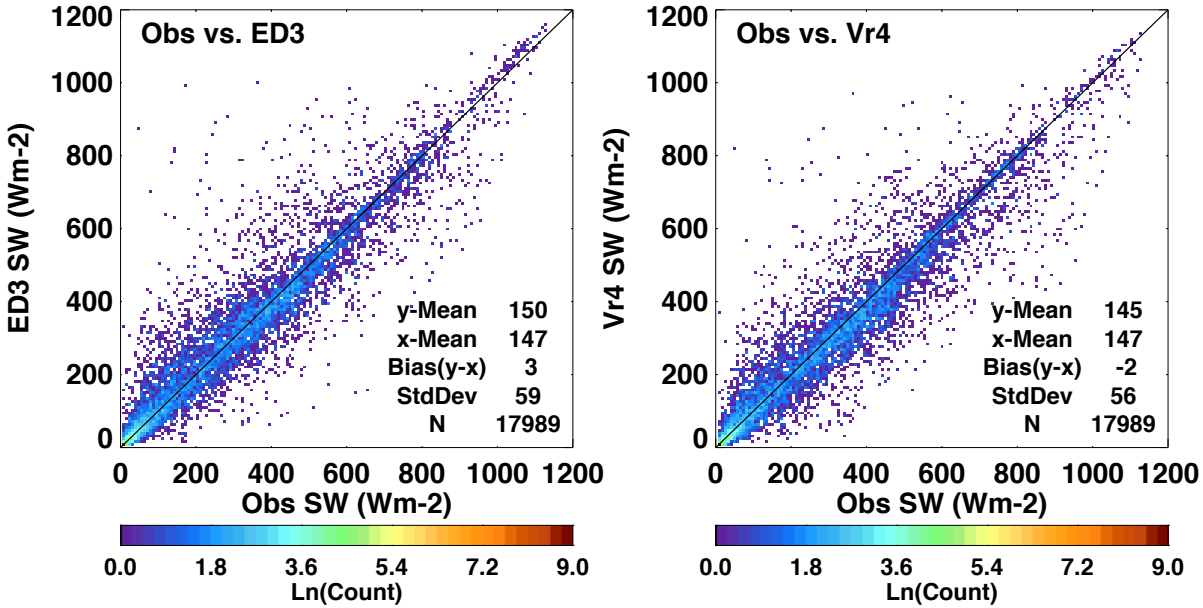
Surface LW Down 1 Hourly (Land Group, 27 Sites)



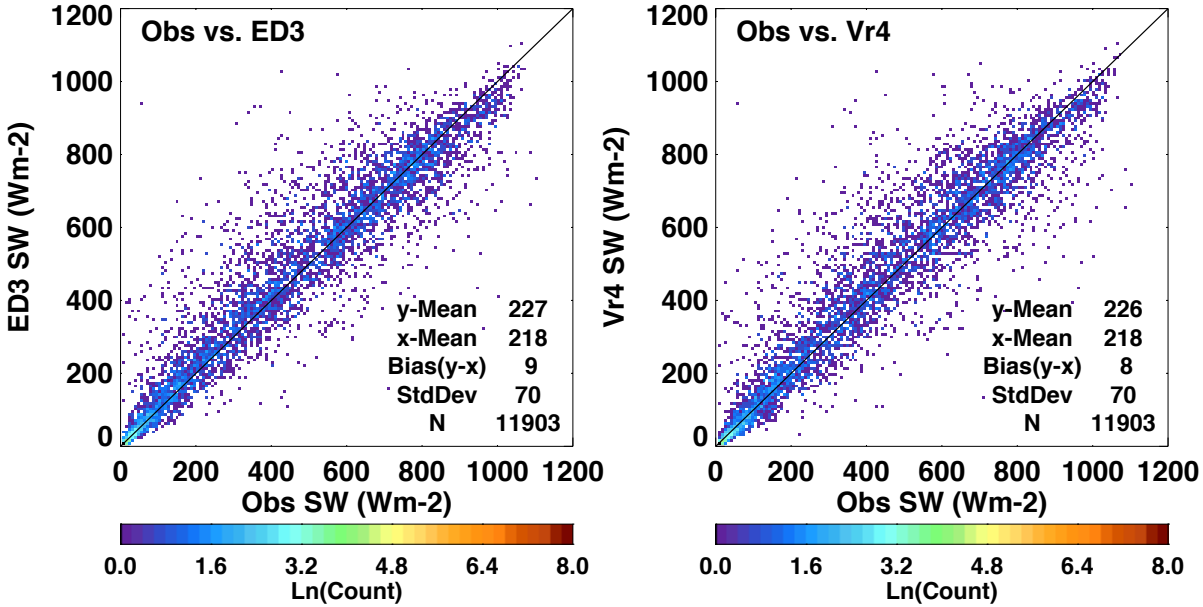
Surface LW Down 1 Hourly (Ocean (Buoys) Group, 9 Sites)



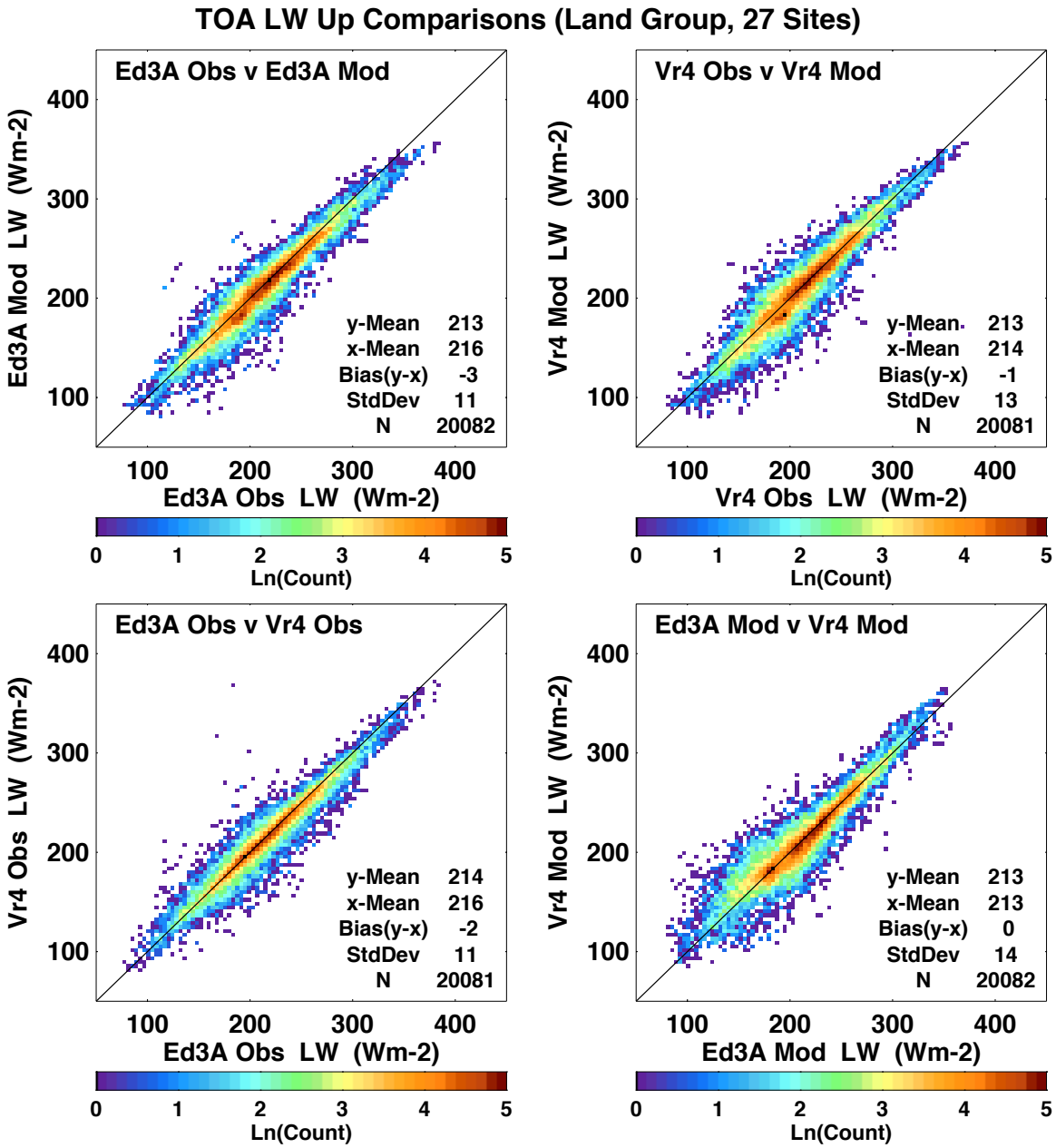
Surface SW Down 1 Hourly (Land Group, 27 Sites)



Surface SW Down 1 Hourly (Ocean (Buoys) Group, 16 Sites)



Surface Flux Comparisons SYN Ed3A & Proto Edition 4					
		Shortwave (Wm^{-2})		Longwave (Wm^{-2})	
		Bias	Std Dev	Bias	Std Dev
Land	Ed3	3	59	-4	25
	PrEd4	-2	56	1	26
Ocean	Ed3	9	70	-1	13
	PrEd4	8	70	4	14


TOA LW Up Comparisons (Land Group, 27 Sites)
Ed3A Obs v Ed3A Mod
y-Mean 213
x-Mean 216
Bias(y-x) -3
StdDev 11
N 20082
Ed3A Mod LW (Wm-2)
Ed3A Obs LW (Wm-2)
Ln(Count)
Vr4 Obs v Vr4 Mod
y-Mean 213
x-Mean 214
Bias(y-x) -1
StdDev 13
N 20081
Vr4 Mod LW (Wm-2)
Vr4 Obs LW (Wm-2)
Ln(Count)
Ed3A Obs v Vr4 Obs
y-Mean 214
x-Mean 216
Bias(y-x) -2
StdDev 11
N 20081
Vr4 Obs LW (Wm-2)
Ed3A Obs LW (Wm-2)
Ln(Count)
Ed3A Mod v Vr4 Mod
y-Mean 213
x-Mean 213
Bias(y-x) 0
StdDev 14
N 20082
Vr4 Mod LW (Wm-2)
Ed3A Mod LW (Wm-2)
Ln(Count)

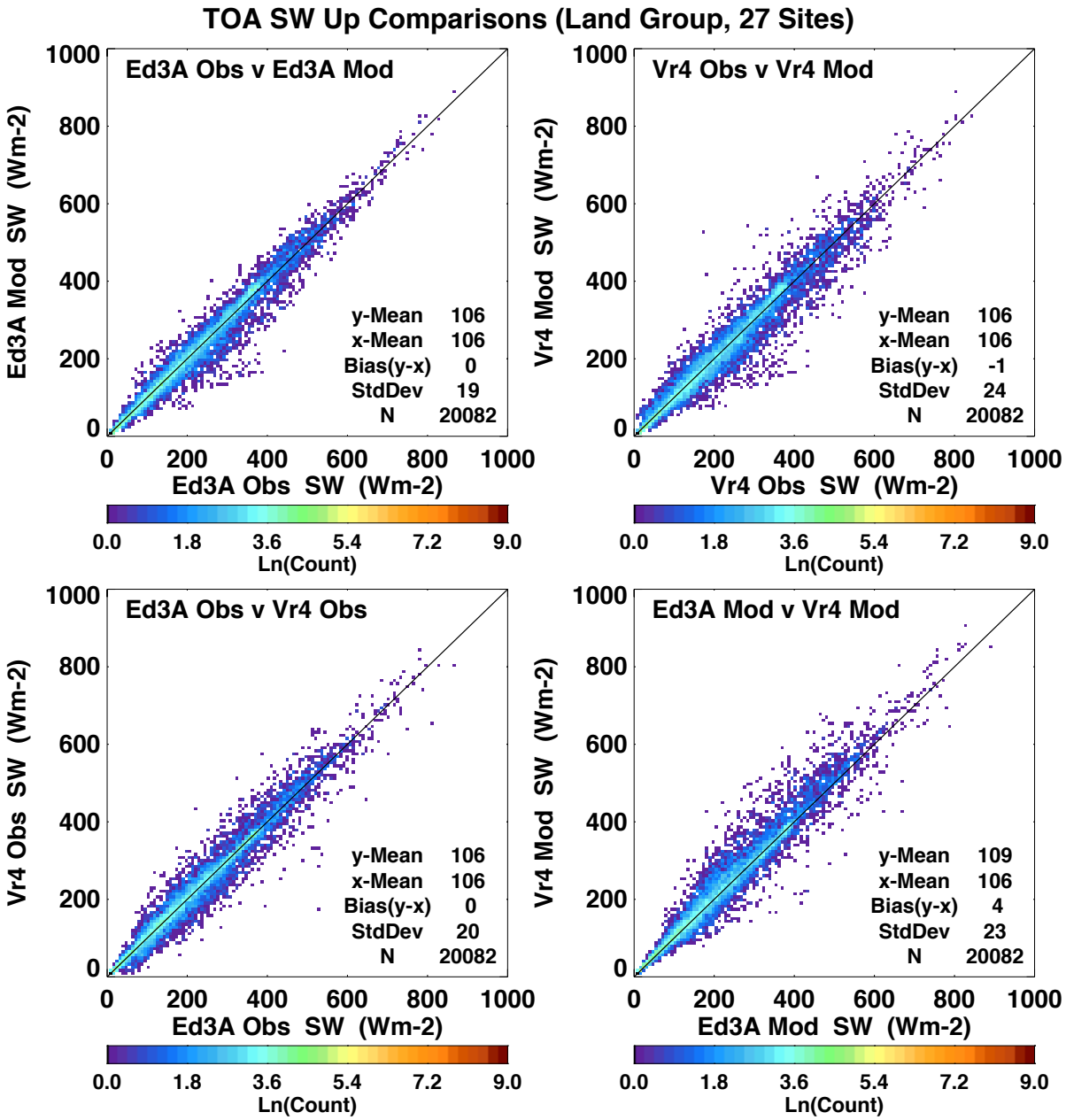

TOA SW Up Comparisons (Land Group, 27 Sites)
Ed3A Obs v Ed3A Mod
y-Mean 106
x-Mean 106
Bias(y-x) 0
StdDev 19
N 20082
Ed3A Mod SW (Wm-2)
Ed3A Obs SW (Wm-2)
Vr4 Obs v Vr4 Mod
y-Mean 106
x-Mean 106
Bias(y-x) -1
StdDev 24
N 20082
Vr4 Mod SW (Wm-2)
Vr4 Obs SW (Wm-2)
Ed3A Obs v Vr4 Obs
y-Mean 106
x-Mean 106
Bias(y-x) 0
StdDev 20
N 20082
Vr4 Obs SW (Wm-2)
Ed3A Obs SW (Wm-2)
Ed3A Mod v Vr4 Mod
y-Mean 109
x-Mean 106
Bias(y-x) 4
StdDev 23
N 20082
Vr4 Mod SW (Wm-2)
Ed3A Mod SW (Wm-2)
0 200 400 600 800 1000
0.0 1.8 3.6 5.4 7.2 9.0
Ln(Count)

Table compares Edition 3 Model-Observations and Proto Edition 4 at the same times and places.

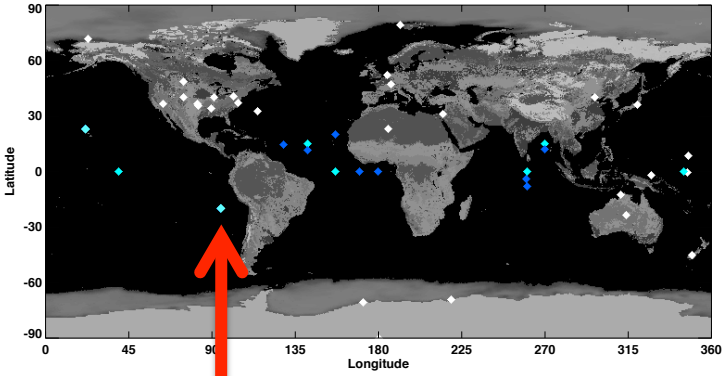
Hourly TOA Up Flux Comparisons SYN Ed3A & Proto Edition 4					
		Shortwave (Wm^{-2})		Longwave (Wm^{-2})	
	Mod-Obs	Bias	Std Dev	Bias	Std Dev
Land	Ed3	0	19	-2	11
	PreEd4	-1	24	-1	13
Ocean	Ed3	7	17	-1	9
	PreEd4	2	26	0	10

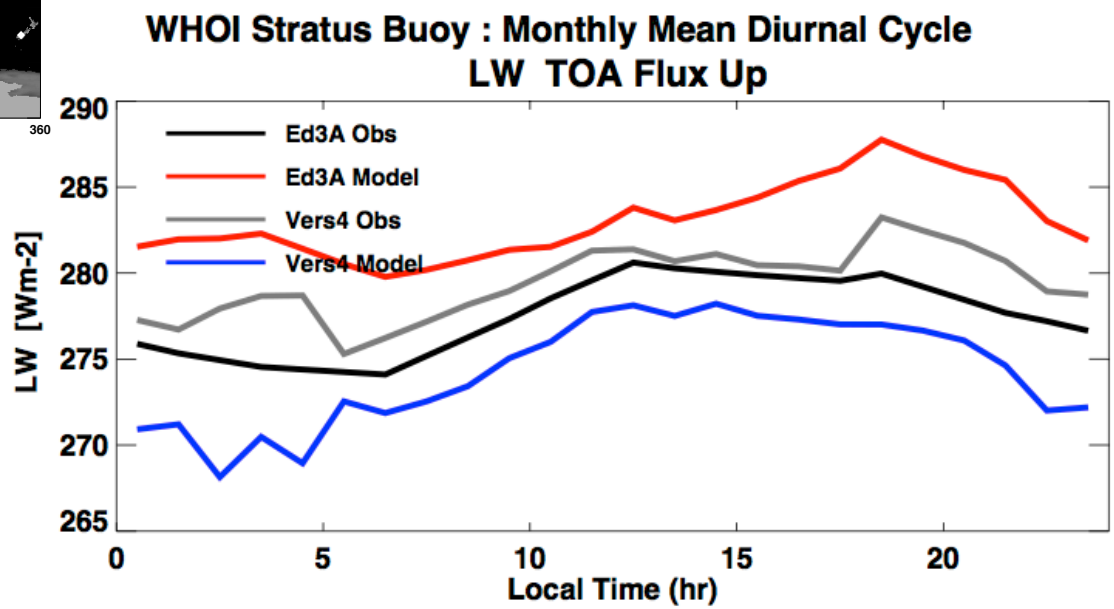
Table compares Edition 3 Observations to Proto Edition 4 Observations.

Hourly TOA Up Flux Comparisons SYN Ed3A & Proto Edition 4				
	Shortwave (Wm^{-2})		Longwave (Wm^{-2})	
Vr4-Ed3	Bias	Std Dev	Bias	Std Dev
Land	0	20	-2	11
Ocean	5	25	-1	9

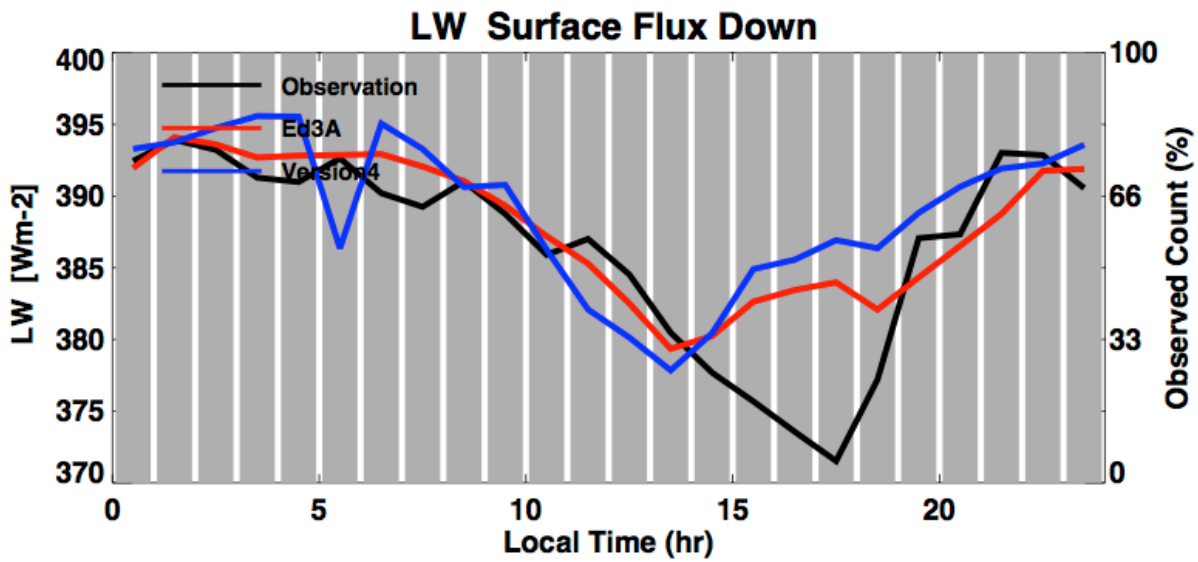
Table compares Edition 3 Calculations to Proto Edition 4 Calculations.

Hourly TOA Up Flux Comparisons SYN Ed3A & Proto Edition 4				
	Shortwave (Wm^{-2})		Longwave (Wm^{-2})	
Vr4-Ed3	Bias	Std Dev	Bias	Std Dev
Land	4	23	0	14
Ocean	0	22	1	13

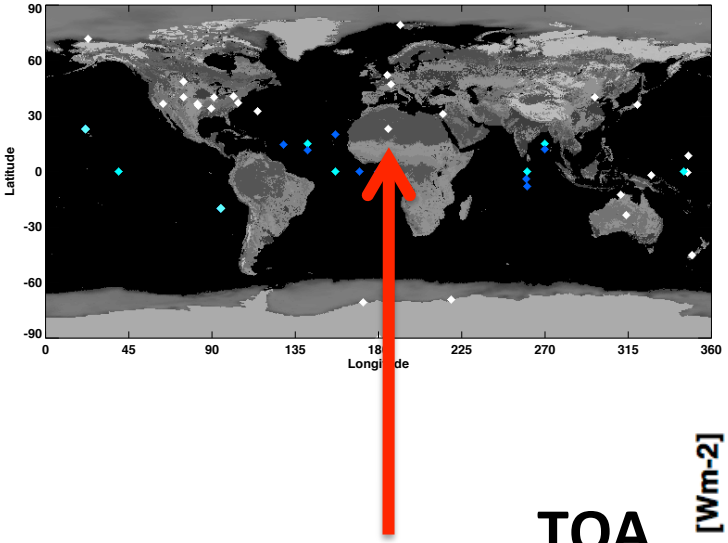

Latitude
Longitude


WHOI Stratus Buoy : Monthly Mean Diurnal Cycle
LW TOA Flux Up
Ed3A Obs
Ed3A Model
Vers4 Obs
Vers4 Model
LW [Wm-2]
Local Time (hr)

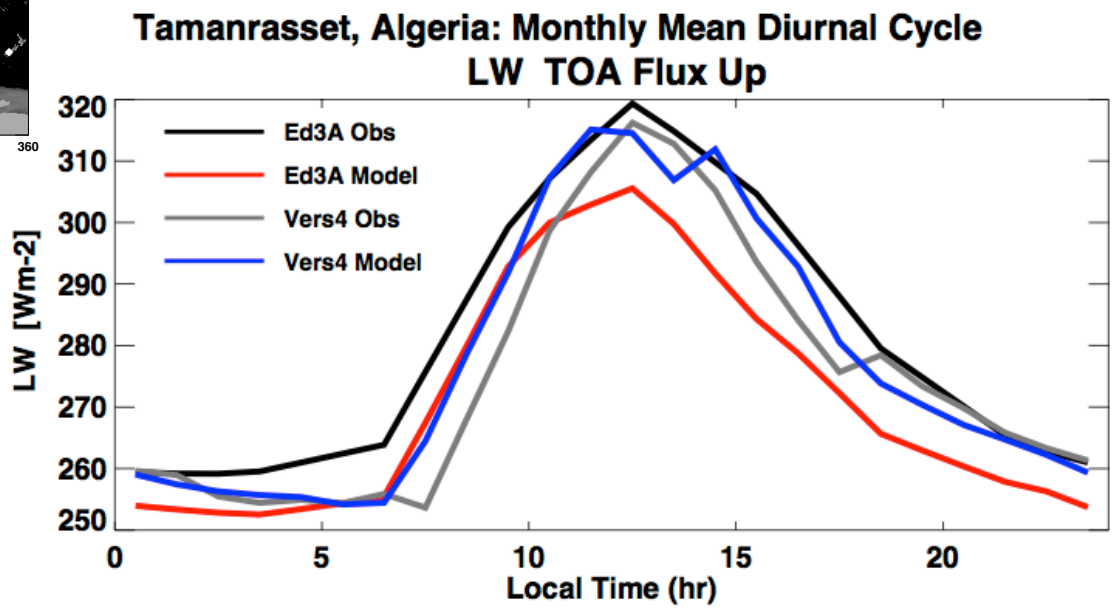
TOA


LW Surface Flux Down
Observation
Ed3A
Version4
LW [Wm-2]
Observed Count (%)
Local Time (hr)

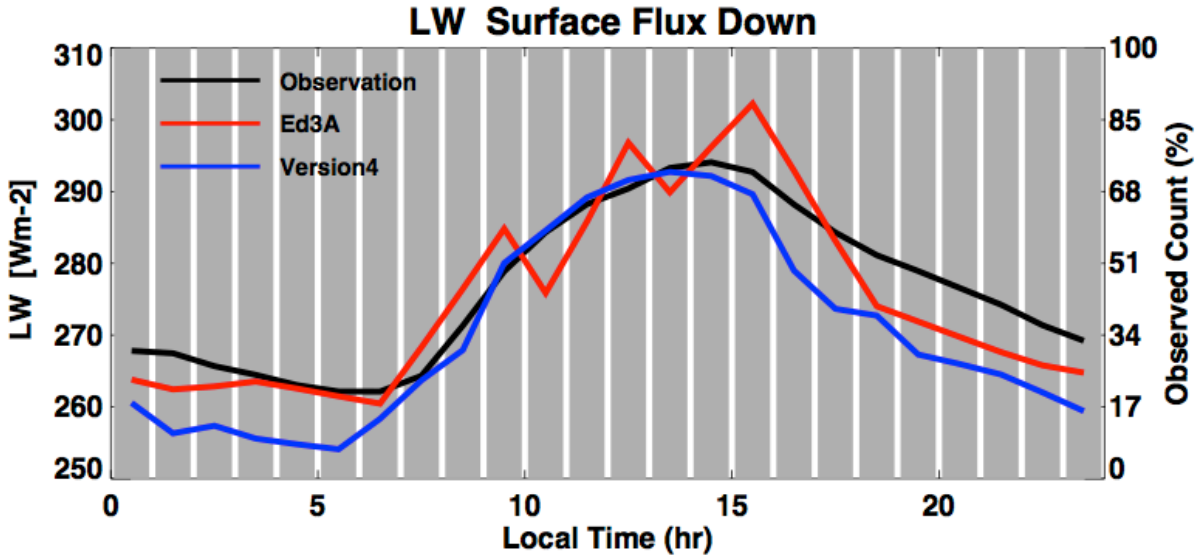
Surface

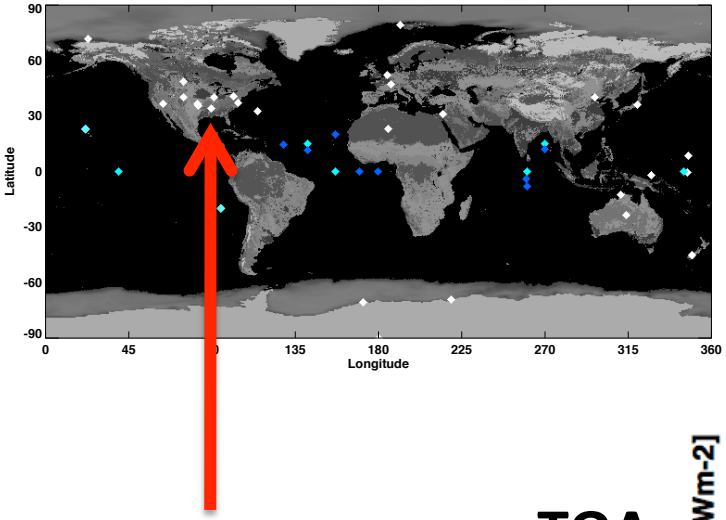

Latitude
Longitude

TOA

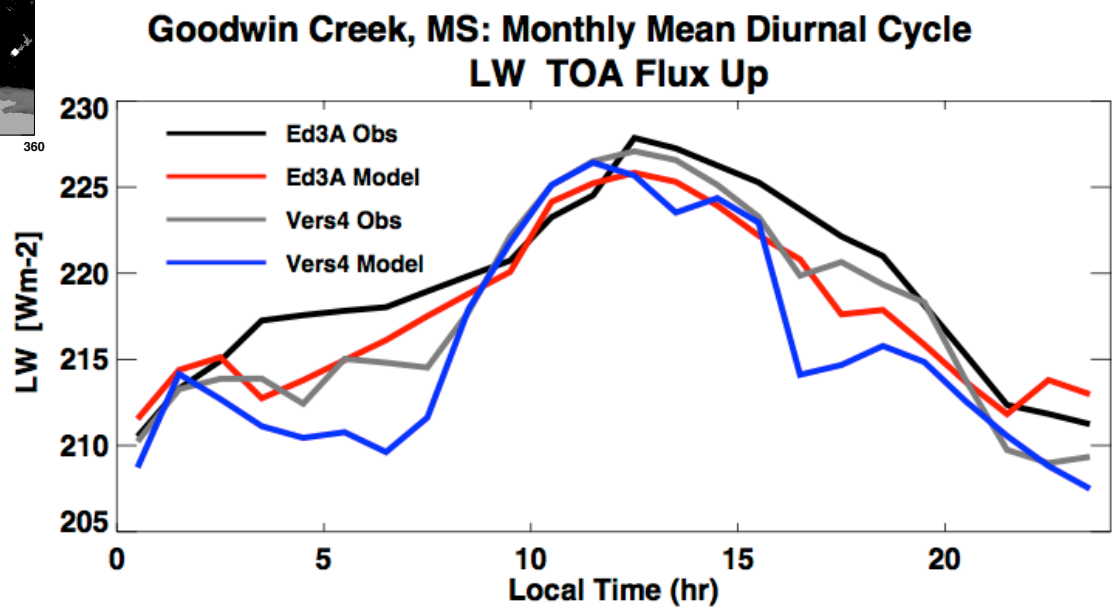

Tamanrasset, Algeria: Monthly Mean Diurnal Cycle
LW TOA Flux Up
Ed3A Obs
Ed3A Model
Vers4 Obs
Vers4 Model
LW [Wm-2]
Local Time (hr)

Surface

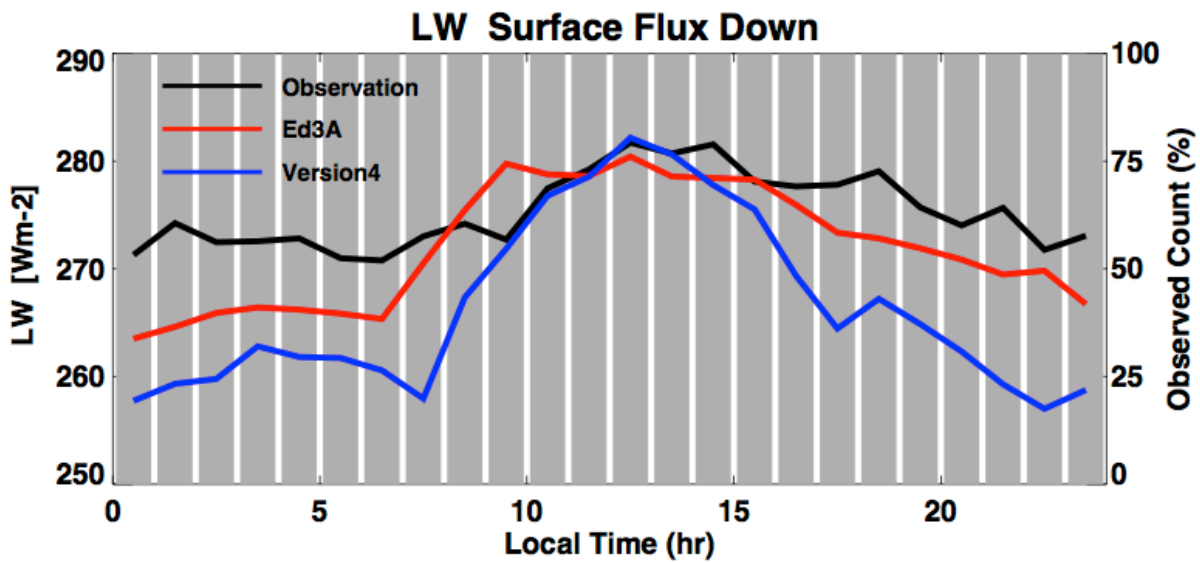

LW Surface Flux Down
Observation
Ed3A
Version4
LW [Wm-2]
Observed Count (%)
Local Time (hr)

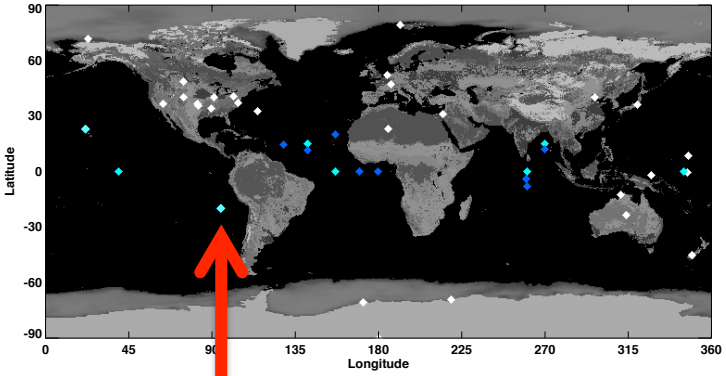

90
60
30
0
-30
-60
-90
Latitude
0
45
135
180
225
270
315
360
Longitude

TOA

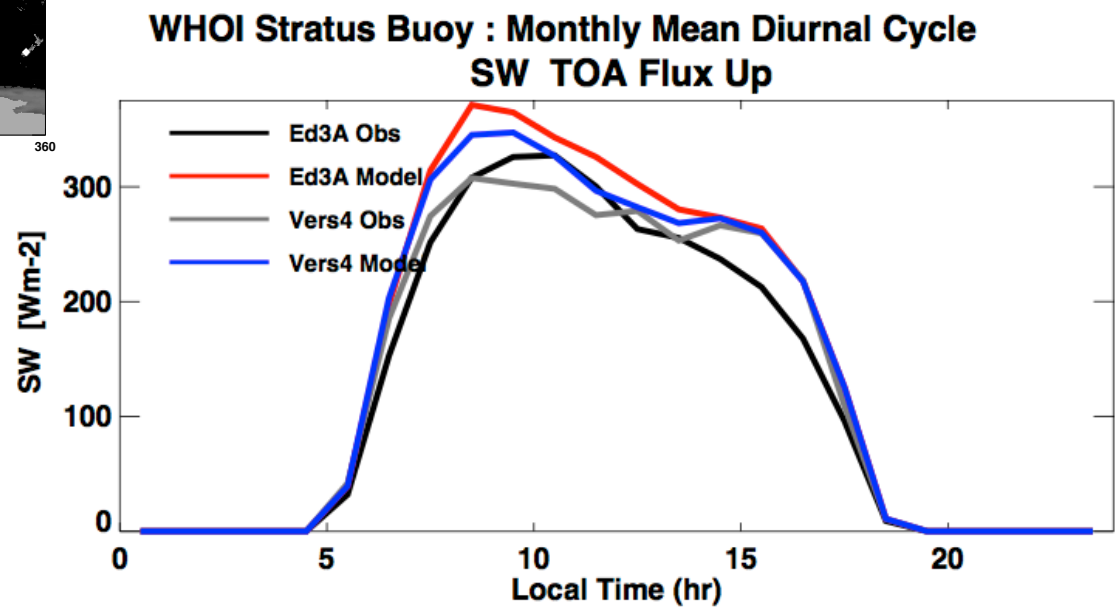

Goodwin Creek, MS: Monthly Mean Diurnal Cycle
LW TOA Flux Up
Ed3A Obs
Ed3A Model
Vers4 Obs
Vers4 Model
LW [Wm-2]
230
225
220
215
210
205
0
5
10
15
20
Local Time (hr)

Surface

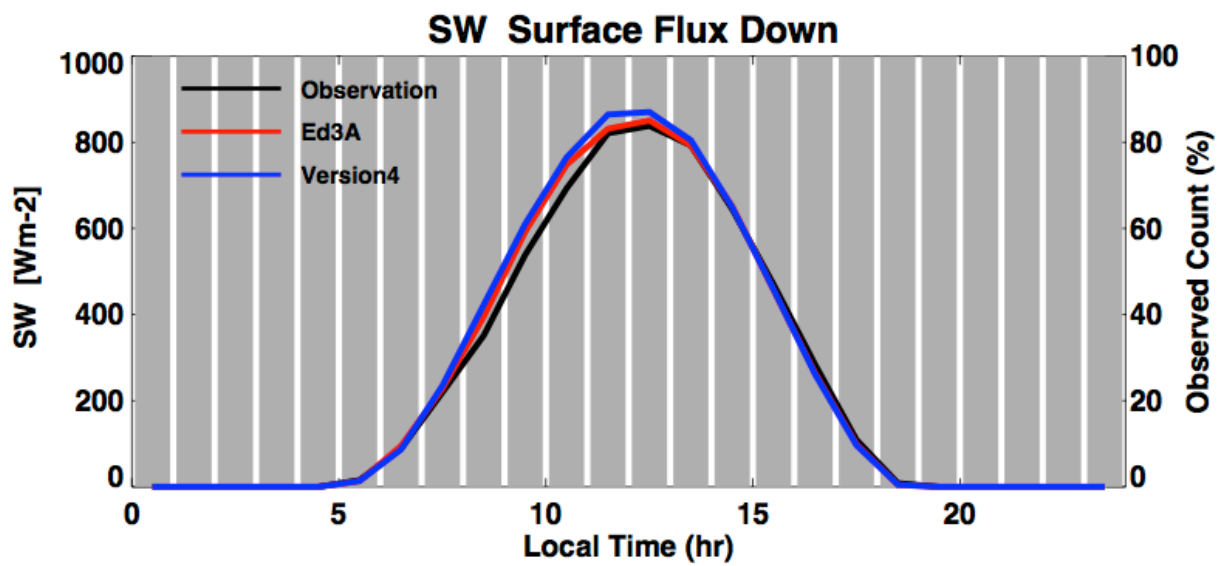

LW Surface Flux Down
Observation
Ed3A
Version4
LW [Wm-2]
290
280
270
260
250
Observed Count (%)
100
75
50
25
0
0
5
10
15
20
Local Time (hr)

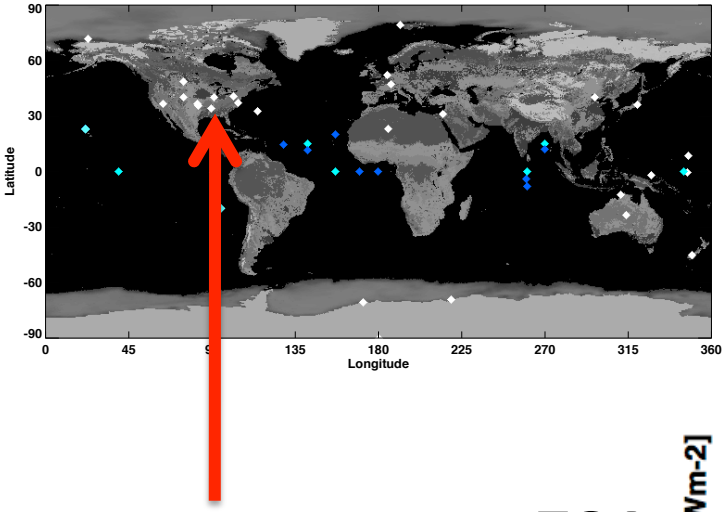

Latitude
Longitude
90
60
30
0
-30
-60
-90
0
45
90
135
180
225
270
315
360

TOA

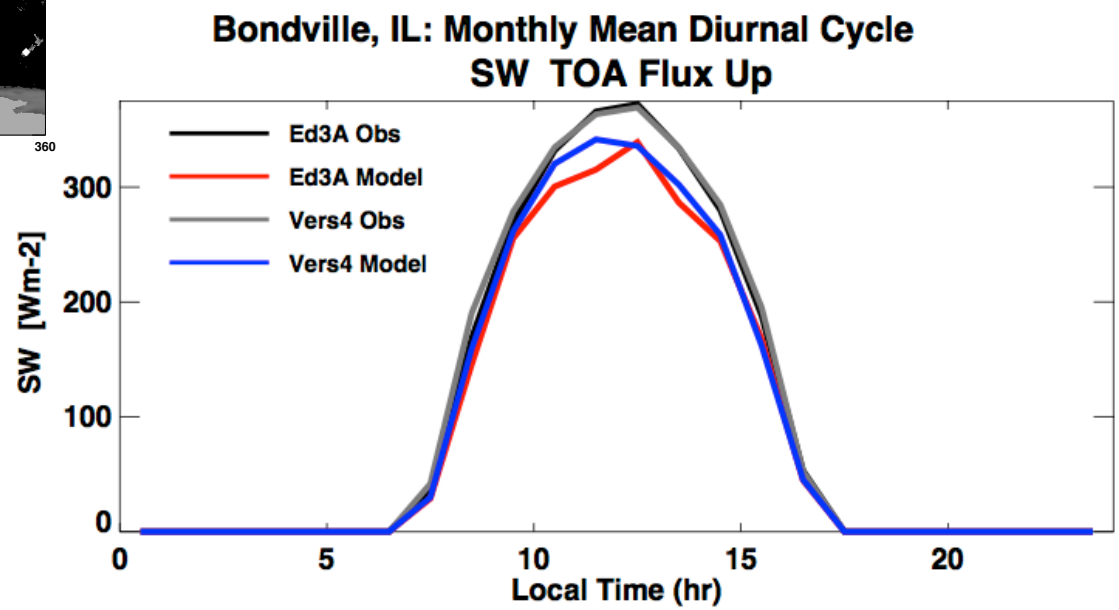

WHOI Stratus Buoy : Monthly Mean Diurnal Cycle
SW TOA Flux Up
Ed3A Obs
Ed3A Model
Vers4 Obs
Vers4 Model
SW [Wm-2]
Local Time (hr)
0
100
200
300
0
5
10
15
20

Surface

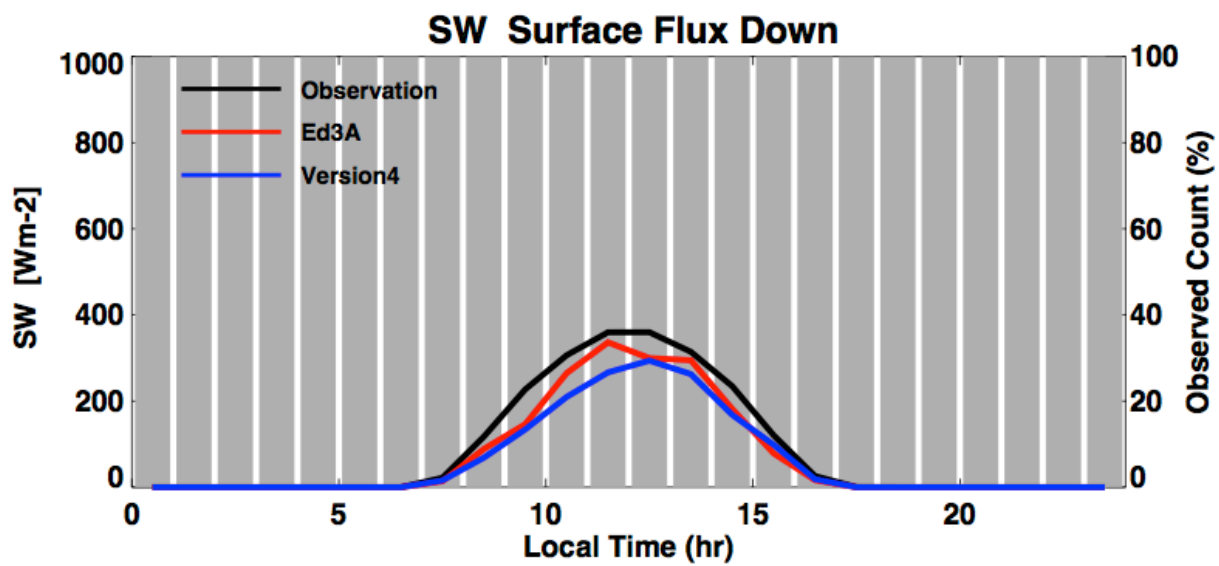

SW Surface Flux Down
Observation
Ed3A
Version4
SW [Wm-2]
Observed Count (%)
Local Time (hr)
0
200
400
600
800
1000
0
20
40
60
80
100
0
5
10
15
20


90
60
30
0
-30
-60
-90
Latitude
0
45
135
180
225
270
315
360
Longitude

TOA


Bondville, IL: Monthly Mean Diurnal Cycle
SW TOA Flux Up
Ed3A Obs
Ed3A Model
Vers4 Obs
Vers4 Model
SW [Wm-2]
0
100
200
300
0
5
10
15
20
Local Time (hr)

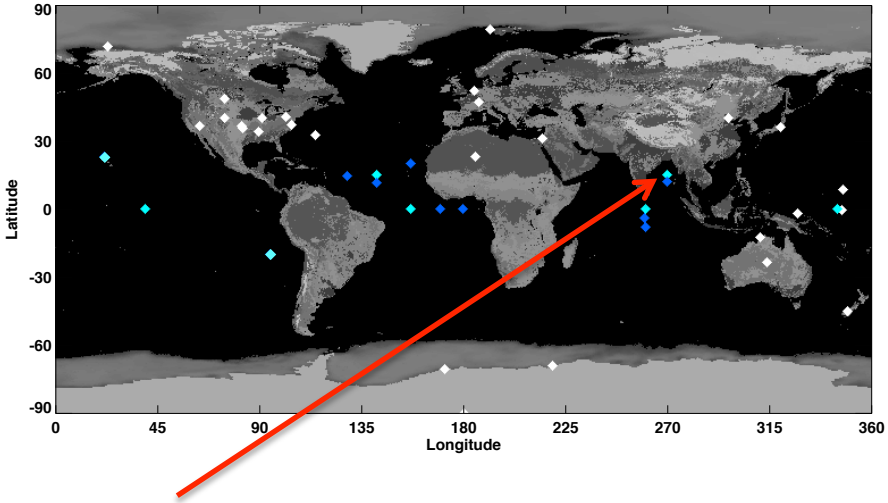
Surface

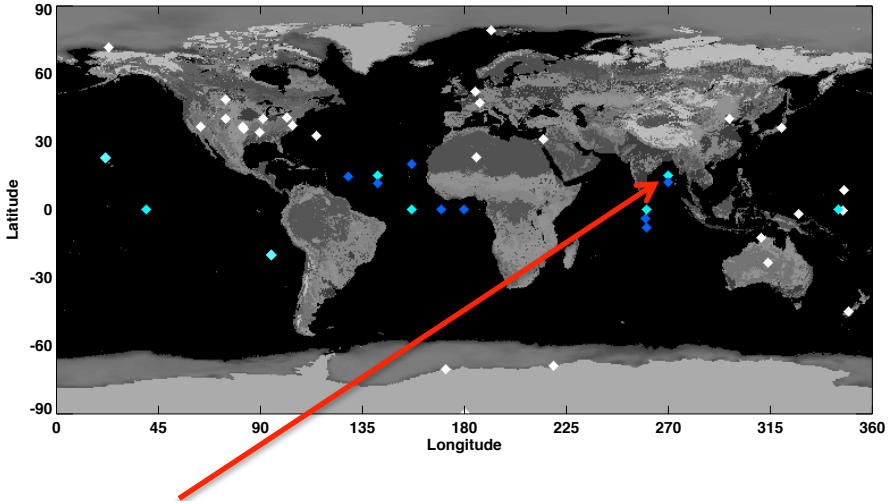

SW Surface Flux Down
Observation
Ed3A
Version4
SW [Wm-2]
0
200
400
600
800
1000
Observed Count (%)
0
20
40
60
80
100
0
5
10
15
20
Local Time (hr)

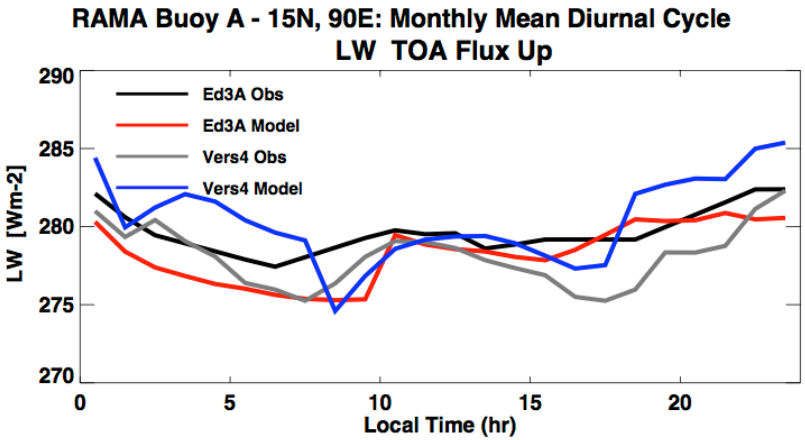
Summary

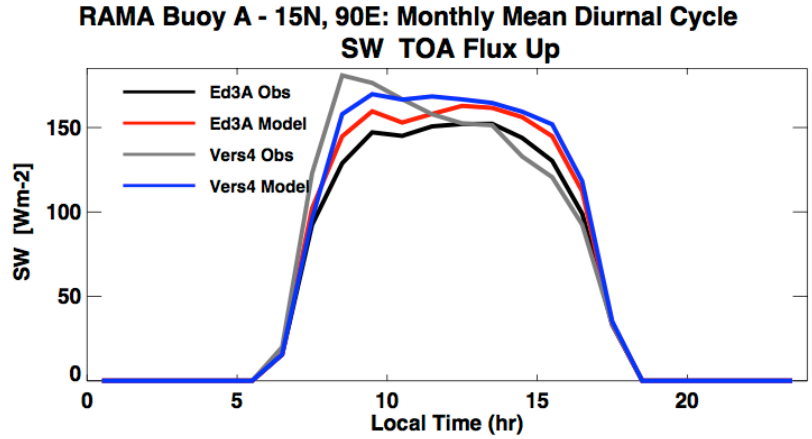
		Shortwave (Wm^{-2})		Longwave (Wm^{-2})	
		Bias	Std Dev	Bias	Std Dev
Land	Ed3	3	59	-4	25
	PrEd4	-2	56	1	26
Ocean	Ed3	9	70	-1	13
	PrEd4	8	70	4	14

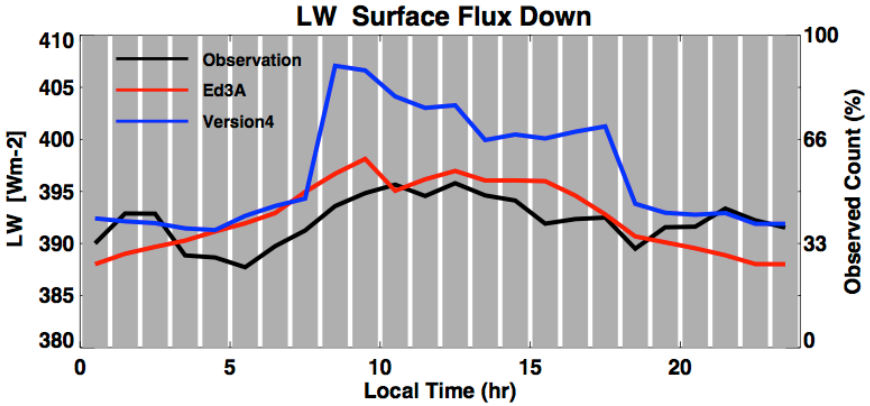
- Ed4 improves surface flux bias w.r.t. observations, for this month, leaving RMS essentially the same.
- Ed4 does not change TOA bias however SW RMS at TOA at these sites increases over land and ocean.
- Given usual caveats regarding surface site vs grid box calculations: No Big surprises in diurnal cycle plots.

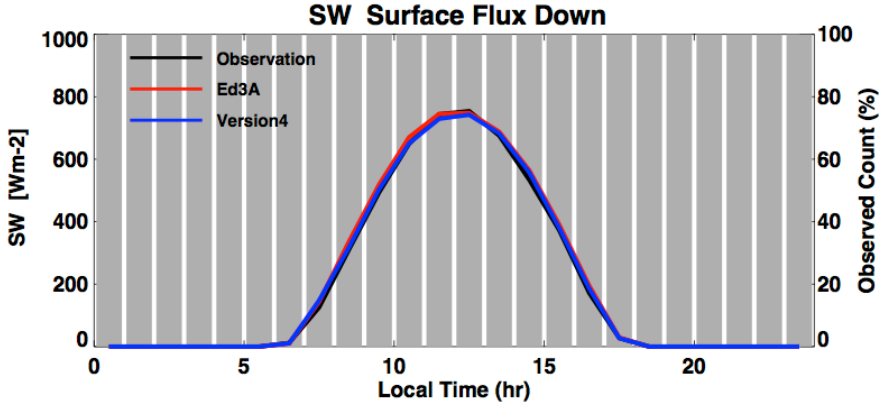

Latitude
Longitude

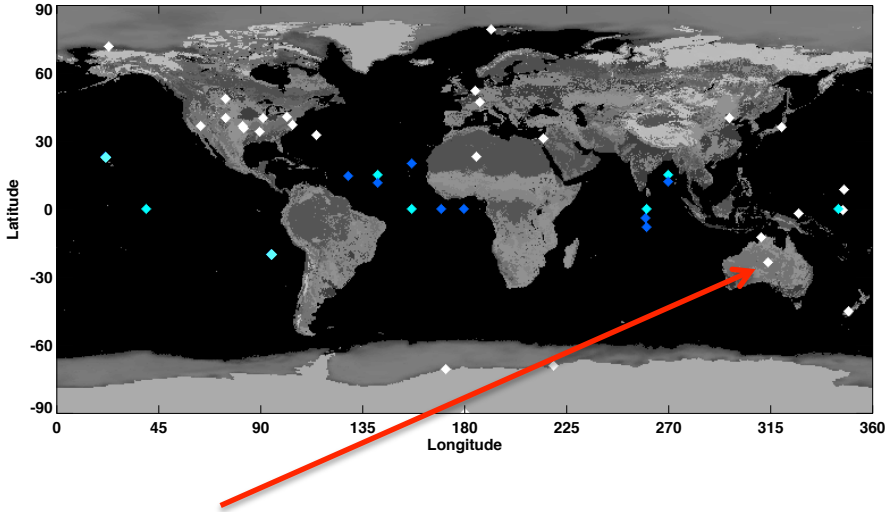

Latitude
Longitude

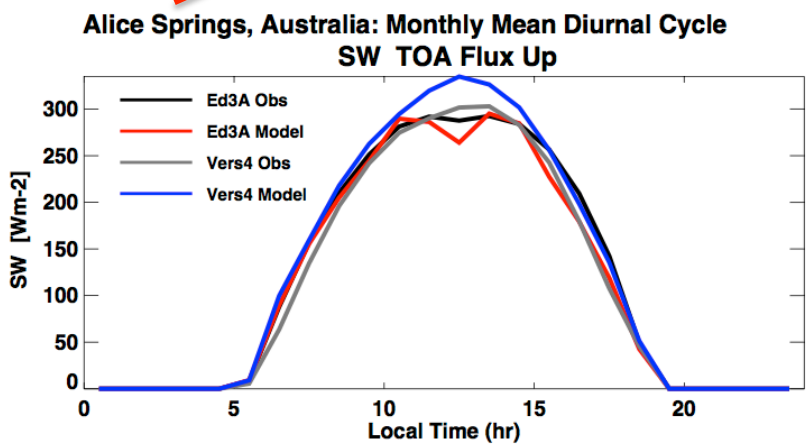

RAMA Buoy A - 15N, 90E: Monthly Mean Diurnal Cycle
LW TOA Flux Up
Ed3A Obs
Ed3A Model
Vers4 Obs
Vers4 Model
LW [Wm-2]
Local Time (hr)

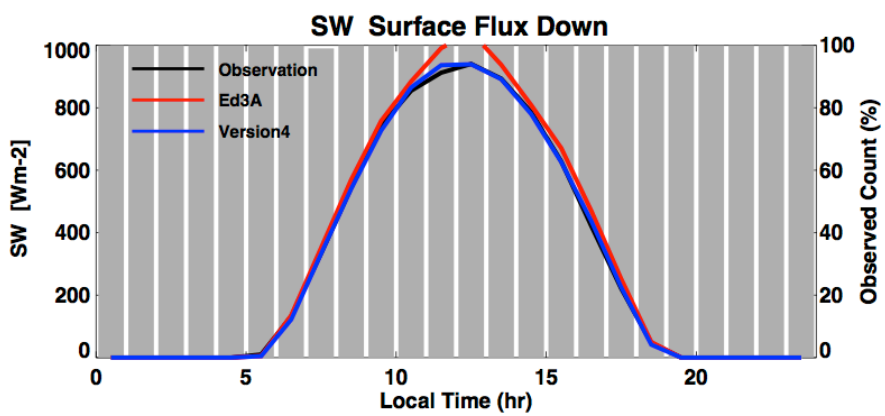

RAMA Buoy A - 15N, 90E: Monthly Mean Diurnal Cycle
SW TOA Flux Up
Ed3A Obs
Ed3A Model
Vers4 Obs
Vers4 Model
SW [Wm-2]
Local Time (hr)


LW Surface Flux Down
Observation
Ed3A
Version4
LW [Wm-2]
Observed Count (%)
Local Time (hr)

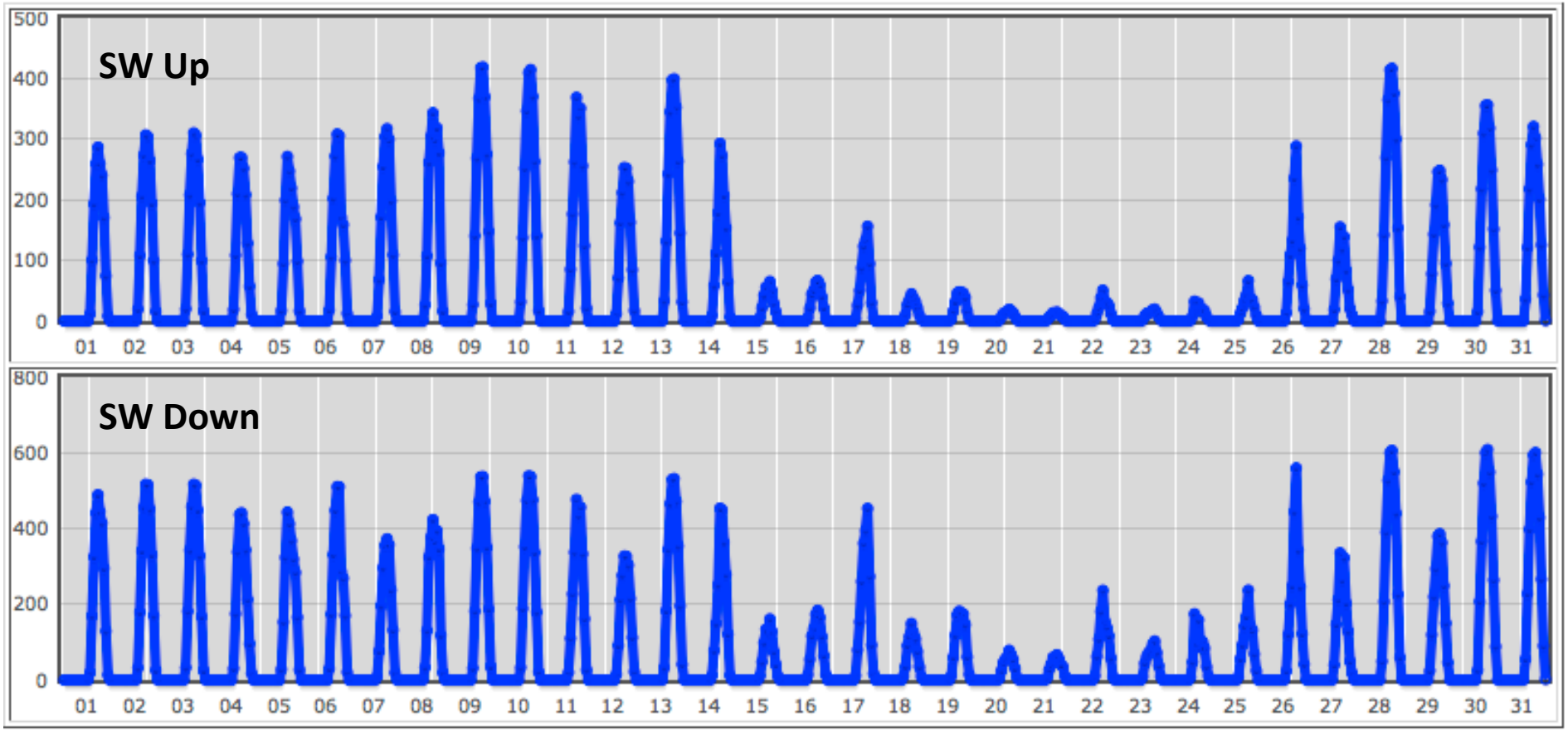

SW Surface Flux Down
Observation
Ed3A
Version4
SW [Wm-2]
Observed Count (%)
Local Time (hr)

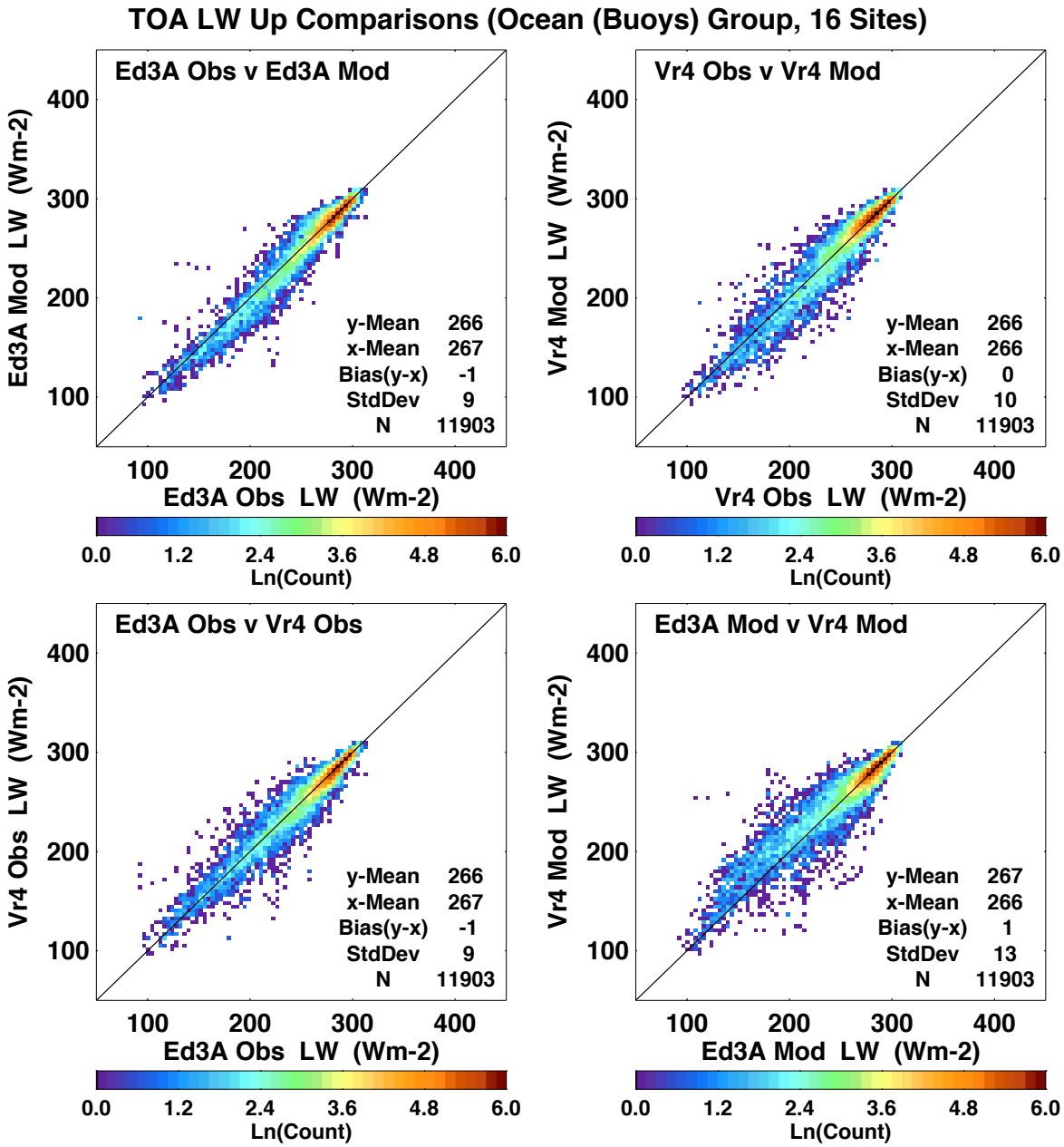

90
60
30
0
-30
-60
-90
Latitude
0
45
90
135
180
225
270
315
360
Longitude

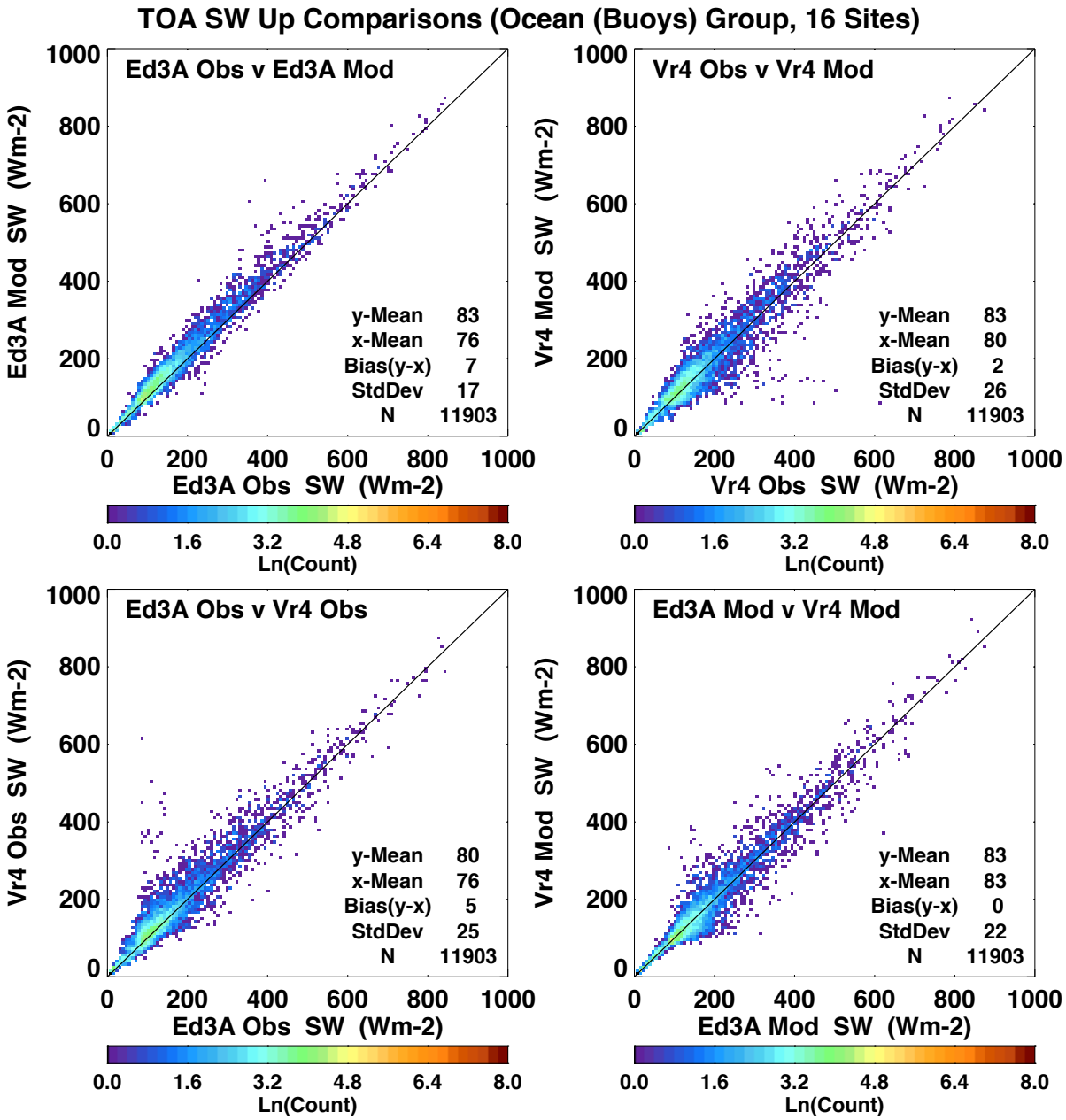

Alice Springs, Australia: Monthly Mean Diurnal Cycle
SW TOA Flux Up
Ed3A Obs
Ed3A Model
Vers4 Obs
Vers4 Model
SW [Wm-2]
300
250
200
150
100
50
0
0
5
10
15
20
Local Time (hr)


SW Surface Flux Down
Observation
Ed3A
Version4
SW [Wm-2]
1000
800
600
400
200
0
Observed Count (%)
100
80
60
40
20
0
0
5
10
15
20
Local Time (hr)

Bondville, IL **January - 2010 (hourly)**




TOA LW Up Comparisons (Ocean (Buoys) Group, 16 Sites)
Ed3A Obs v Ed3A Mod
y-Mean 266
x-Mean 267
Bias(y-x) -1
StdDev 9
N 11903
Ed3A Mod LW (Wm-2)
Ed3A Obs LW (Wm-2)
Vr4 Obs v Vr4 Mod
y-Mean 266
x-Mean 266
Bias(y-x) 0
StdDev 10
N 11903
Vr4 Mod LW (Wm-2)
Vr4 Obs LW (Wm-2)
Ed3A Obs v Vr4 Obs
y-Mean 266
x-Mean 267
Bias(y-x) -1
StdDev 9
N 11903
Vr4 Obs LW (Wm-2)
Ed3A Obs LW (Wm-2)
Ed3A Mod v Vr4 Mod
y-Mean 267
x-Mean 266
Bias(y-x) 1
StdDev 13
N 11903
Vr4 Mod LW (Wm-2)
Ed3A Mod LW (Wm-2)
100
200
300
400
0.0
1.2
2.4
3.6
4.8
6.0
Ln(Count)


TOA SW Up Comparisons (Ocean (Buoys) Group, 16 Sites)
Ed3A Obs v Ed3A Mod
y-Mean 83
x-Mean 76
Bias(y-x) 7
StdDev 17
N 11903
Ed3A Mod SW (Wm-2)
Ed3A Obs SW (Wm-2)
Vr4 Obs v Vr4 Mod
y-Mean 83
x-Mean 80
Bias(y-x) 2
StdDev 26
N 11903
Vr4 Mod SW (Wm-2)
Vr4 Obs SW (Wm-2)
Ed3A Obs v Vr4 Obs
y-Mean 80
x-Mean 76
Bias(y-x) 5
StdDev 25
N 11903
Vr4 Obs SW (Wm-2)
Ed3A Obs SW (Wm-2)
Ed3A Mod v Vr4 Mod
y-Mean 83
x-Mean 83
Bias(y-x) 0
StdDev 22
N 11903
Vr4 Mod SW (Wm-2)
Ed3A Mod SW (Wm-2)
0 200 400 600 800 1000
0.0 1.6 3.2 4.8 6.4 8.0
Ln(Count)