CERES Surface Validation Update & Uncertainty Study

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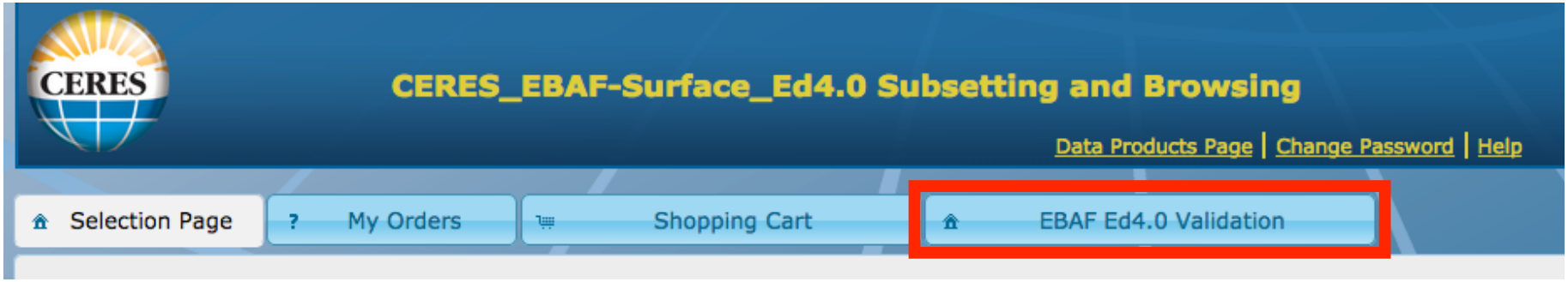
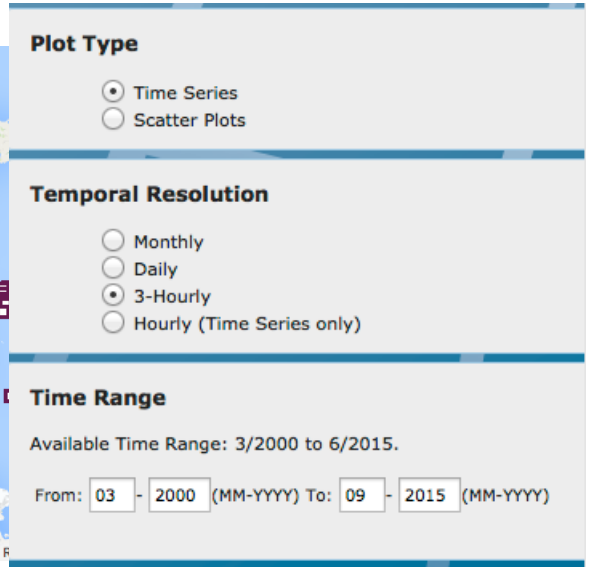
- Show how to access validation data.
- Summarize SYN1Deg & EBAF −surface results.
- Describe a study determining sensitivity of uncertainty (RMS) to spatial variability of surface sites.

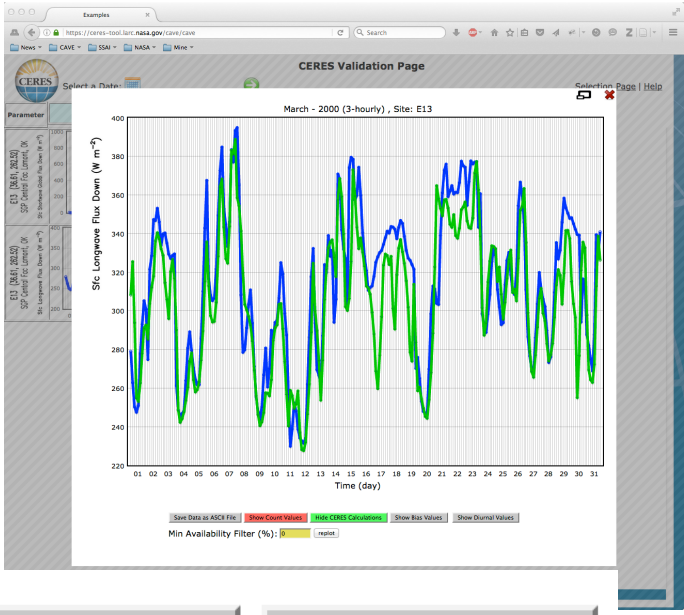
(All biases are based on Calculation − Observation)

CERES Data Access

https://ceres-tool.larc.nasa.gov/ord-tool







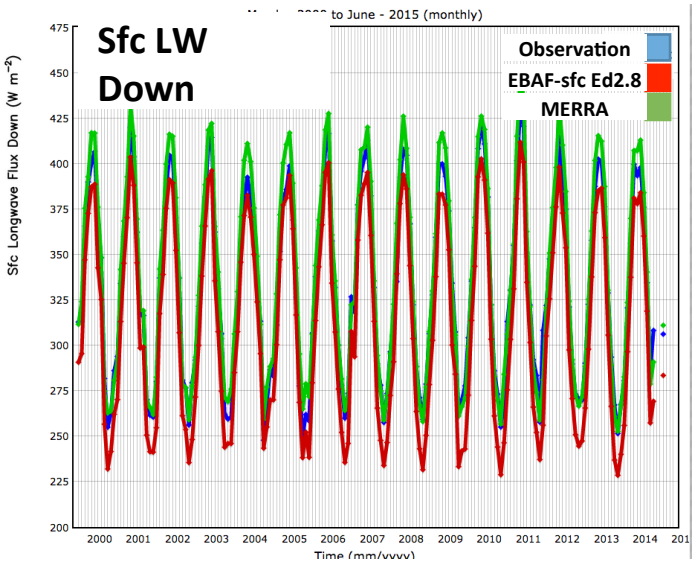
Save Data as ASCII File | Show Count Values | Hide CERES Calculations | Show Bias Values | Show Diurnal Values

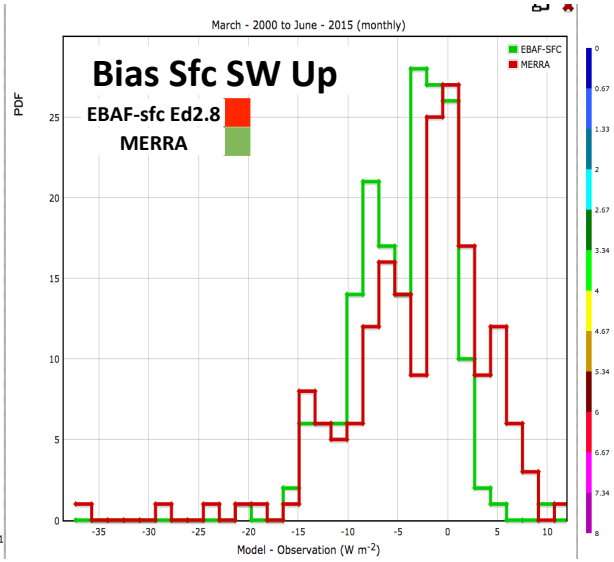
Min Availability Filter (%): 0 replot

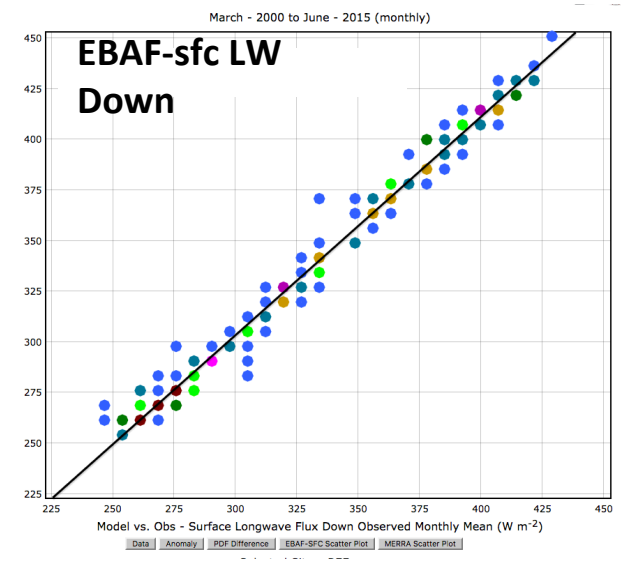
MD

EBAF-surface & MERRA Validation Access

http://ceres-iprod.larc.nasa.gov/cave2

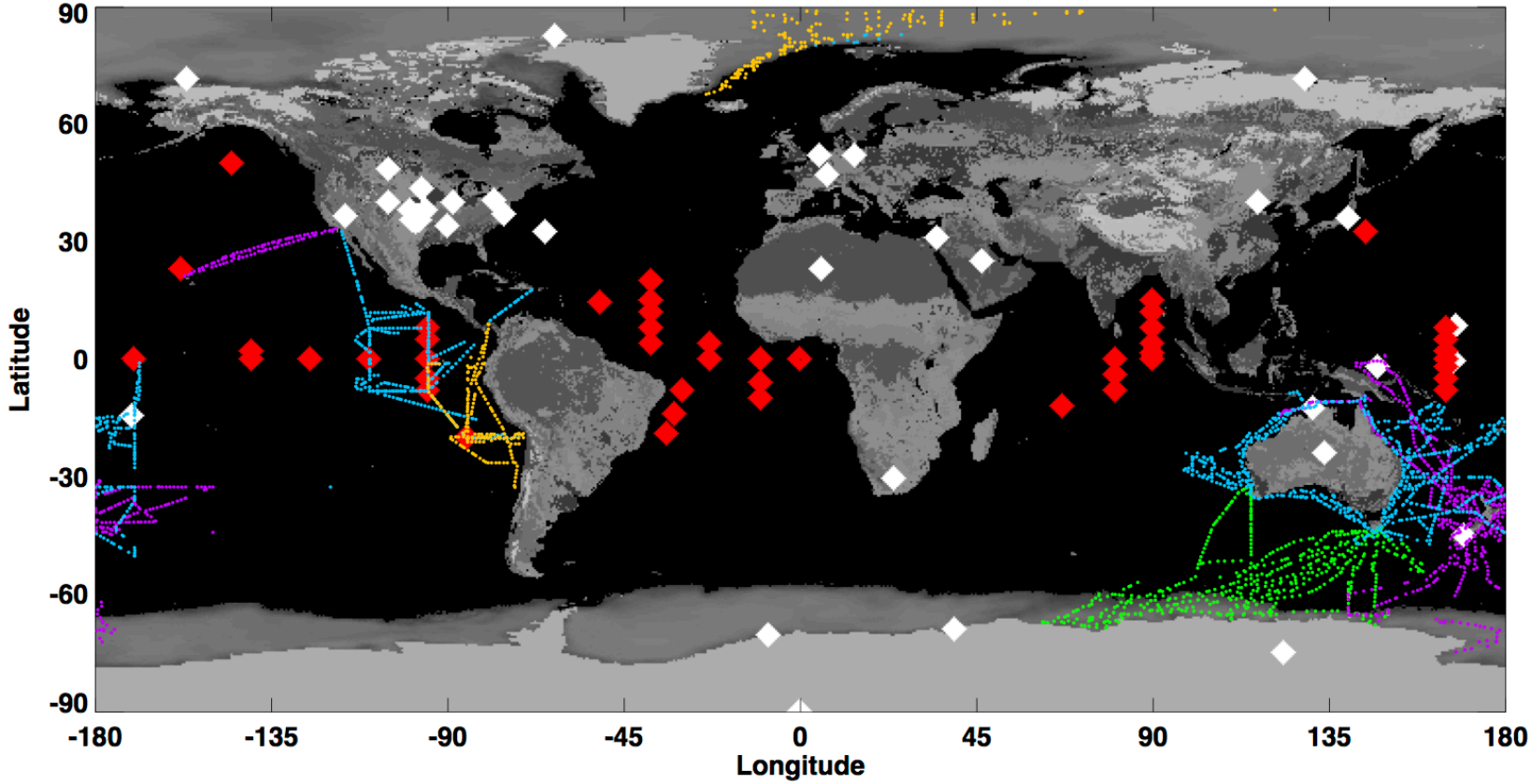






Surface Validation Summary

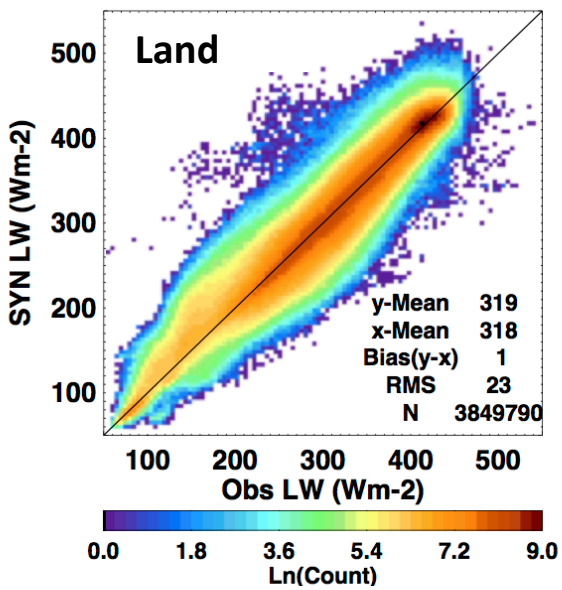
Available Surface Validation Sites

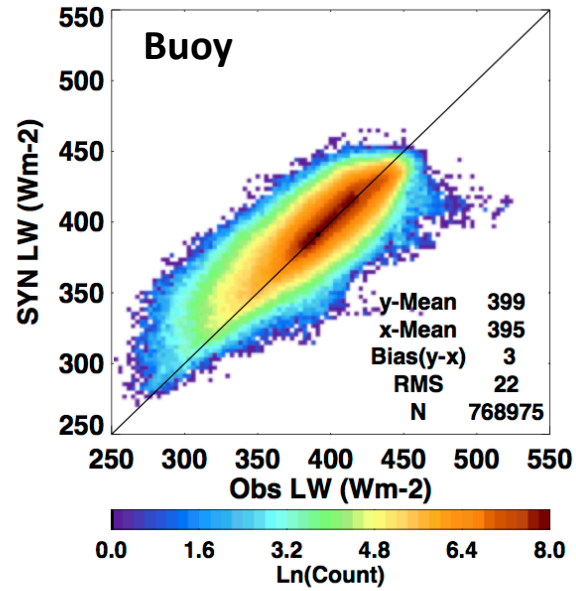


Longwave Surface Irradiance Down (SYN1Deg Ed4)

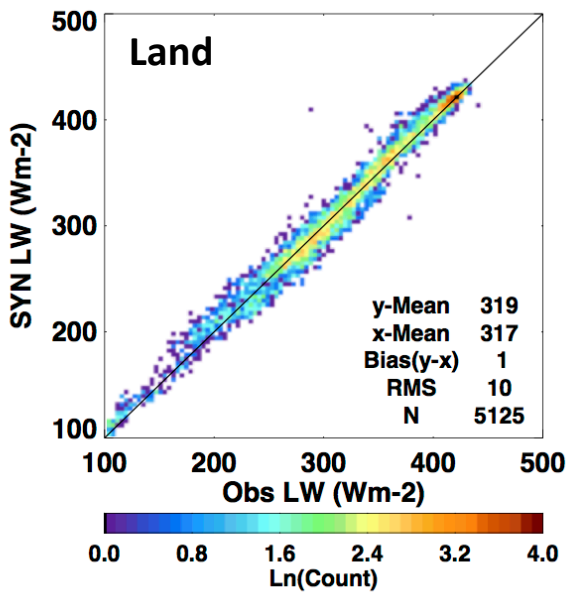
(2000/02 - 2016/12)

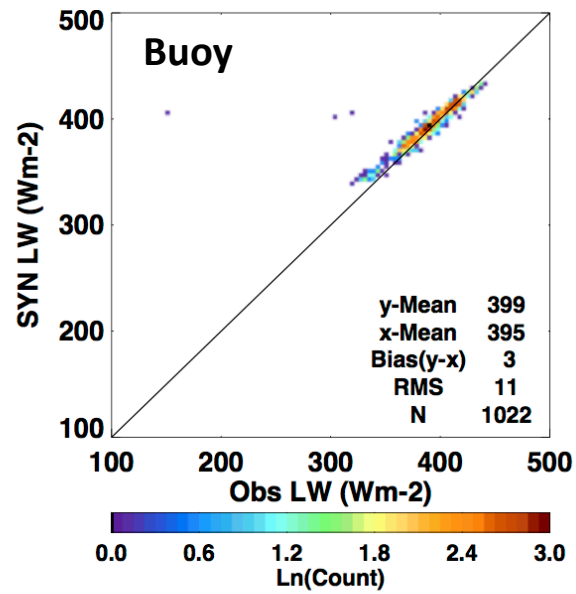
Hourly





Monthly

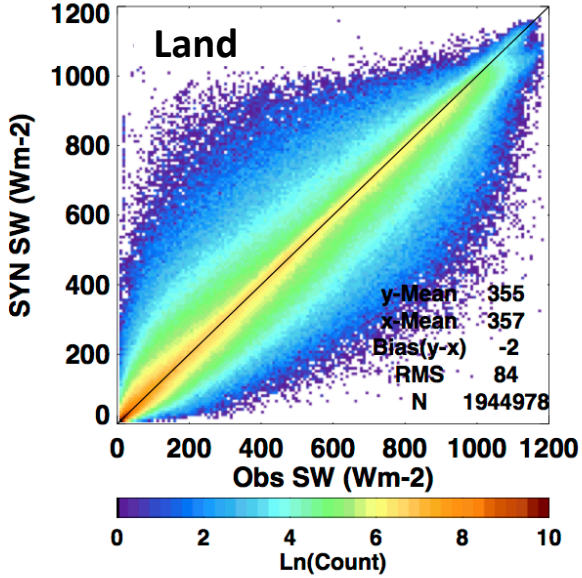


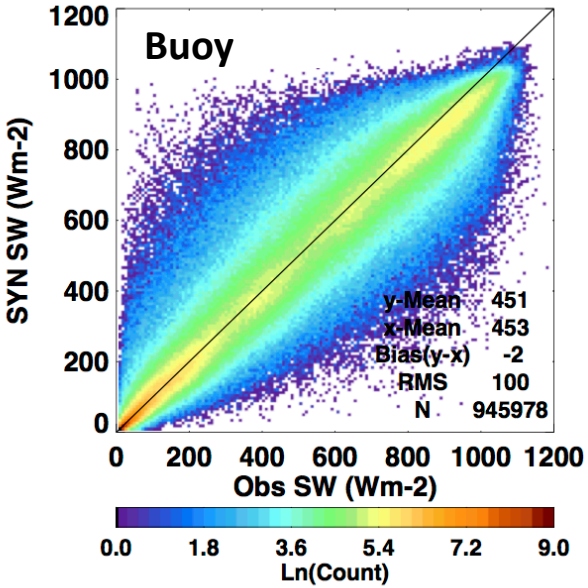


Shortwave Surface Irradiance Down (SYN1Deg Ed4)

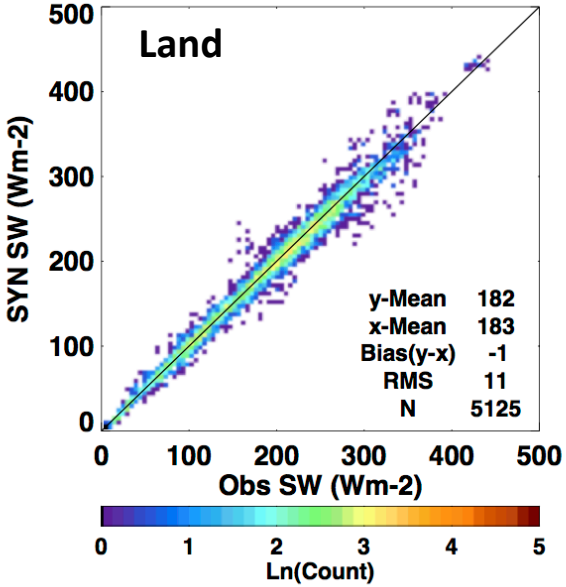
(2000/02 - 2016/12)

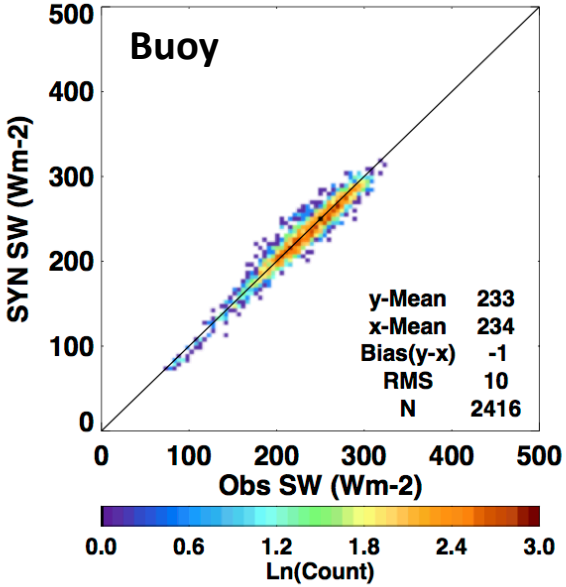
Hourly





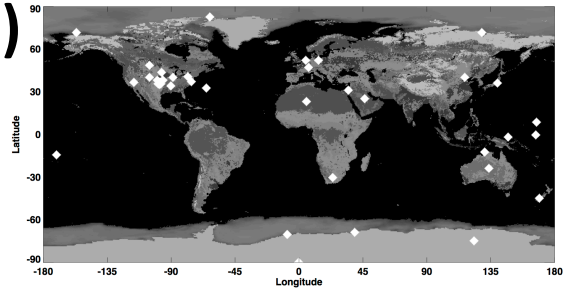
Monthly

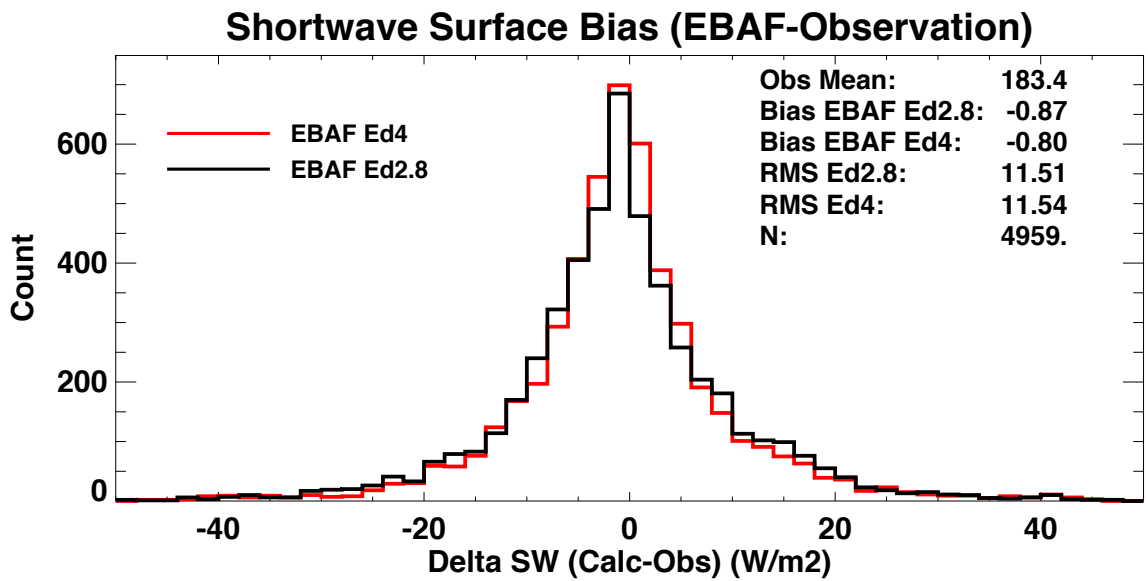


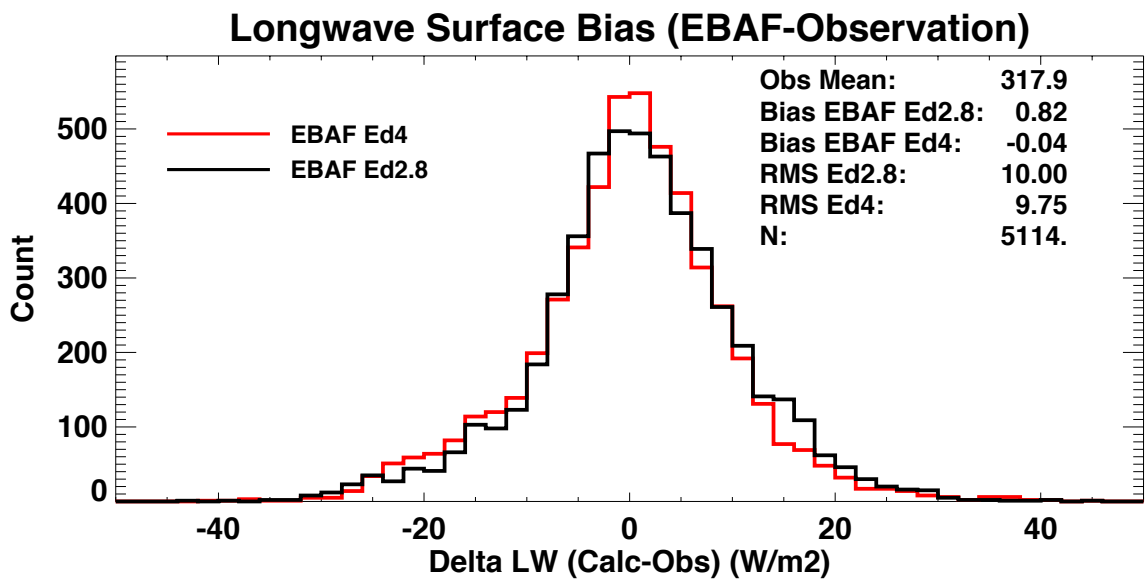


Surface Irradiance Down (EBAF-Surface Ed4)

Land Sites (2000/02 - 2016/12)

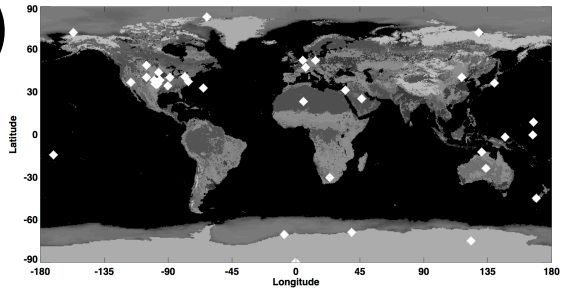


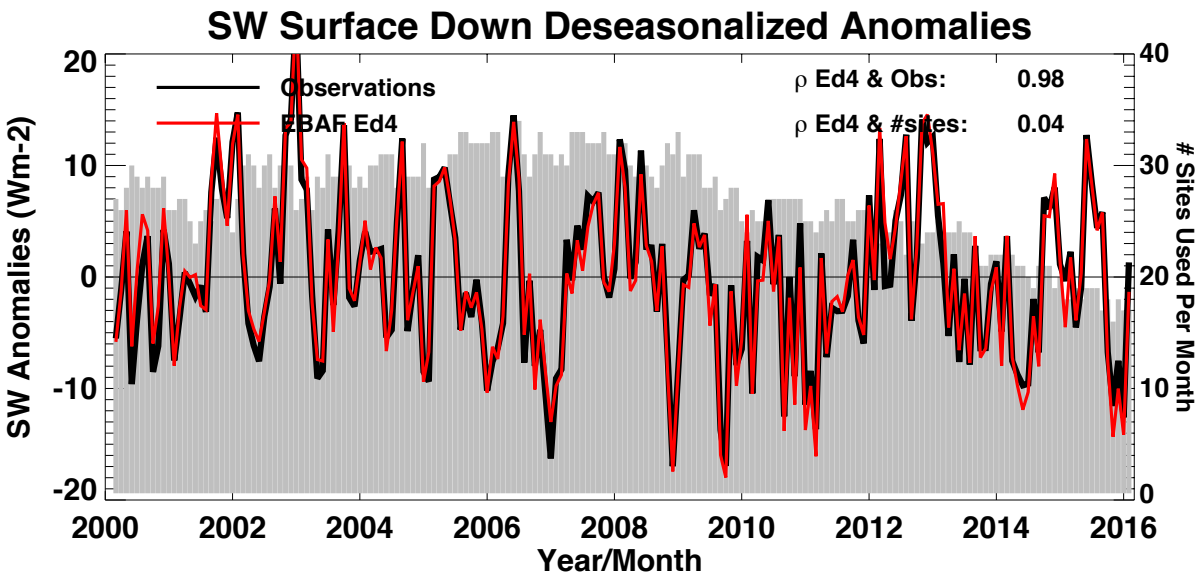


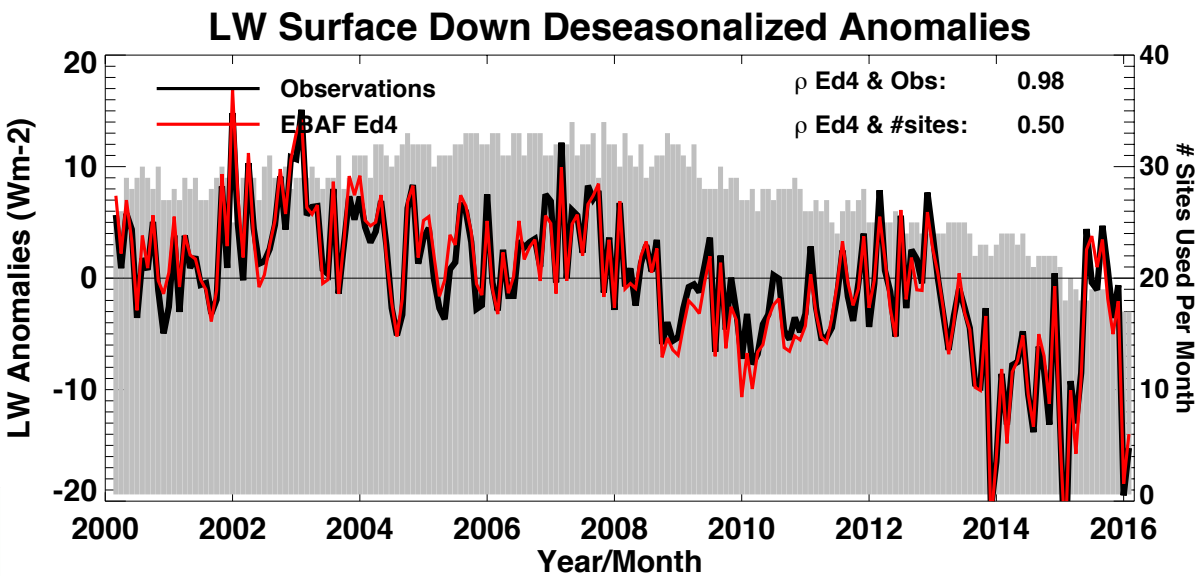


Surface Irradiance Down (EBAF-Surface Ed4)

Land Sites (2000/02 - 2016/12)

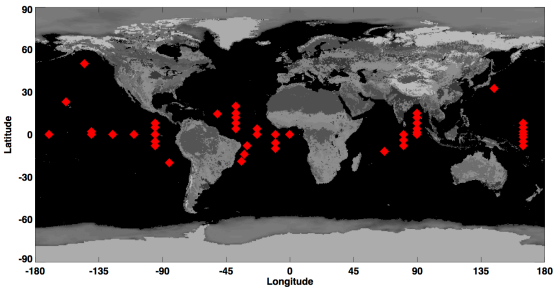


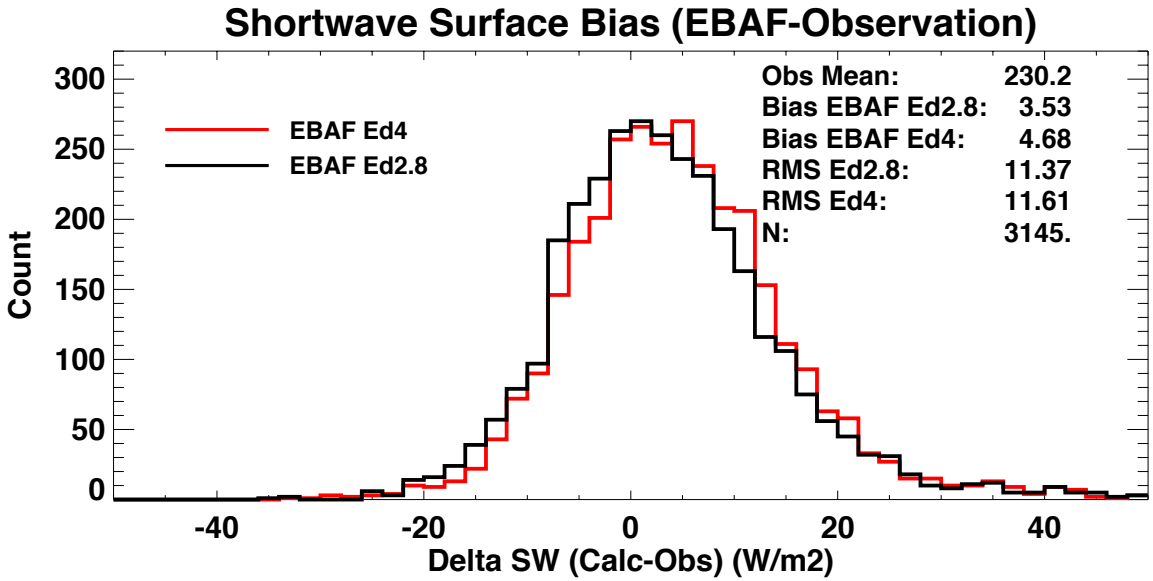


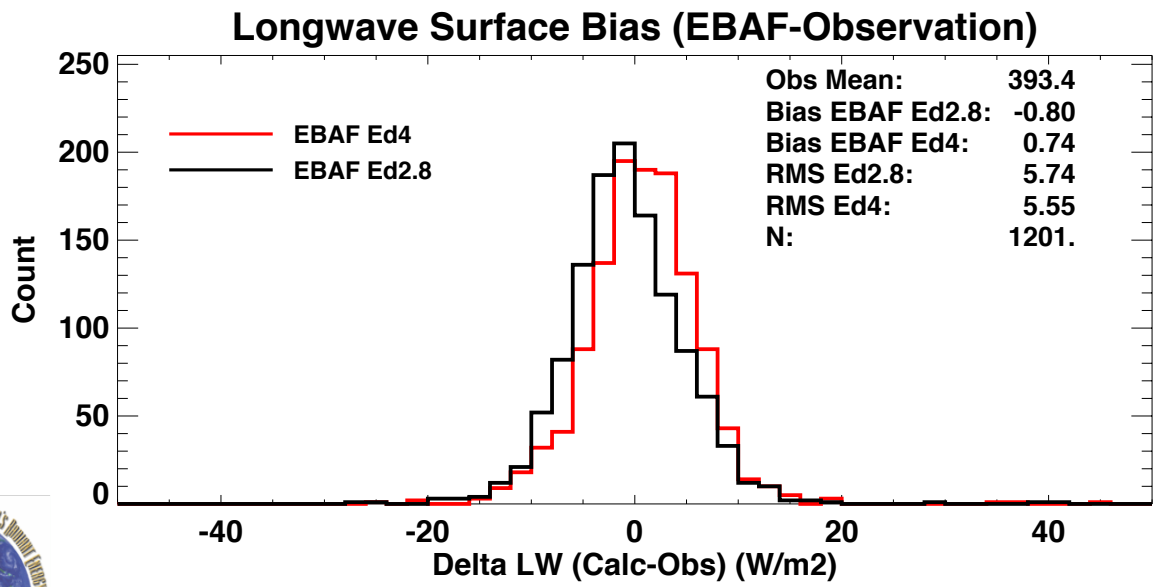


Surface Irradiance Down EBAF-Surface Ed4

Buoys (2000/02 - 2016/12)

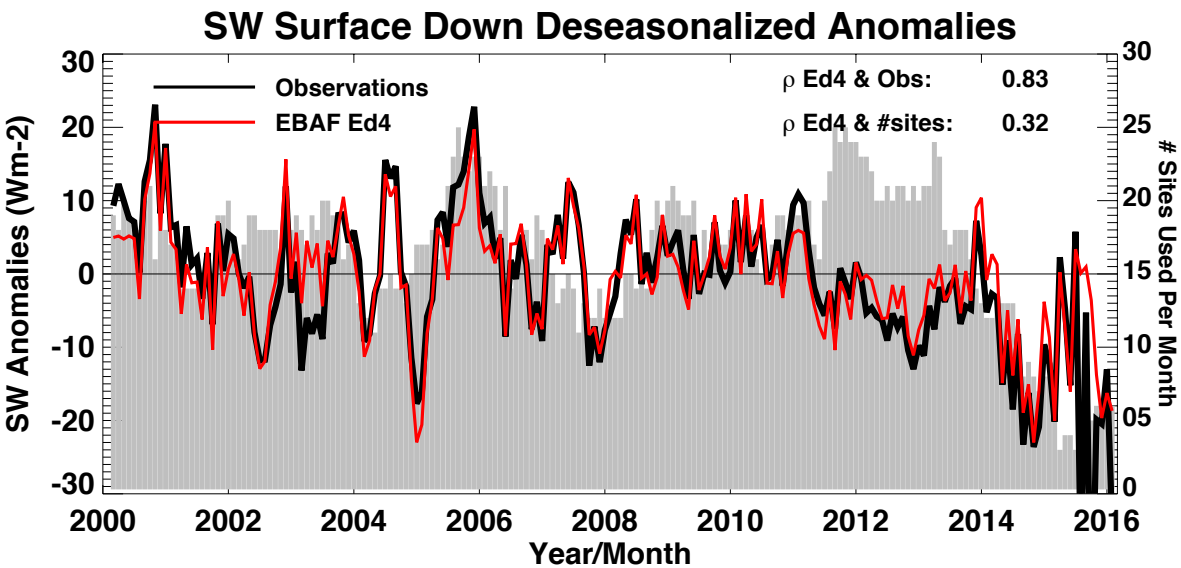


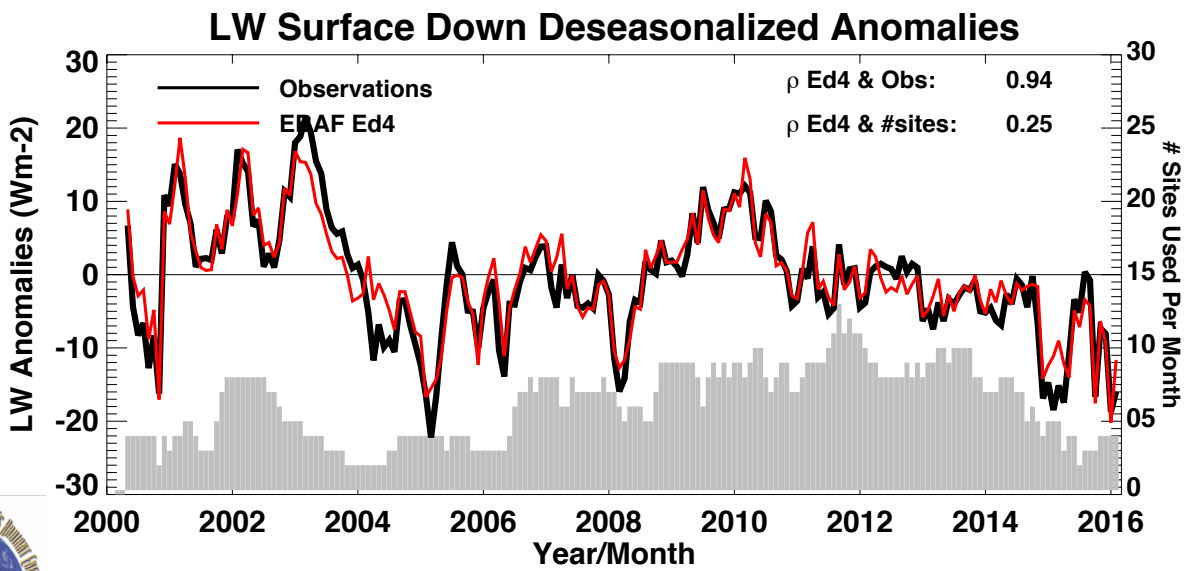


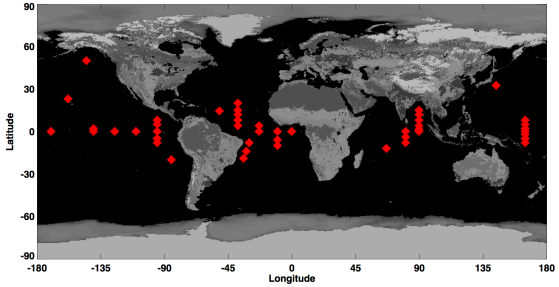


Surface Irradiance Down EBAF-Surface Ed4

Buoys (2000/02 - 2016/12)







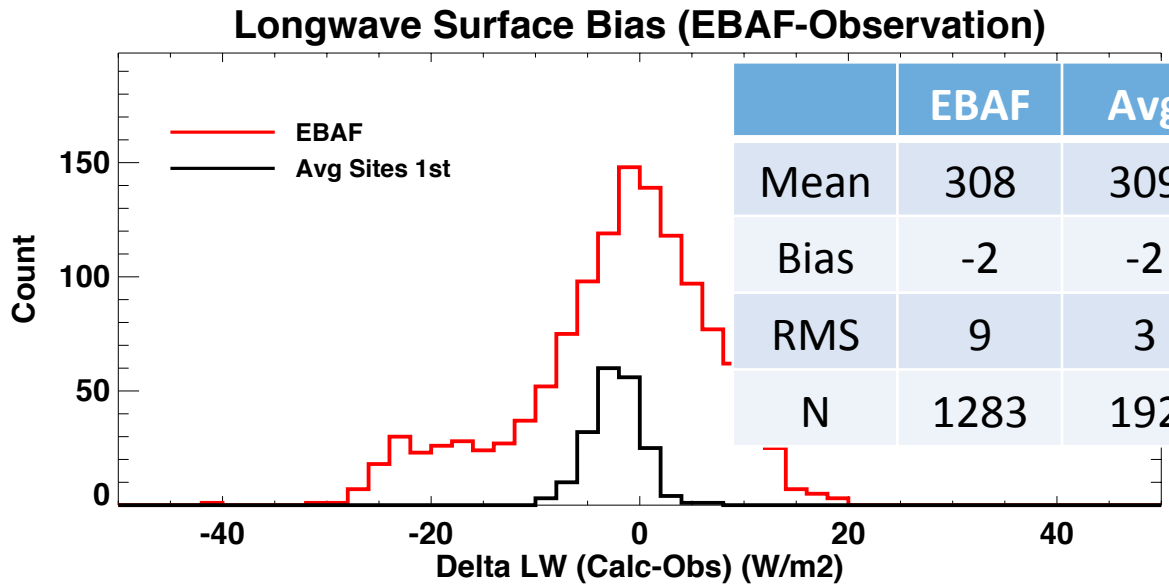
Monthly Mean Bias/RMS for SYN1deg & EBAF-Surface

EBAF-surface	Longwave				Shortwave			
All in Wm^{-2}	Land		Buoy		Land		Buoy	
	Ed2.8	Ed4	Ed2.8	Ed4	Ed2.8	Ed4	Ed2.8	Ed4
Observed Mean	318		393		183		230	
Bias	0.8	-0.0	-0.8	0.7	-0.9	-0.8	3.5	4.7
RMS	10.0	9.8	5.7	5.6	11.5	11.5	11.4	11.6
N (Months)	5114		1201		4959		3145	

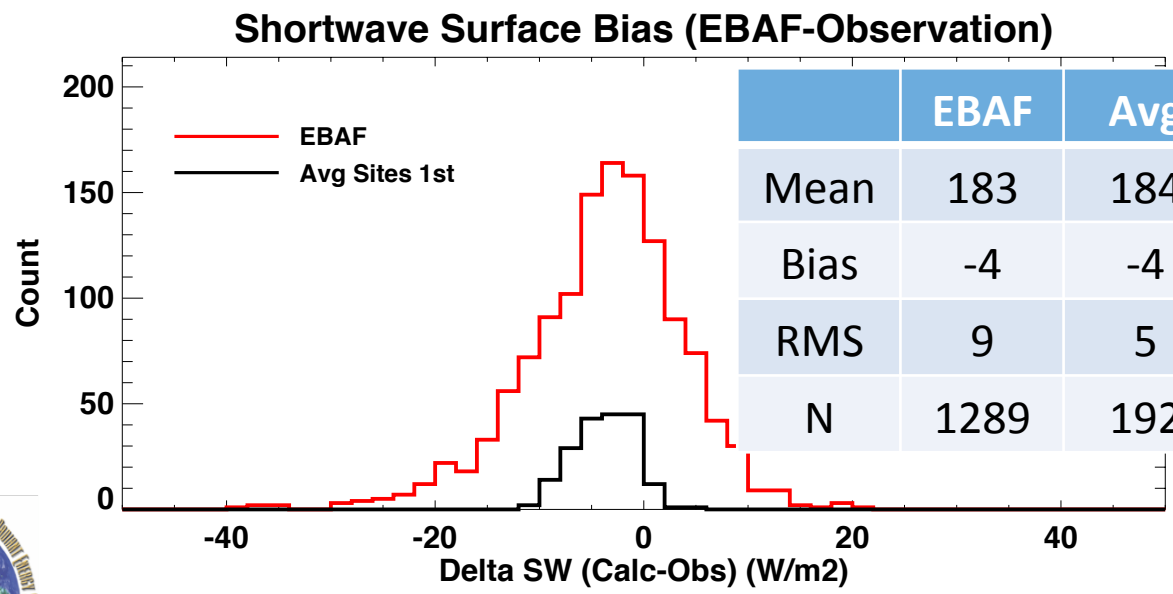
SYN1Deg	Longwave				Shortwave			
All in Wm^{-2}	Land		Buoy		Land		Buoy	
	Ed3	Ed4	Ed3	Ed4	Ed3	Ed4	Ed3	Ed4
Observed Mean	317		396		183		235	
Bias	-3.1	1.3	-1.9	2.9	1.9	-1.2	3.7	-1.2
RMS	10.7	10.3	5.0	5.8	11.8	11.2	10.4	9.9
N (Months)	5125		943		5125		2295	

Spatial Uncertainty Analysis of Surface Validation

At times assume a group of sites represent a larger area: drives down the RMS.

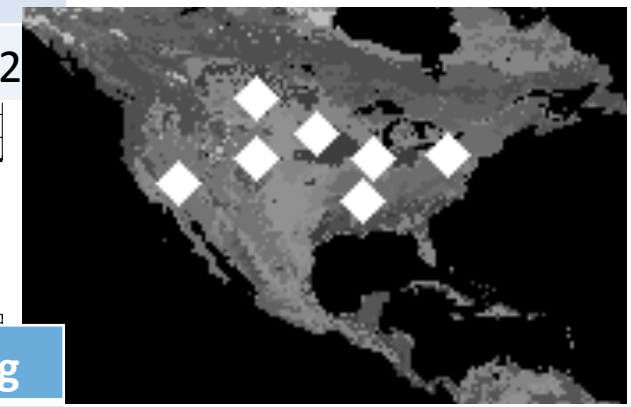


	EBAF	Avg
Mean	308	309
Bias	-2	-2
RMS	9	3
N	1283	192

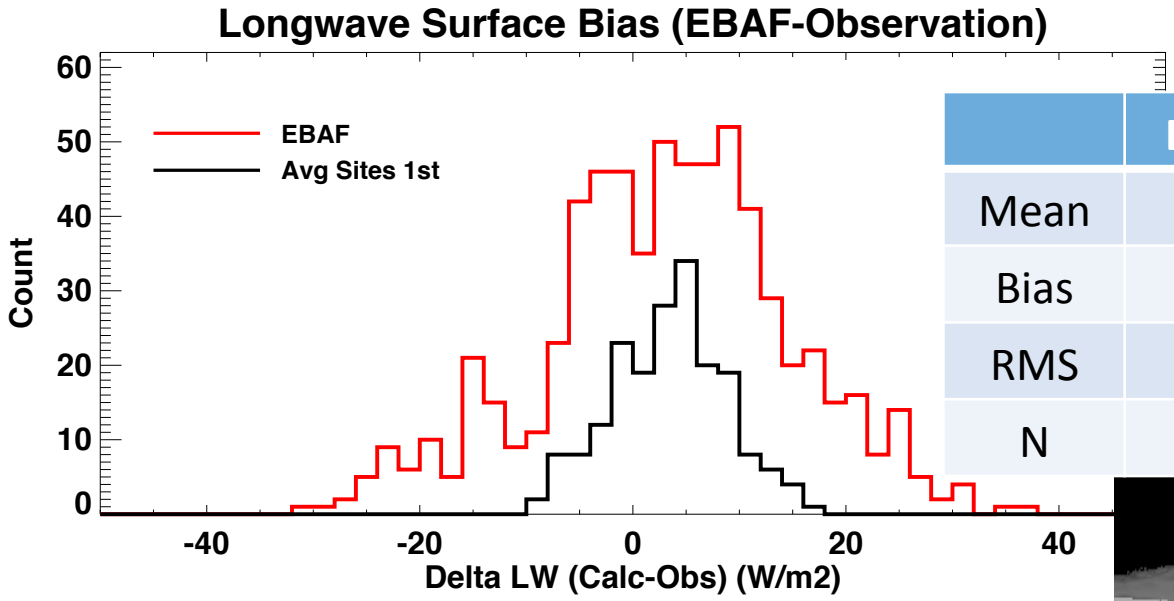


	EBAF	Avg
Mean	183	184
Bias	-4	-4
RMS	9	5
N	1289	192

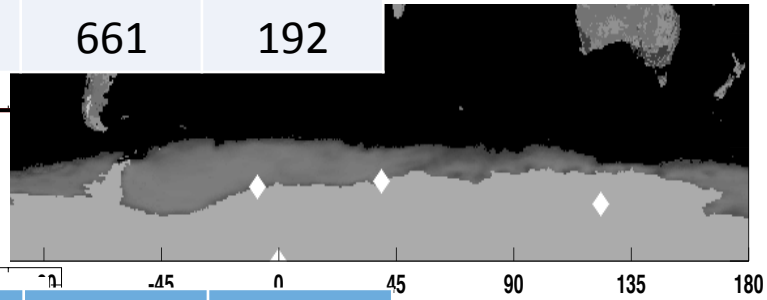
NOAA GMD Surfrad Sites

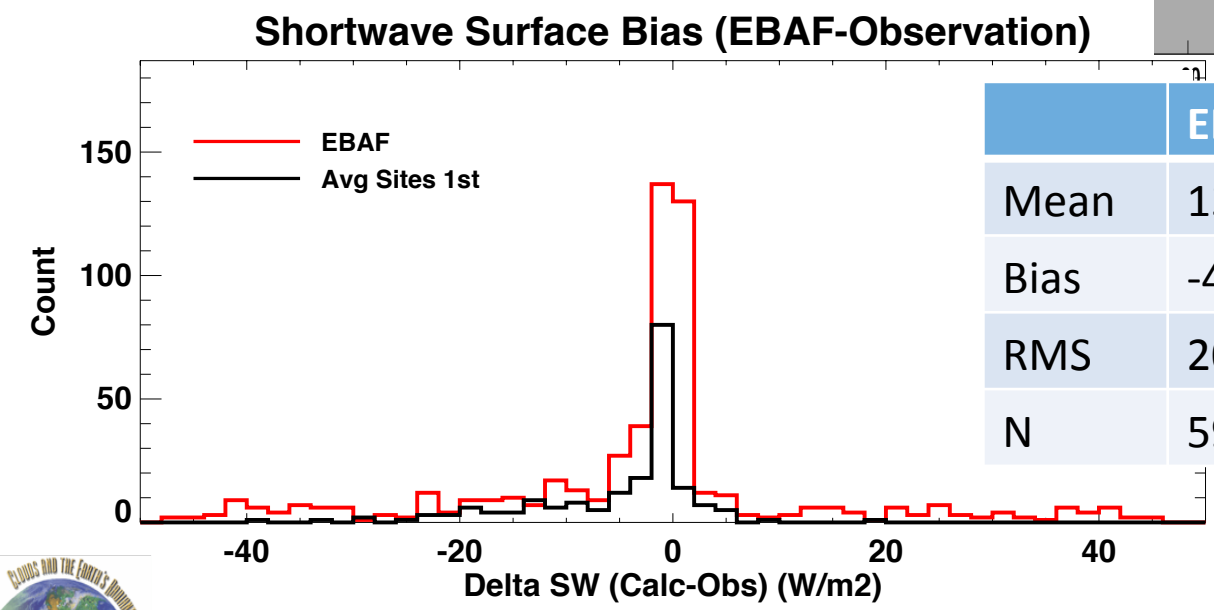


Four South Polar Sites Represent Antarctica:



	EBAF	Avg
Mean	168	169
Bias	3	3
RMS	12	4
N	661	192

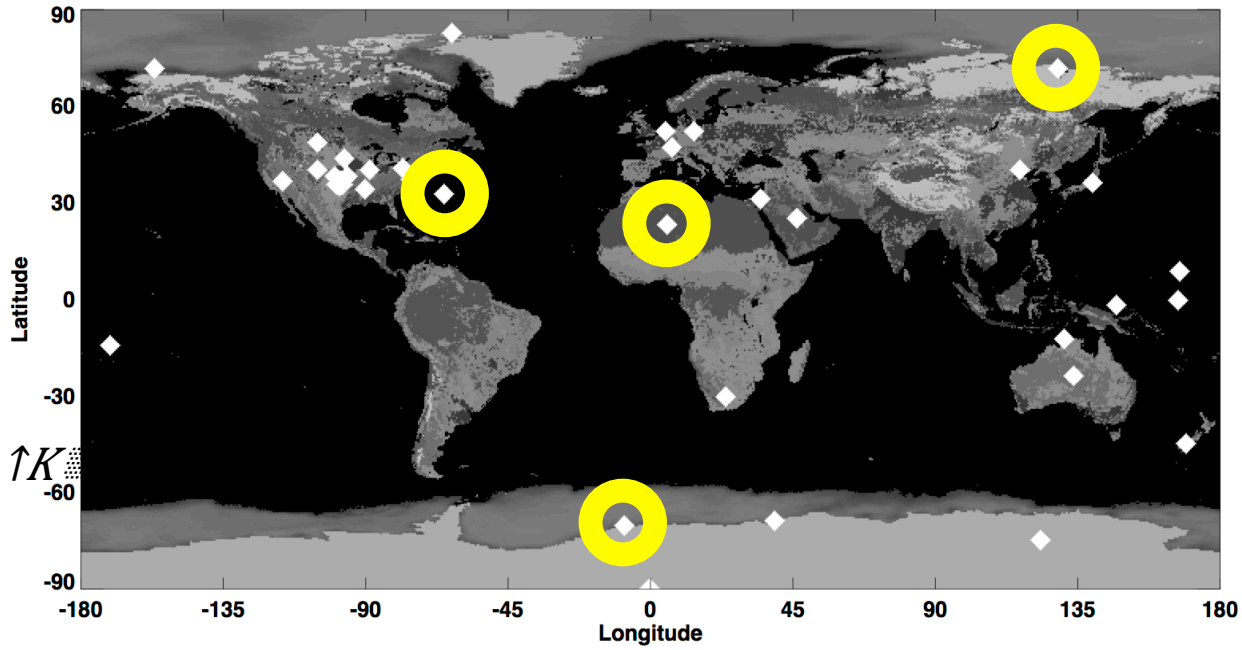




	EBAF	Avg
Mean	132	133
Bias	-4	-5
RMS	20	9
N	597	191

Simply average over larger and larger groups of sites; randomly select groups 100 times number.

Do land and buoy sites separately.



$$F_{il}(comp;obs)(K)=1/K\sum_{1}^{K}$$

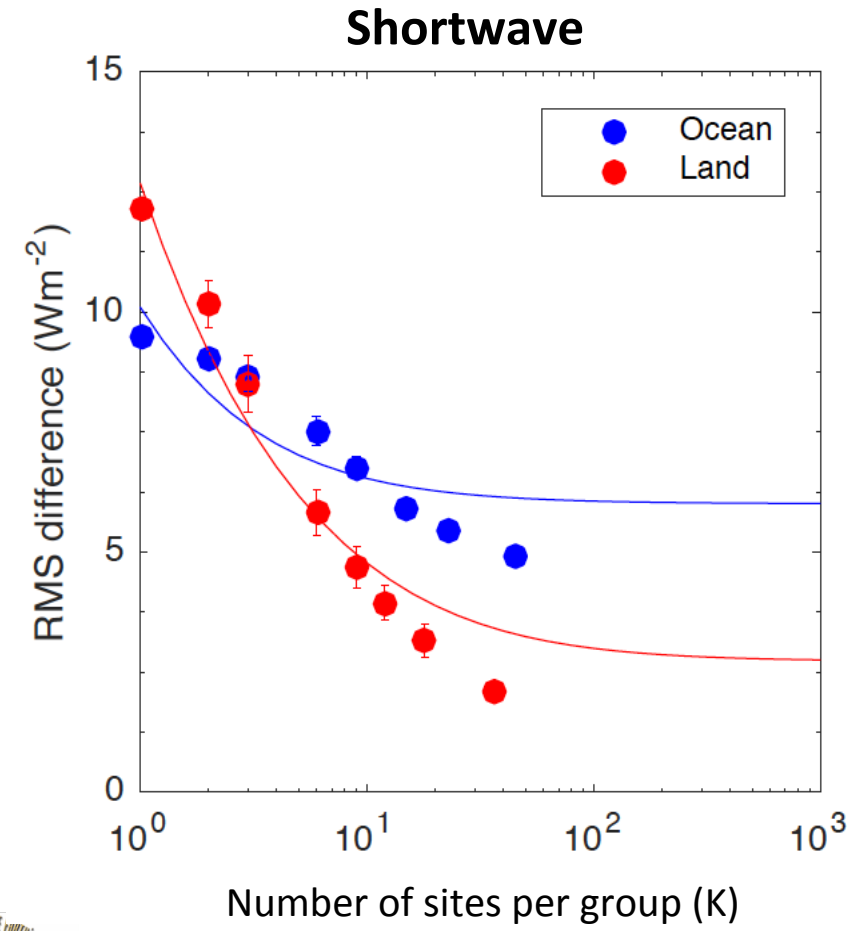
$$\Delta F_{il}(K)=\Delta F_{il}(comp)(K)-\Delta F_{il}(obs)(K)$$

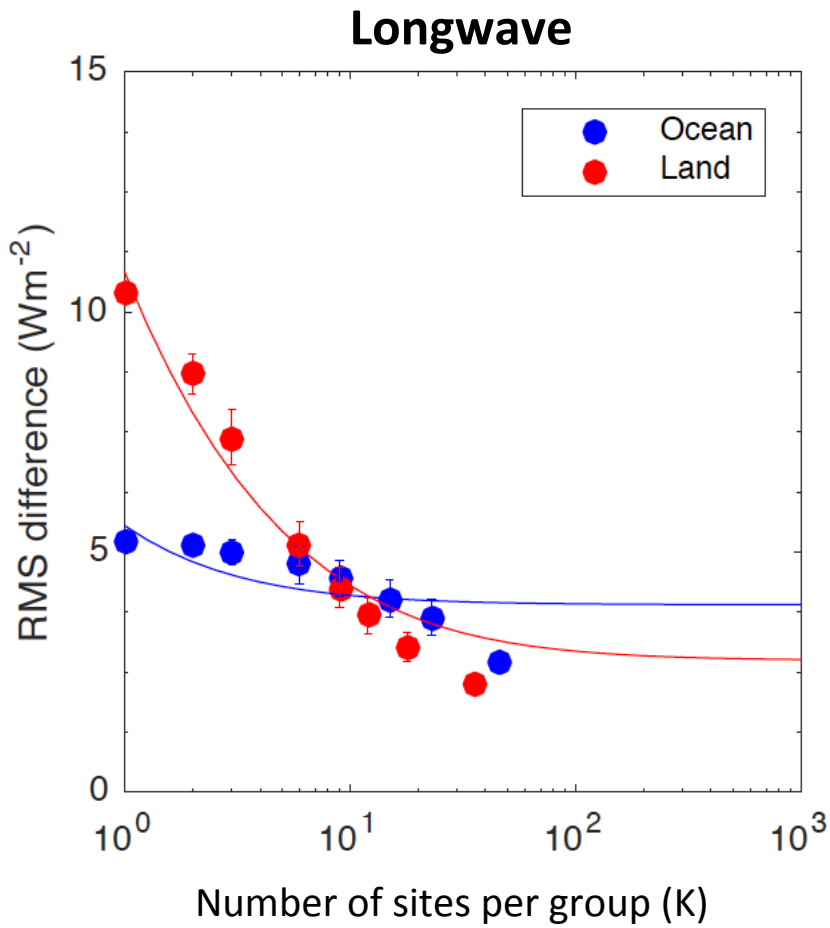
$$F_{x,RMS}(K)=\left[1/N\sum_{1}^{N}1/L\sum_{l}^{L}\left[\Delta F_{il}(K)\right]^{2}\right]^{1/2}$$

$(x=100\ realizations)$

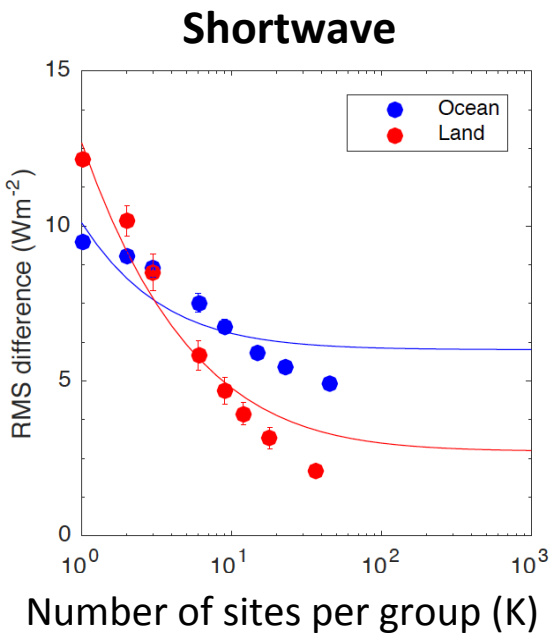
Plot RMS as a function of increasing group size.

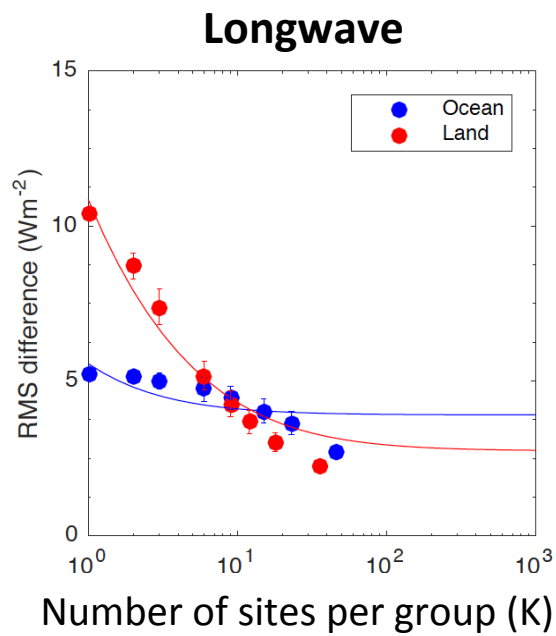
$F\downarrow x, RMS(K)\uparrow 2$





Plot RMS as a function of increasing group size.





$$F_{x,RMS}(K)^2 = \Delta F_{x,bias}^2 + \Delta F_{x,random}^2 / K$$

	Land (Wm^{-2})		Buoy (Wm^{-2})	
	Shortwave	Longwave	Shortwave	Longwave
$\Delta F_{x,bias}^2$	3.2	3.1	7.3	4.2
$\Delta F_{x,random}^2$	9.6	7.9	5.4	2.0

Summary

- CERES EBAF & SYN1Deg along with surface observation can still be accessed at:

https://ceres-tool.larc.nasa.gov/ord-tool

- Overall the new EBAF-sfc Ed4 and SYN1Deg Ed4 surface validation shows little change (good thing).

- Uncertainty due to spatial variability in our surface validation sites shows:
  - Decrease is rapid for the land indicates higher spatial variability for these sites
  - Slower over ocean buoys:
    - Sites are primarily in tropics, less spatial variability in general
    - Fewer site with continuous time series adds to less reliable relationship.