1   Auxiliary Material for

2   Correcting surface solar radiation of two data assimilation systems against FLUXNET
3   observations in North America

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Introduction

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12   Information including the observed annual mean surface solar radiation from BSRN sites
13   and the published literature, and the comparison between the correction by quadratic fit
14   and linear fit are presented in this auxiliary material. Radiation data and the basic
15   information of the sites are given in the table "ts01.doc" and the map showing the
16   locations in the pdf file "fs01.pdf". Statistics of monthly S correction by quadratic fit and
17   linear fit are given in the table "ts02.doc". A same figure with Figure 7 described in the
18   paper but with ocean sites highlighted is also included as shown in the pdf file "fs02.pdf".

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20   1. ts01.doc (Table S1): Validation sites from BSRN and the published literature.

21   1.1 Column "Site label", abbreviation of the site name

22   1.2 Column "Area", geographic location of the site

23   1.3 Column "Latitude", degrees, latitude of the site

24   1.4 Column "Longitude", degrees, longitude of the site

25   1.5 Column "Elevation", meters, site elevation

26   1.6 Column "Year", the year range of the observations included in this study

27   1.7 Column "Mean", annual mean surface solar radiation observed at the site

28   1.8 Column "Reference", reference of the sites from the published literature

29   2. ts02.doc (Table S2): Statistics of monthly S correction by quadratic fit (Equation 11

30   and 12) and linear fit (NARR: $b = 0.044 z_e + 0.63$; MERRA: $b = 0.057 z_e + 0.50$)

31   2.1 Column "Site Code", FLUXNET code of the site

32   2.2 Column "ME", Wm^{-2}, mean bias errors

33   2.3 Column "RMSE", Wm^{-2}, root mean-square errors

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35   3. fs01.pdf (Figure S1) Map of the validation sites from BSRN and the published

36   literature.

37   4. fs02.pdf (Figure S2) Same with Figure 7 in the paper. Blue star: ocean sites before

38   correction; red star: ocean sites after correction.

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40   Table S1 Validation sites from BSRN and the published literature.

Site label	Area	Latitude	Longitude	Elevation (m)	Year	Mean (W m^{-2})	Reference
ALE	Lincoln Sea	82.49	-62.42	127	2005-2007	103.7	
ASP	Macdonnell Ranges, Northern Territory, Australia	-23.80	133.89	547	2002-2009	260.7	
BER	Bermuda	32.27	-64.67	8	2000-2008	191.3	
BRB	Brasilia City, Distrito Federal, Brazil	-15.60	-47.71	1023	2010-2011	231.0	
CAB	The Netherlands	51.97	4.93	0	2006-2011	123.0	
CAM	United Kingdom	50.22	-5.32	88	2001-2007	128.7	
CAR	France	44.08	5.06	100	2000-2010	181.2	
CNR	Spain, Sarriguren, Navarra	42.82	-1.60	471	2009-2011	168.0	
CLH	North Atlantic Ocean	36.91	-75.71	37	2000-2009	184.3	
COC	Cocos (Keeling) Islands	-12.19	96.84	5.8	2006-2009	235.0	
DOM	Antarctica	-75.10	123.38	3233	2006-2009	157.0	
DAR	Australia	-12.43	130.89	30	2004-2009	238.7	
DWN	Australia	-12.42	130.89	32	2009-2010	225.5	
DAA	South Africa	-30.67	23.99	1287	2002-2003	237.0	

EUR	Ellesmere Island, Canadian Arctic Archipelago	79.99	-85.94	85	2008-2011	102.5
FLO	South Atlantic Ocean	-27.53	-48.52	11	2000-2004	179.6
FUA	Japan	33.58	130.38	3	2011	152.0
GVN	Dronning Maud Land, Antarctica	-70.65	-8.25	42	2000-2010	127.2
ILO	Nigeria	8.53	4.57	350	2000-2004	190.8
ISH	Japan	24.34	124.16	6	2011	168.0
KWA	North Pacific Ocean	8.72	167.73	10	2001-2007	228.9
LAU	New Zealand	-45.05	169.69	350	2001-2008	163.5
LER	United Kingdom	60.13	-1.18	84	2002-2006	92.8
LIN	Germany	52.21	14.12	125	2000-2004	122.4
MNM	Minami-Torishima	24.29	153.98	7	2011	218.0
MAN	Papua New Guinea	-2.06	147.43	6	2000-2008	210.8
NAU	Nauru	-0.52	166.92	7	2005-2007	245.7
NYA	Ny-Ålesund, Spitsbergen	78.93	11.93	11	2000-2010	78.2
PAL	France	48.71	2.21	156	2006	134.0
PAY	Switzerland	46.82	6.94	491	2000-2008	144.4
PTR	Brazil	-9.07	-40.32	387	2009	219.0
REG	Canada	50.21	-104.71	578	2000-2007	160.3
SAP	Japan	43.06	141.33	17	2011	140.0
SBO	Israel	30.91	34.78	500	2005-2009	240.4

SOV	Saudi Arabia	24.91	46.41	650	2002	265.0	
SPO	Antarctica	-89.98	-24.80	2800	2000-2009	129.0	
SYO	Cosmonaut Sea	-69.01	39.59	18	2000-2005	127.2	
SMS	Brazil	-29.44	-53.82	489	2009-2011	197.7	
TAM	Algeria	22.78	5.51	1385	2002-2010	265.2	
TAT	Japan	36.05	140.13	25	2005	161.0	
TOR	Estonia	58.25	26.46	70	2000-2010	111.4	
XIA	China	39.75	116.96	32	2006-2009	161.3	
Tibet	China	31.90	91.70	4620	2003	246.1	*Wang and Zeng* [2012]
Yatir	Israel	31.35	35.05	650	2000-2005	238.0	*Rotenberg and Yakir* [2010]
Tapajos SP	Brazil	-3.01	-54.58	100	June2000-May2001	180.0	*da Rocha et al.* [2004]
Forest Rondonia	Brazil	-10.08	-61.93	145	Sep1999-Sep2000	206.0	*von Randow et al.* [2004]
Pasture FNS	Brazil	-10.75	-62.37	293	Sep1999-Sep2000	202.8	*von Randow et al.* [2004]
Lake Taihu	China	31.40	120.22	7	2011	154.7	*Deng et al.* [2013]
GEBA Stockholm	Switzerland	59.30	17.95	55	2000	114.0	*Wild* [2009]
Mount Pui	Thailand	18.80	98.90	1263.1	1998	167.0	*Tanaka et al.* [2003]

41   Table S2. Statistics of monthly S correction by quadratic fit (Equation 11 and 12) and

42   linear fit (NARR: $b = 0.044z_e + 0.63$; MERRA: $b = 0.057z_e + 0.50$)

Site Code	NARR				MERRA			
	Quadratic fit		Linear fit		Quadratic fit		Linear fit	
	ME (Wm^{-2})	RMSE (Wm^{-2})	ME (Wm^{-2})	RMSE (Wm^{-2})	ME (Wm^{-2})	RMSE (Wm^{-2})	ME (Wm^{-2})	RMSE (Wm^{-2})
Calibration								
CA-Obs	-11.3	21.6	-7.7	19.5	1.1	16.4	3.5	17.6
CA-Ojp	-7.8	20.5	-4.5	19.4	3.1	16.8	5.4	18.3
CA-Oas	-7.7	19.5	-4.4	18.1	5.6	17.3	7.8	18.9
CA-Ca1	-9.7	19.2	-8.3	18.5	-0.3	22.2	1.5	23.2
US-UMB	6.4	17.8	7.5	18.5	7.2	13.5	9.2	14.4
CA-Cbo	4.9	19.3	5.8	19.7	10.4	17.1	12.9	19.0
US_NR1	6.4	22.0	-9.7	19.1	6.6	23.0	-20.7	25.3
US-MMS	1.5	15.6	3.1	15.9	2.5	16.3	5.2	16.8
US-Ton	9.0	22.2	9.3	22.2	-1.1	9.9	-0.4	9.7
US-Var	14.9	24.9	14.9	24.9	3.4	10.4	4.1	10.5
US-WBW	-11.9	22.9	-9.7	21.7	1.4	20.3	4.1	20.3
US-Aud	7.2	24.8	14.3	26.6	-3.2	24.4	-3.5	24.5
US_SP2	-0.6	32.4	-1.4	32.5	-2.7	34.5	-0.8	34.0
US-SP3	6.6	35.5	5.7	35.4	3.3	36.6	5.1	36.5
Average	0.6	22.7	1.1	22.3	2.7	19.9	2.4	20.6
Validation								
CA-Qfo	-17.9	21.3	-16.1	19.5	1.5	18.0	3.7	19.6
CA-Ca3	1.6	25.6	1.7	25.6	2.0	31.5	3.3	31.6
US-Ho1	-0.6	21.2	-1.2	21.1	12.9	19.3	15.1	21.5
US-Bkg	8.0	24.2	11.6	26.0	-3.0	16.5	-0.3	16.5
US-Bo1	4.5	19.3	5.5	19.6	8.3	23.5	10.9	24.5
US-Slt	19.6	31.4	18.6	30.6	12.7	18.8	14.8	20.5
US-MOz	12.0	23.5	13.1	24.3	1.5	14.0	4.2	14.3
US-Dk2	-0.6	20.5	0.0	20.6	-2.4	21.5	0.2	21.2
US-NC2	2.6	19.8	1.4	19.6	12.6	24.8	14.5	25.3
US-Fmf	0.8	23.0	4.4	24.0	-4.2	16.6	-12.6	20.0
Average	3.0	23.0	3.9	23.1	4.2	20.5	5.4	21.5

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44   Figure S1 Map of the validation sites from BSRN and the published literature
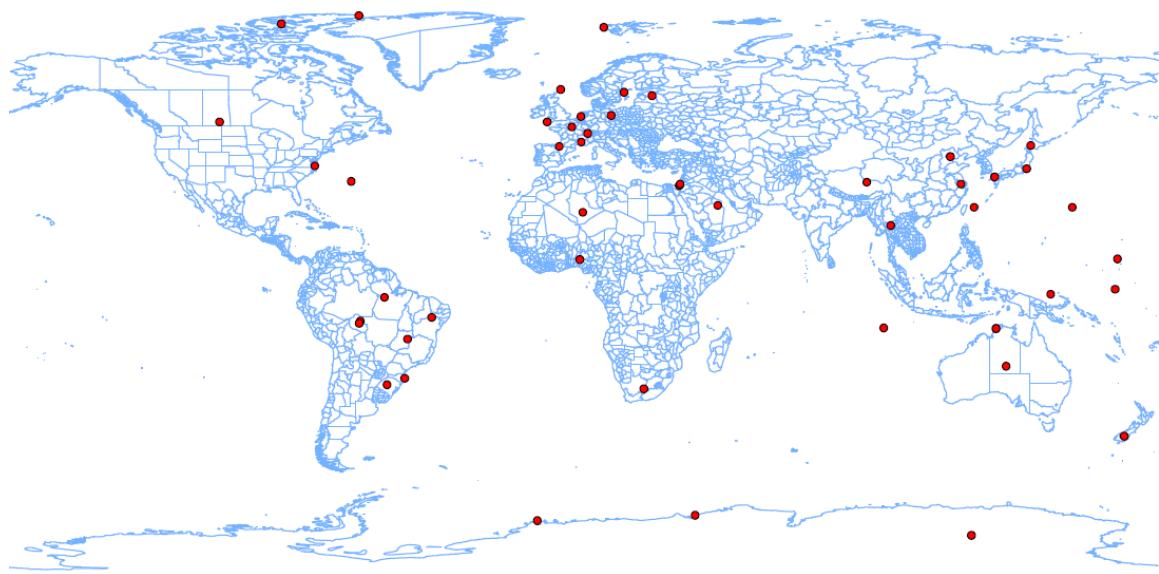

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48   Figure S2. Same with Figure 7. Blue star: ocean sites before correction; red star: ocean

49   sites after correction.

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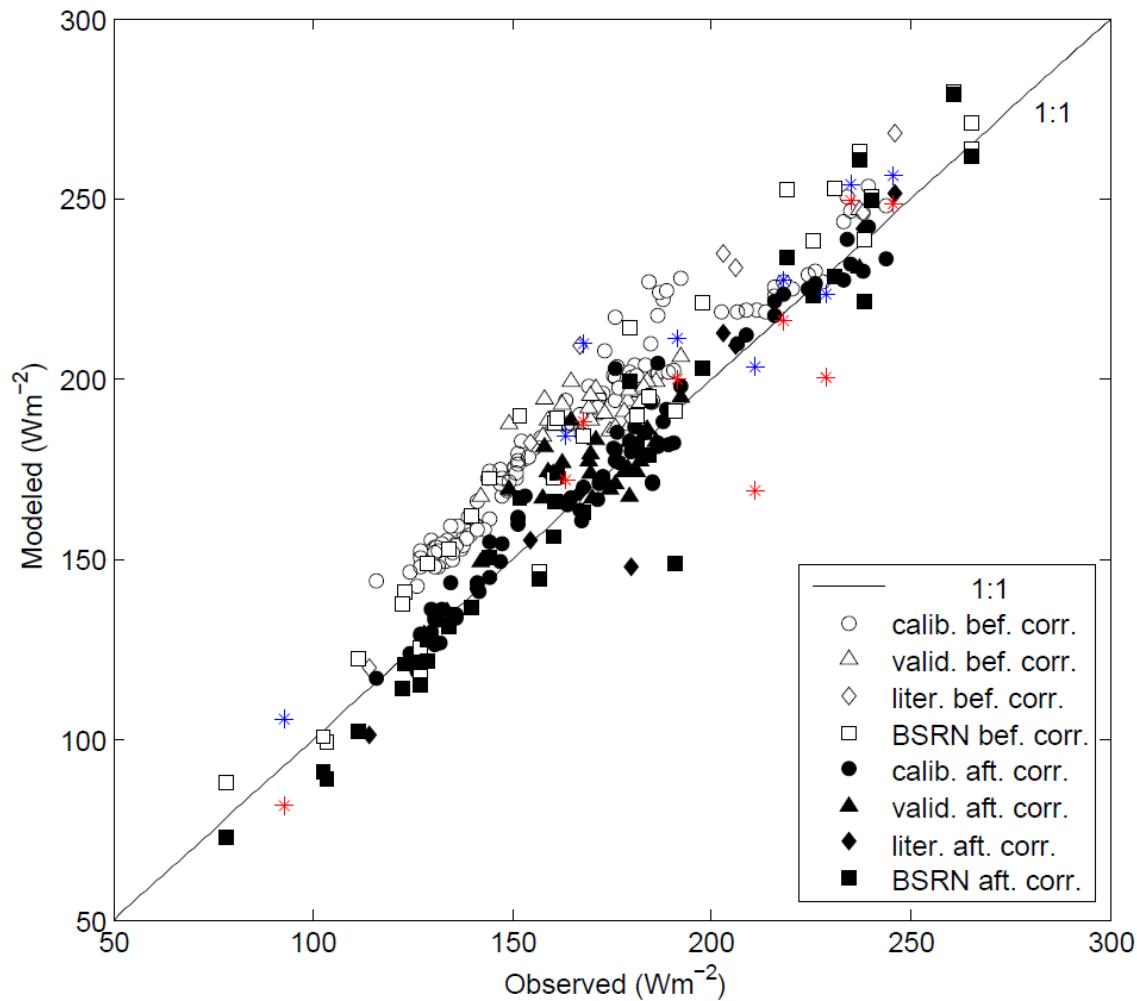
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