



Royal Netherlands
Meteorological Institute
*Ministry of Infrastructure and the
Environment*

BSRN Cabauw – Status and applications

Wouter Knap
KNMI





1. Quality Control: exceptions and visualisation
2. **Multi station shortwave residual (“global minus sum”)**
3. Applications
4. Status Cabauw
5. Considerations on 2.

Exceptions

Maintenance and incidents



(Regular) maintenance



Incidents



Exception handling

Cleaning event



GLOBAL-COMPARE Monday 2018-05-07

date 2018-05-07 action GLBCP GO info exception time

Filter records with this date

Show 7 entries Search:

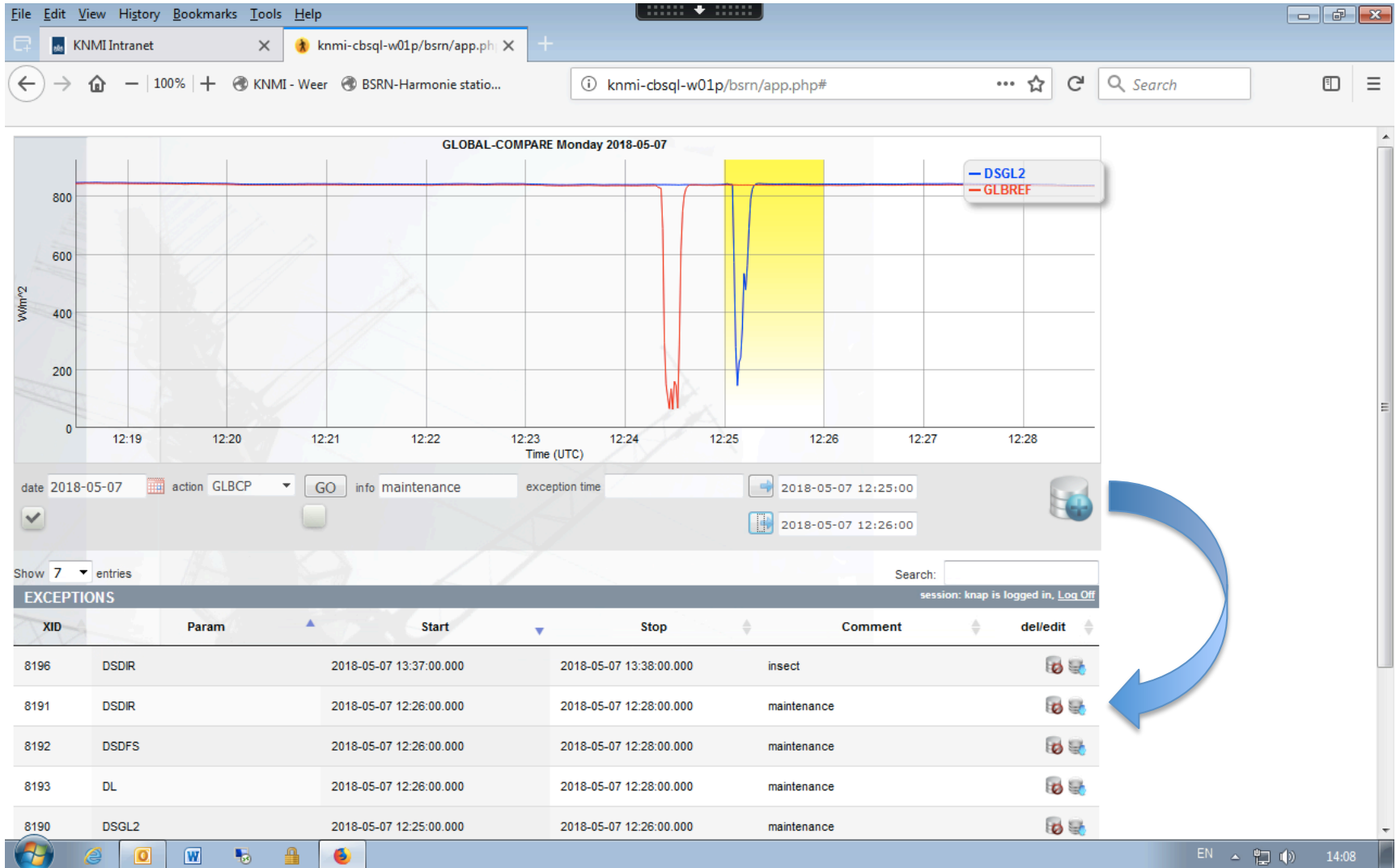
XID	Param	Start	Stop	Comment	del/edit
8196	DSDIR	2018-05-07 13:37:00.000	2018-05-07 13:38:00.000	insect	
8191	DSDIR	2018-05-07 12:26:00.000	2018-05-07 12:28:00.000	maintenance	
8192	DSDFS	2018-05-07 12:26:00.000	2018-05-07 12:28:00.000	maintenance	
8193	DL	2018-05-07 12:26:00.000	2018-05-07 12:28:00.000	maintenance	
8190	DSGL2	2018-05-07 12:25:00.000	2018-05-07 12:26:00.000	maintenance	

session: knap is logged in, Log Off

EN 14:06

Exception handling

Cleaning event



BSRN Quality Control

Quality website



Buienradar.nl - Weersverwachting X BSRN station CAB X BSRN station CAB X BSRN-Harmonie station CAB X BSRN daily X

localhost/~whknap/bsrn/cab/

BSRN overview for station Cabauw – May 2018

Previous month →

Report Quality DSGL2 DSDIR DSDFS Ratio Ratio scat Ratio(t) SWUP Alb Alb(t) DL LWUP Temp RH Pres SD Header Flags →

Quality Report

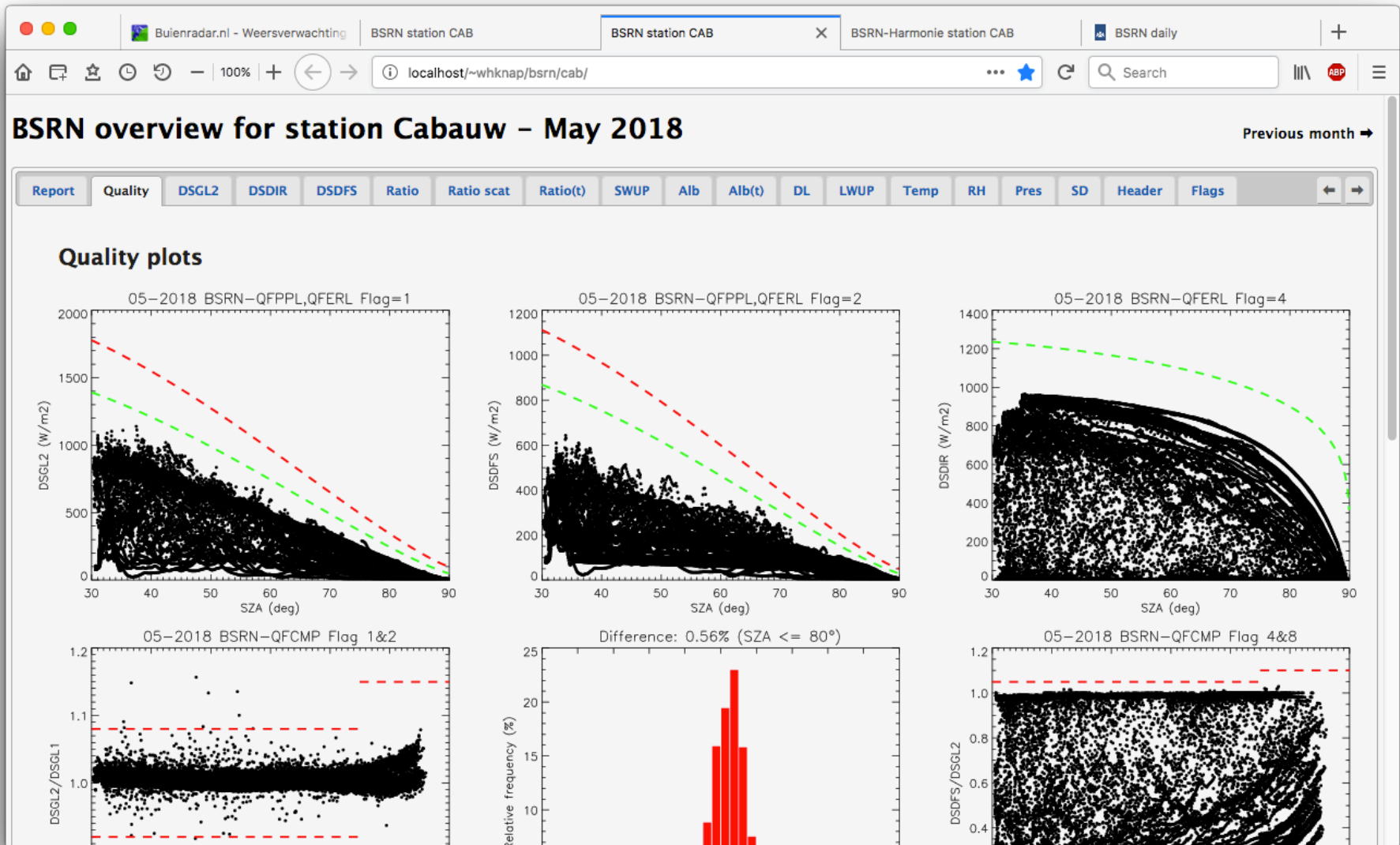
% Script executed at Thu May 31 09:45:06 2018 CET
% ftp error status: 0
% Timestamp submit file: Thu May 31 09:09:00 2018 CET
% Station Cabauw
% Latitude 51.971°N
% Longitude 4.927°E
% Refraction: yes
% Processing May 2018
% Missing days in LR0100: 0
% Missing days in LR0300: 0
% Missing records in LR0100: 0
% Missing records in LR0300: 0

BSRN quality flags and sunshine duration for May 2018

Date	SD MAX (h)	SD ACT (h)	SD REL (%)	DSGL2 QFPPL Fla=1	DSGL2 QFERL Fla=1	DSDFS QFPPL Fla=2	DSDFS QFERL Fla=2	DSDIR QFPPL Fla=4	DSDIR QFERL Fla=4	Ratio QFCMP Fla=1	Ratio QFCMP Fla=2	Ratio QFCMP Fla=4	Ratio QFCMP Fla=8	LWD QFCMP Fla=16	SWU QFPPL Fla=16	SWU QFERL Fla=16	LWU QFCMP Fla=64
31	15.8	0.4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	15.7	8.9	57	0	0	0	0	13	3	6	0	0	0	0	0	0	0
29	15.7	9.6	61	0	0	0	0	0	0	2	0	0	0	0	0	0	0
28	15.7	13.9	89	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	15.6	4.8	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	15.6	13.9	89	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	15.6	10.9	70	0	6	0	28	0	0	0	0	0	0	0	0	0	0
24	15.5	2.5	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0

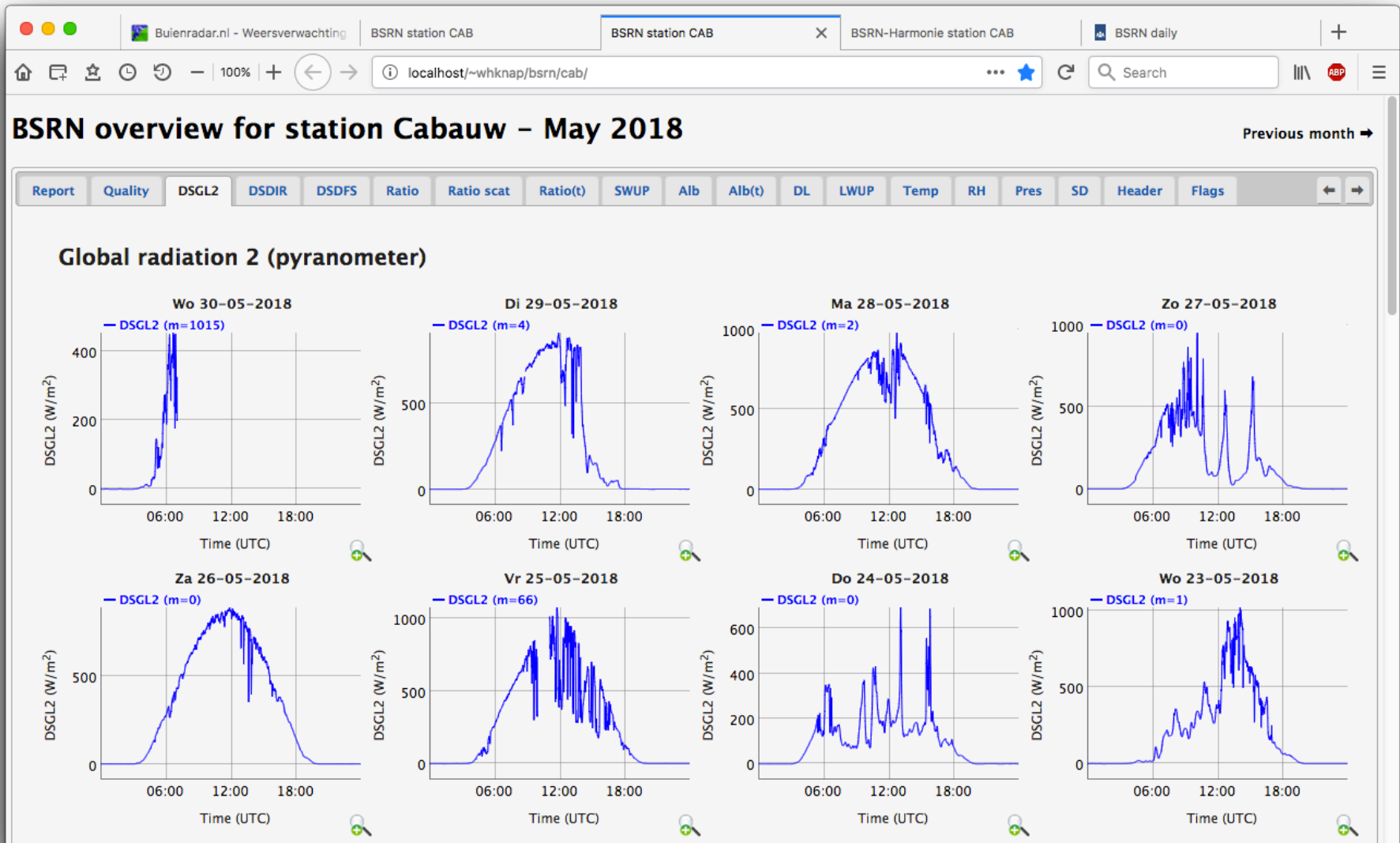
BSRN Quality Control

Quality website



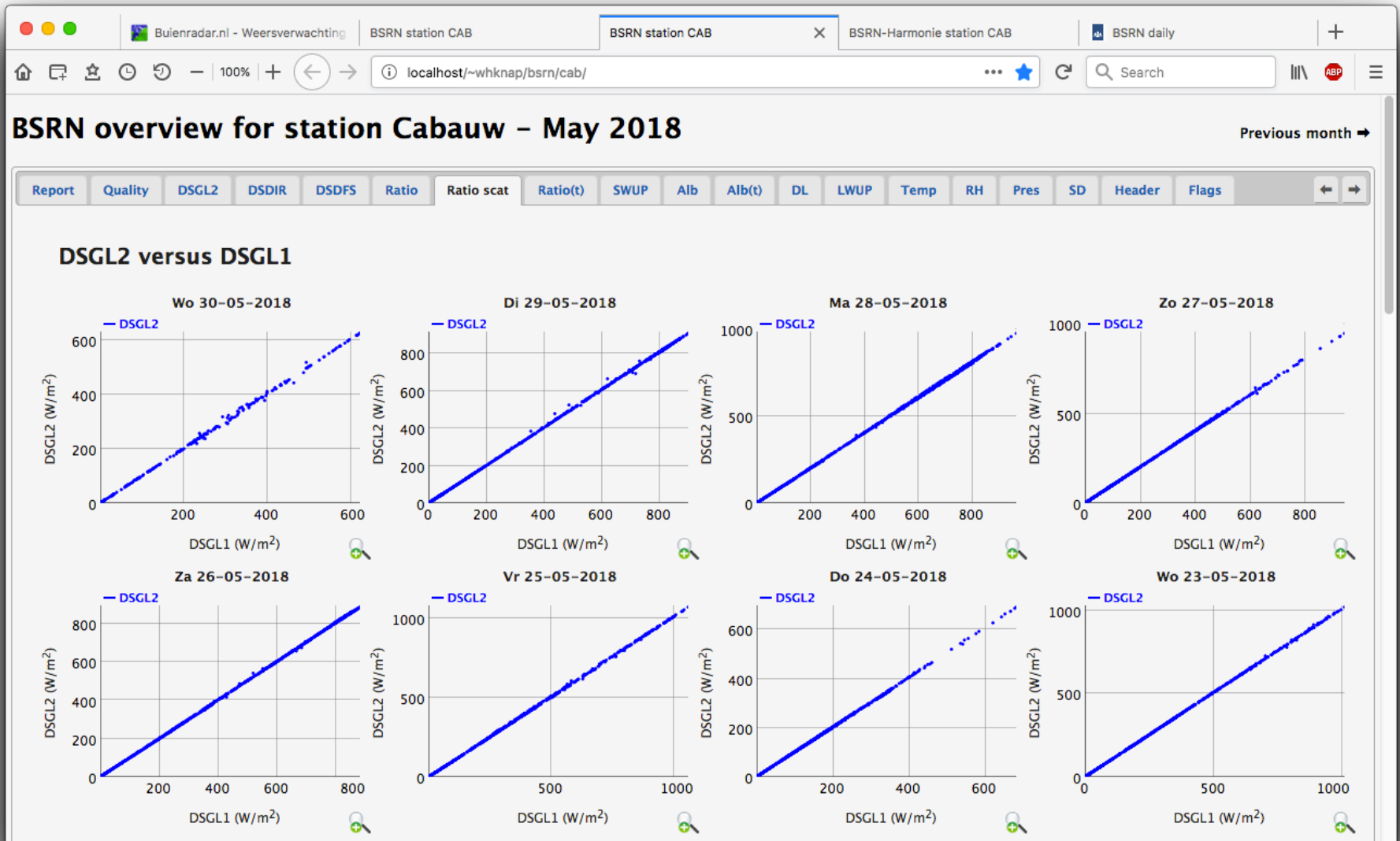
BSRN Quality Control

Quality website



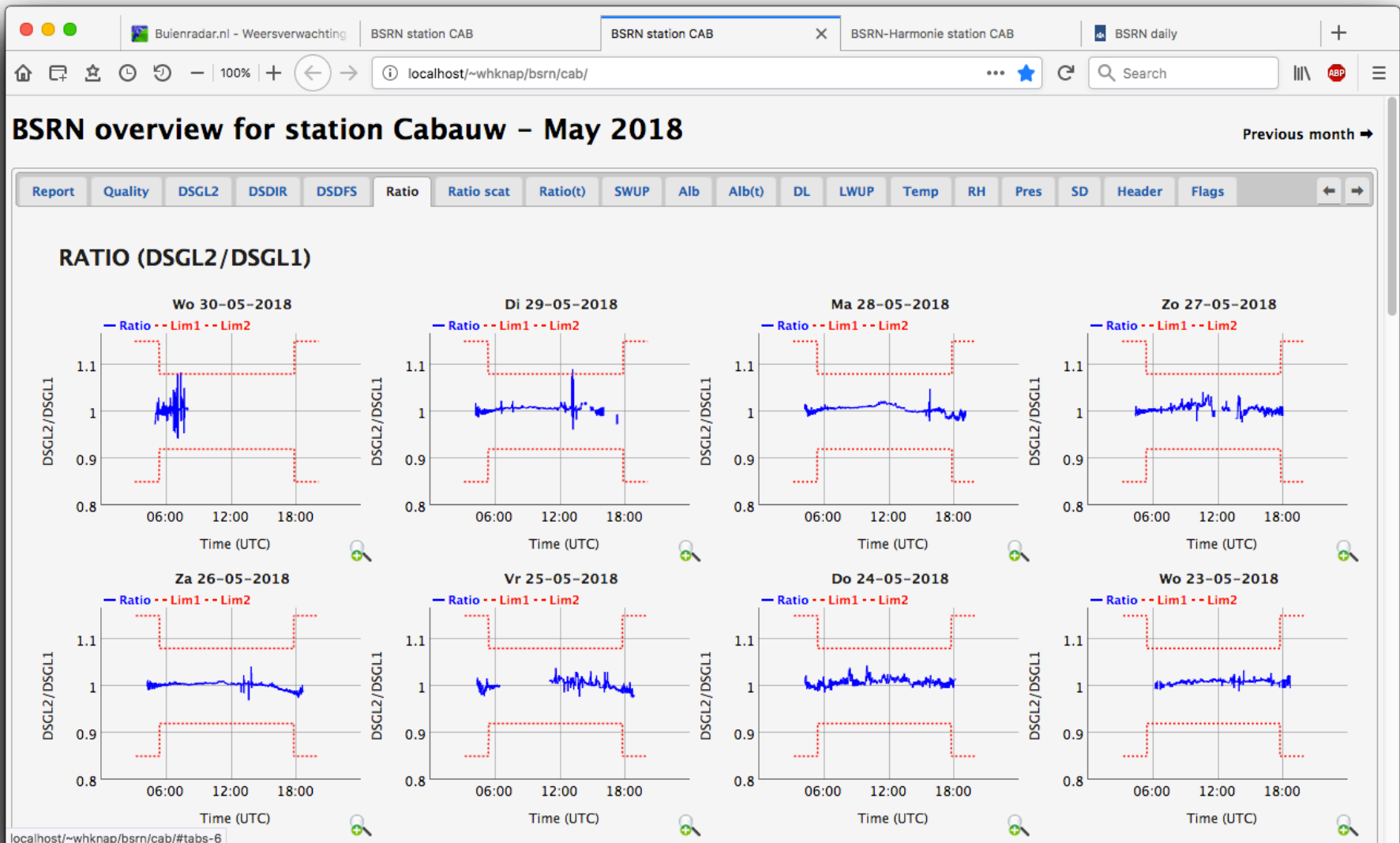
BSRN Quality Control

Quality website



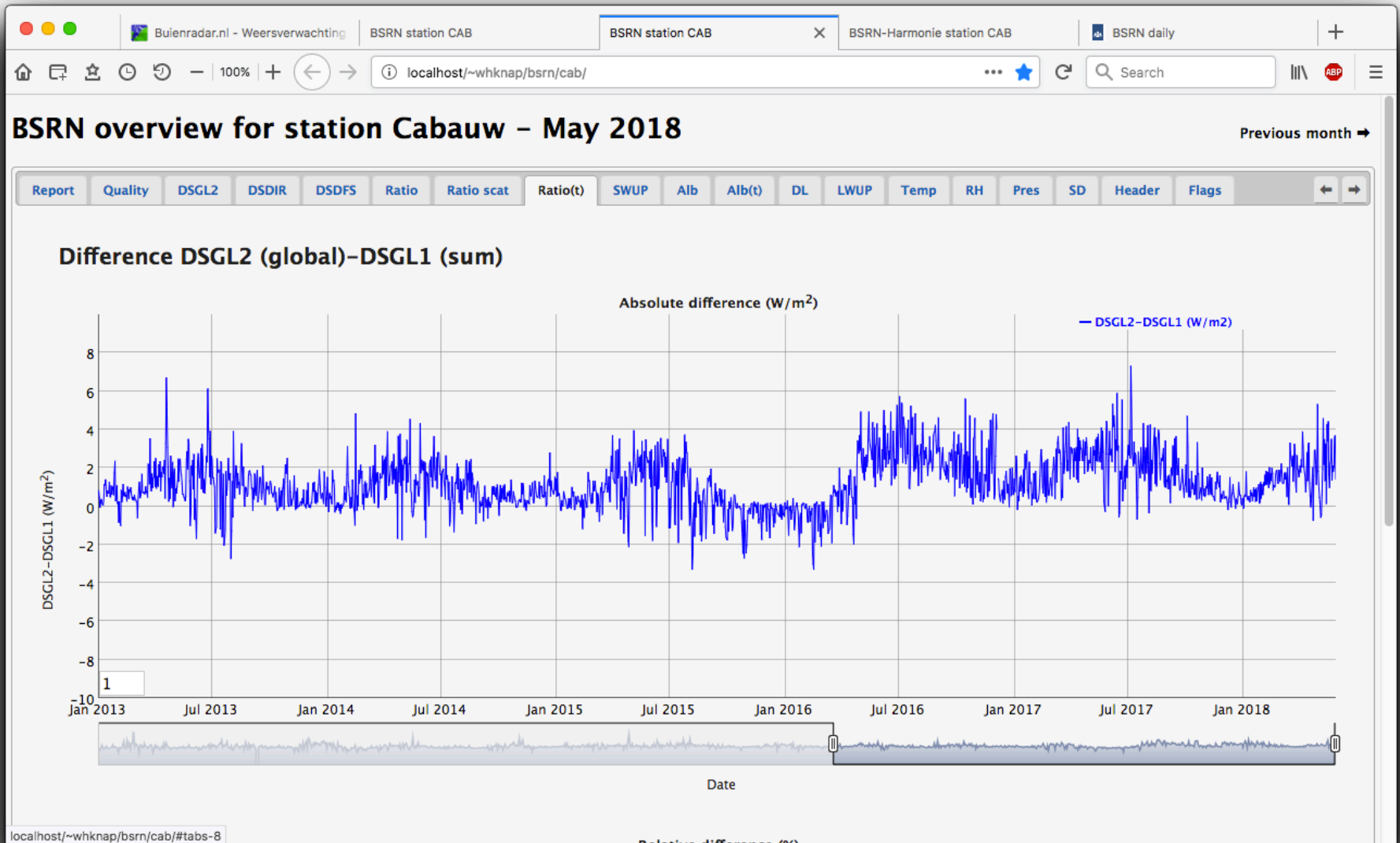
BSRN Quality Control

Quality website



BSRN Quality Control

Quality website





$$\text{SumSW} = \text{DIF} + \text{DIR} * \cos(z)$$

z = solar zenith angle

DIF = diffuse sky irradiance (shaded pyranometer)

DIR = direct normal irradiance (pyrheliometer)

SWD = global irradiance (unshaded pyrheliometer)

$$\text{Residual} = \text{Global} - \text{Sum}$$

$$\text{Ratio} = \text{Global}/\text{Sum}$$

Quote from BSRN website @AWI: *“In an ideal world Global and Sum should be identical. All deviations from identity denote errors.”*

Shortwave residual

Background



...is a complex function of

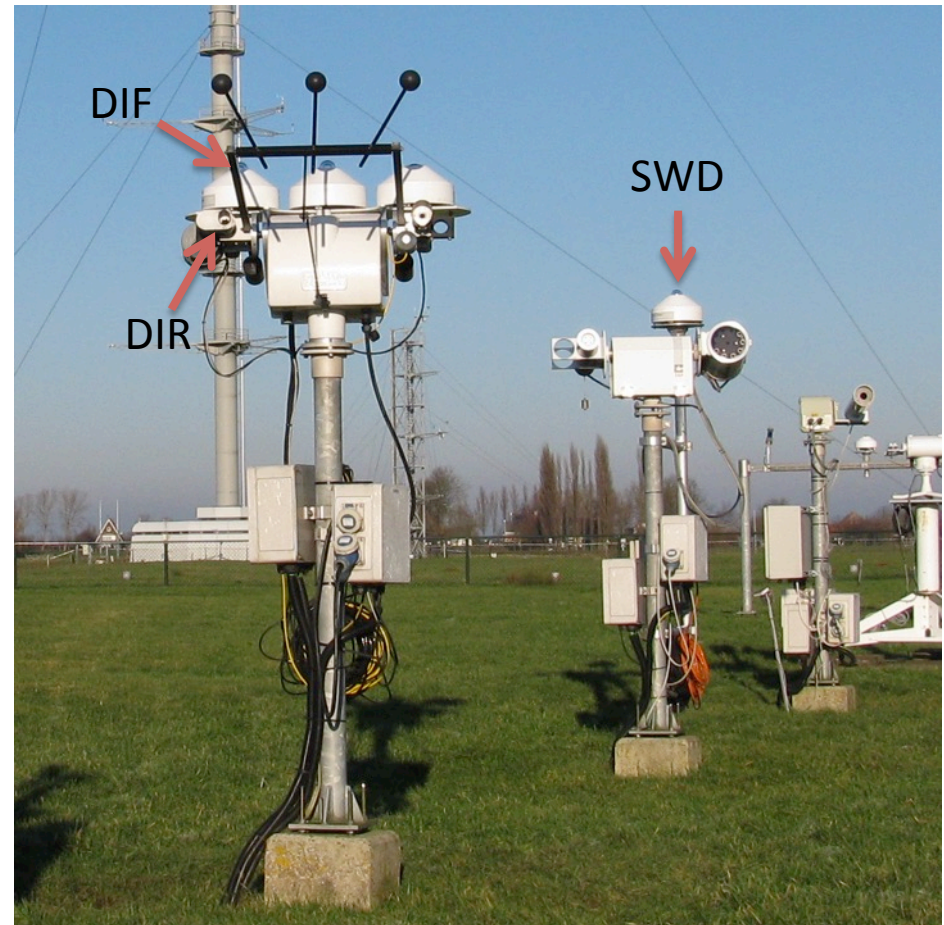
❖ 2 pyranometers and 1 pyr heliometer

characteristics:

- calibration
- cosine response
- temperature response
- response time

❖ Tracking/shading devices:

- Tracker quality
- Shading method (sphere, band?)



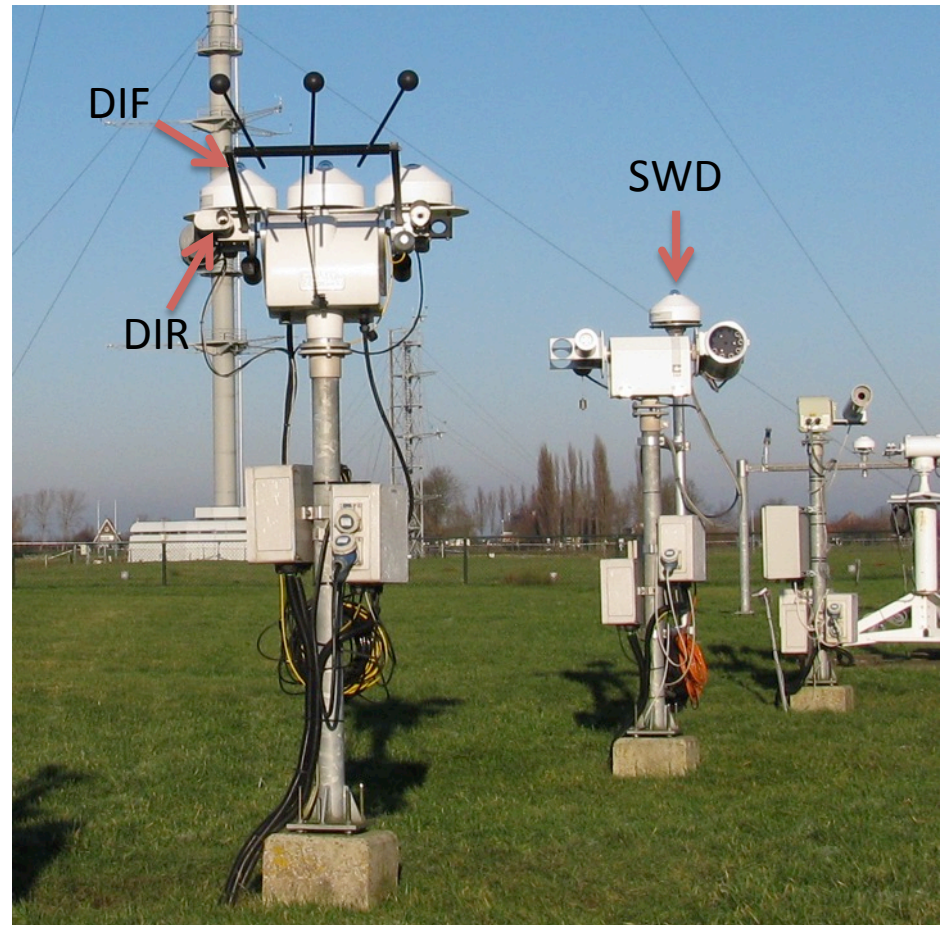
Shortwave residual

Background



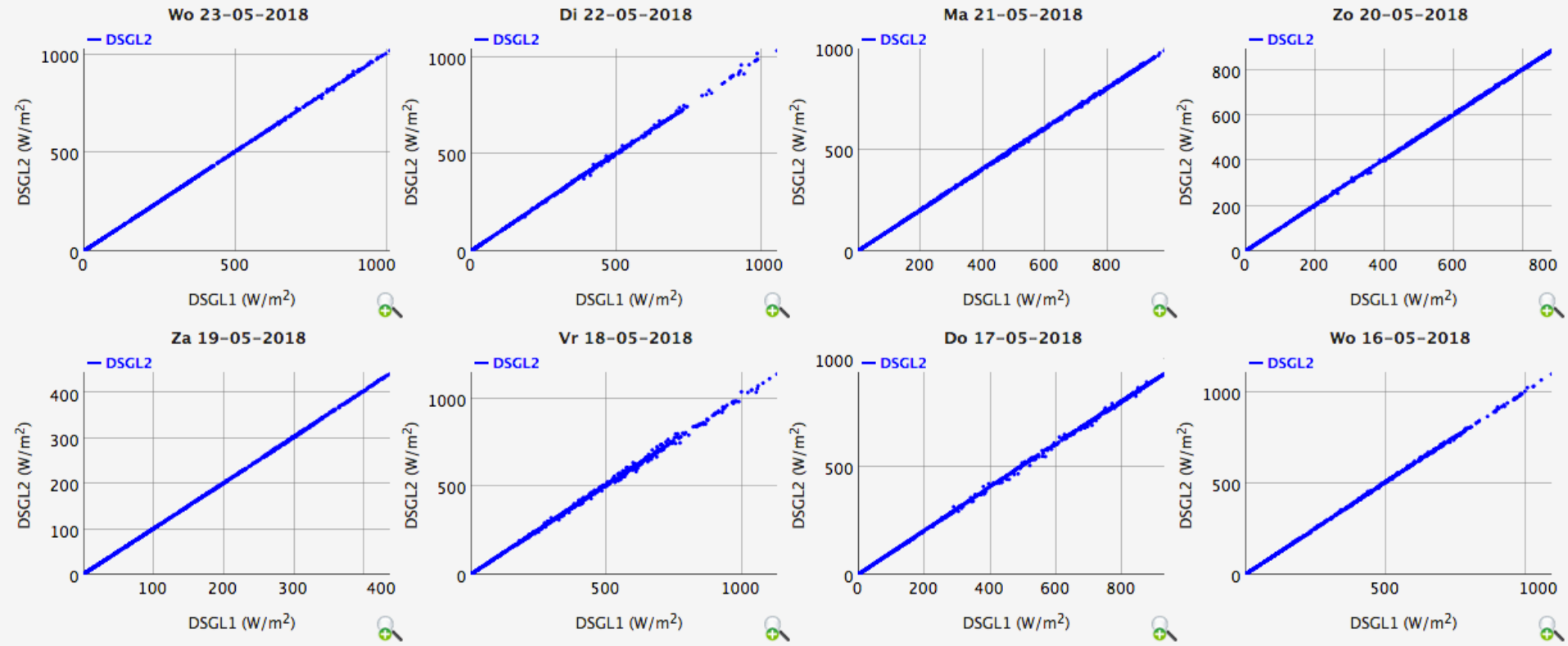
...is a complex function of

- ❖ Field conditions:
 - Pointing and tilt errors
 - Distance between instruments
- ❖ Actual radiation field:
 - clouds
 - aerosols
- ❖ Data acquisition

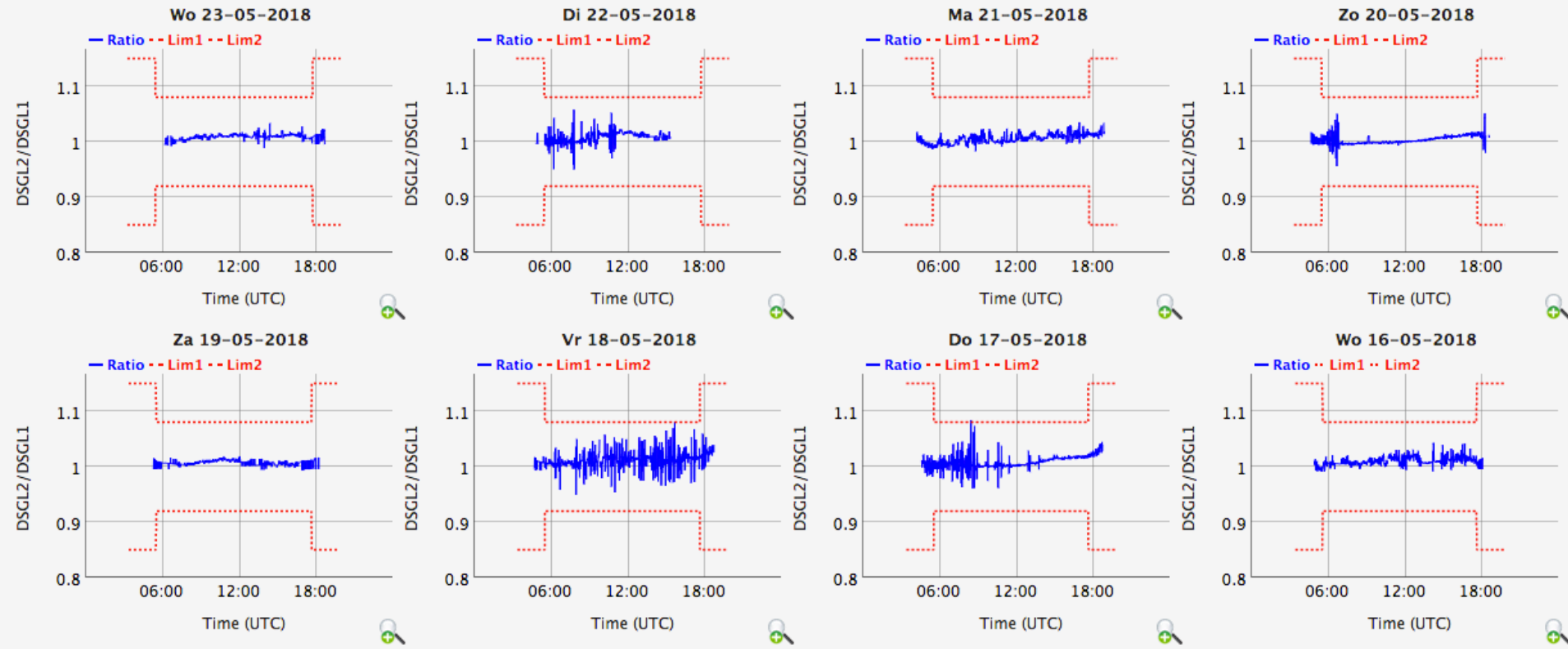


Global vs Sum scatter plots

Cabauw

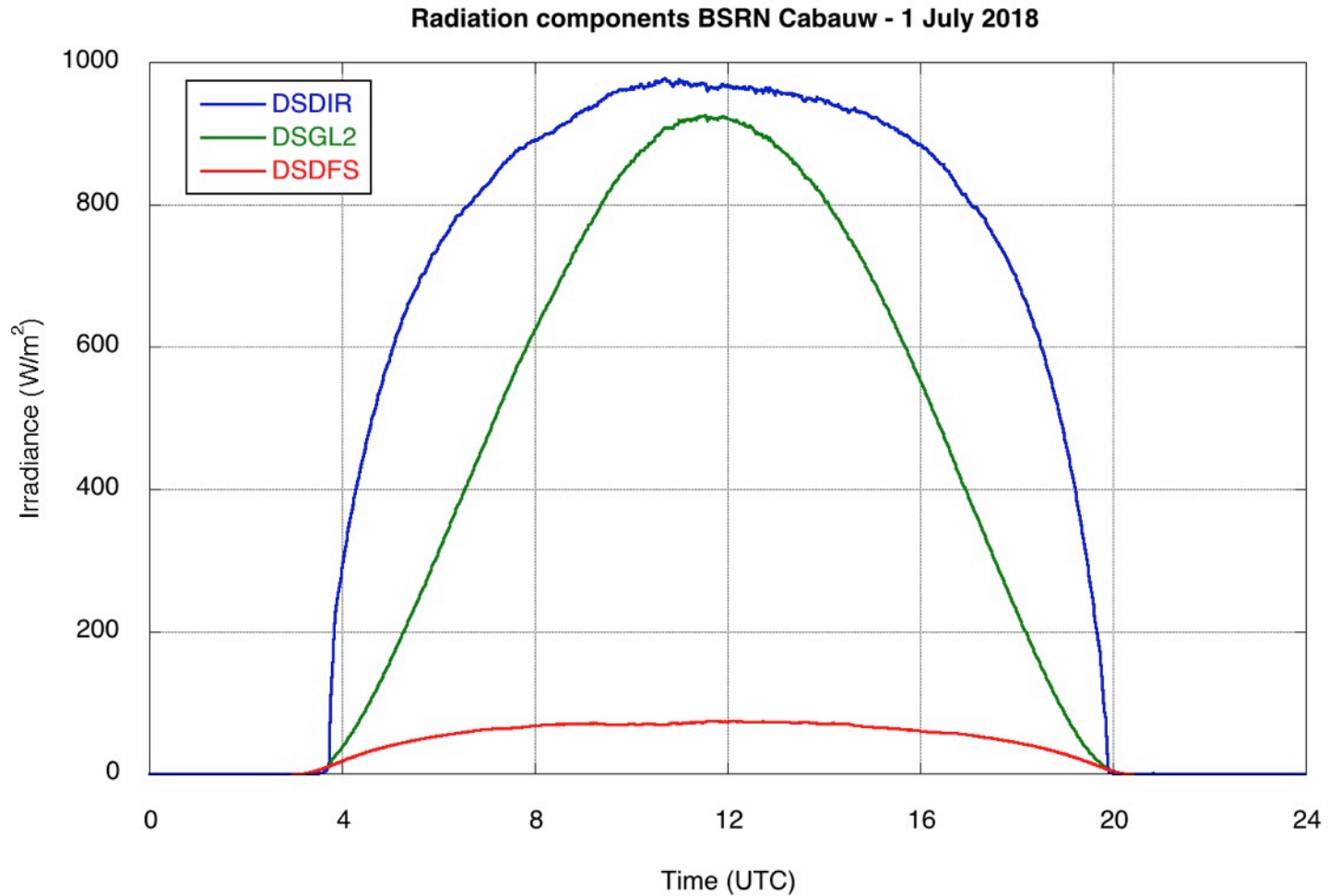


Daily cycles of Global/Sum Cabauw



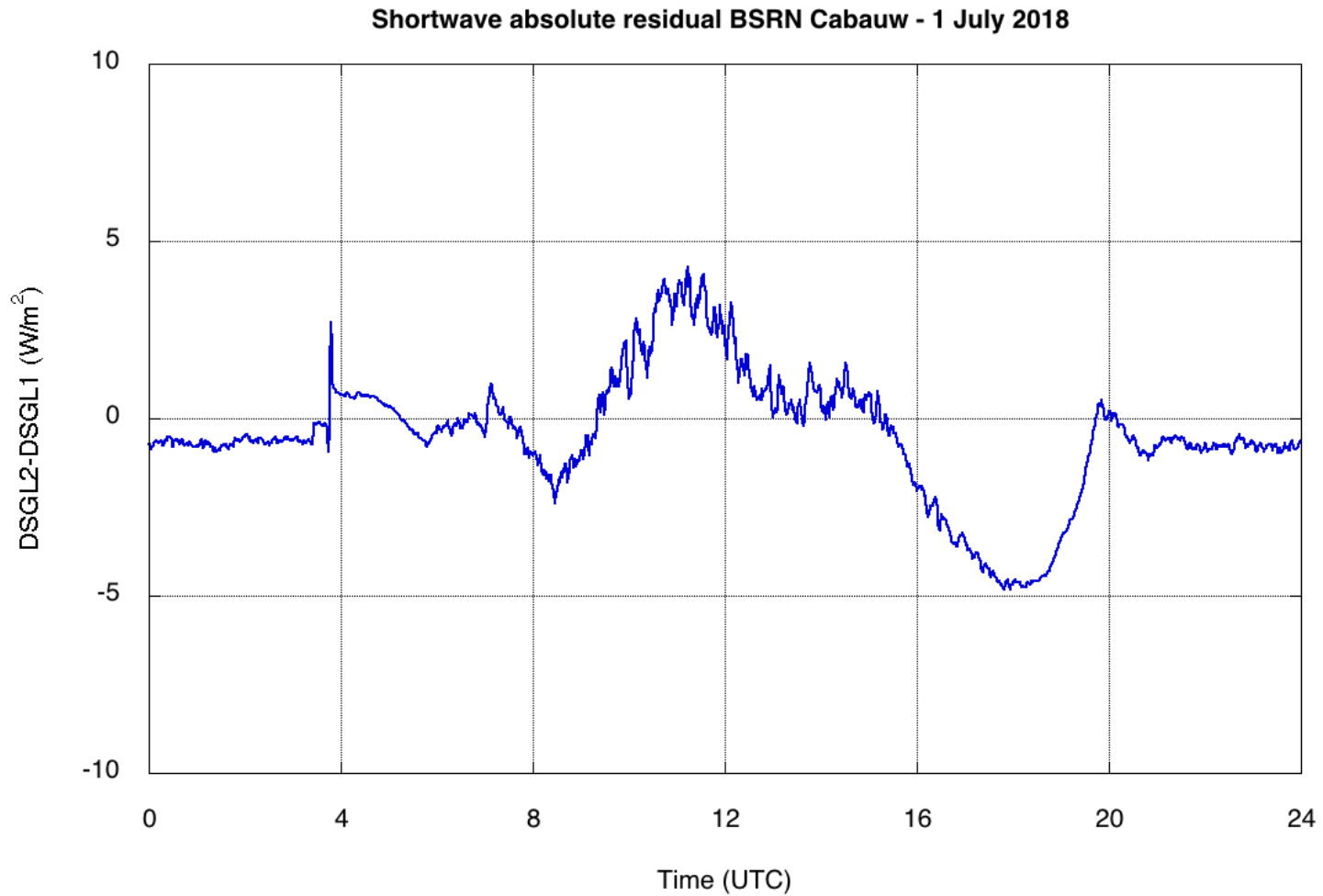
Cloudless day

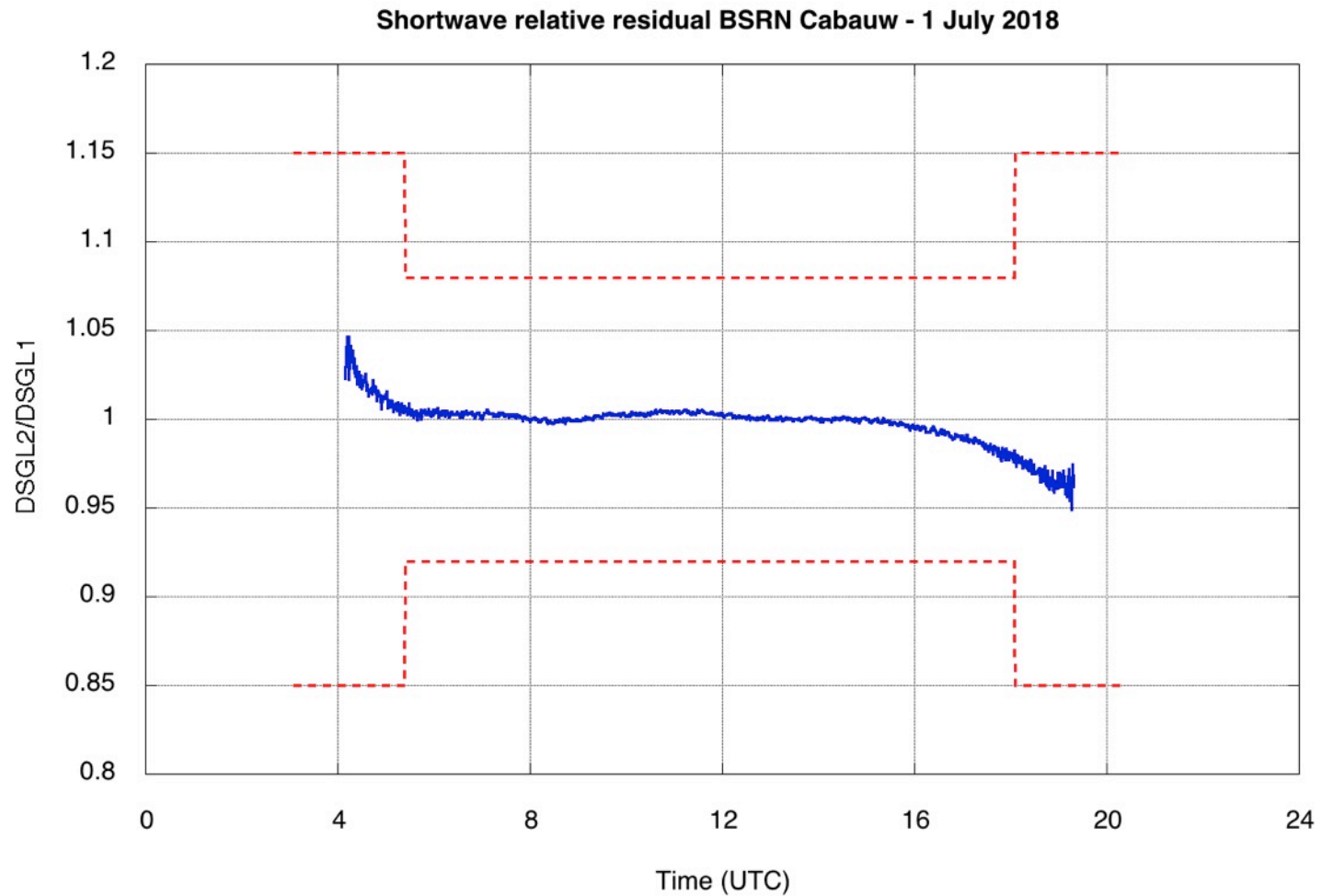
Cabauw, 1 July 2018



Global – Sum (W/m^2)

Cabauw, 1 July 2018



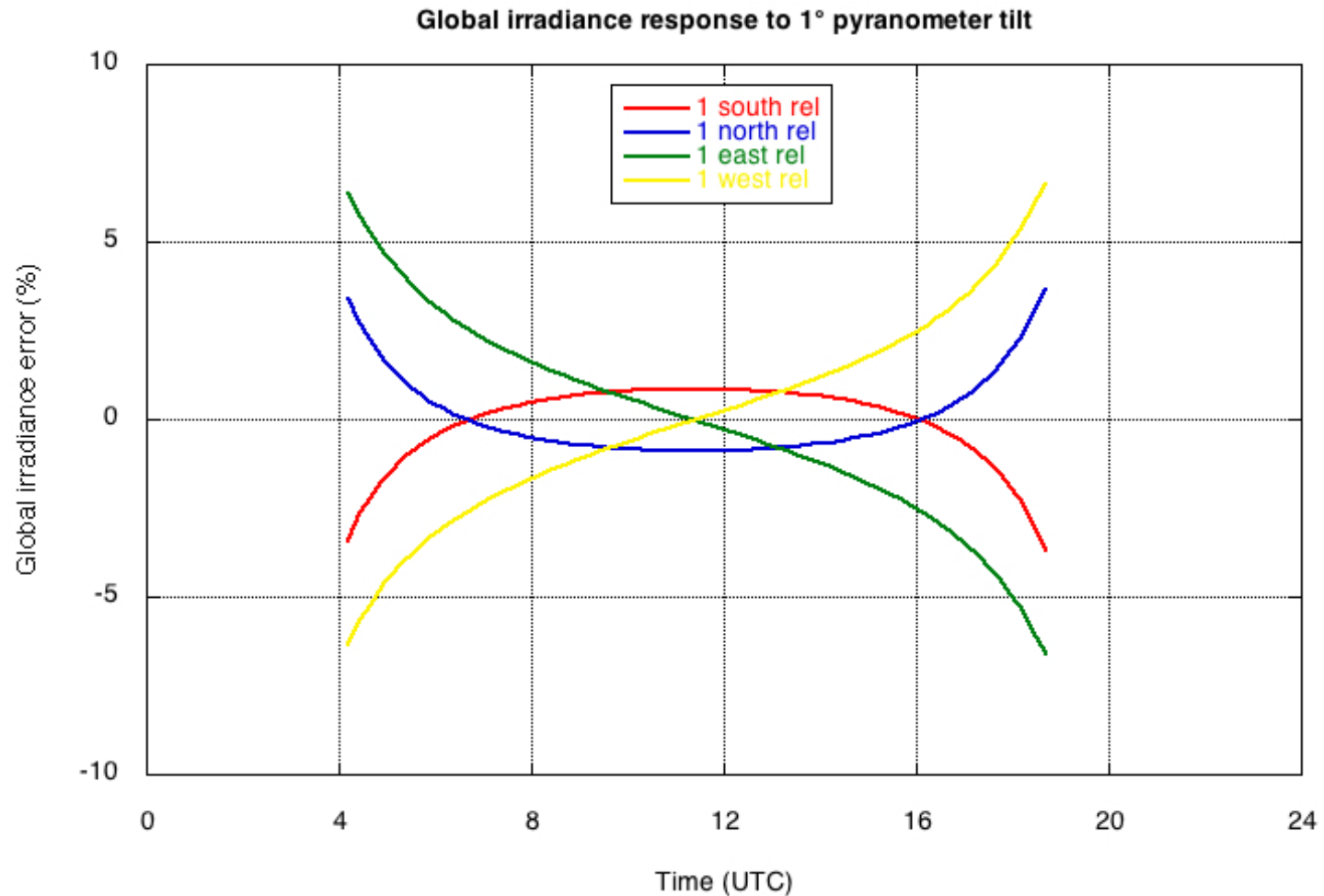


Tilt error

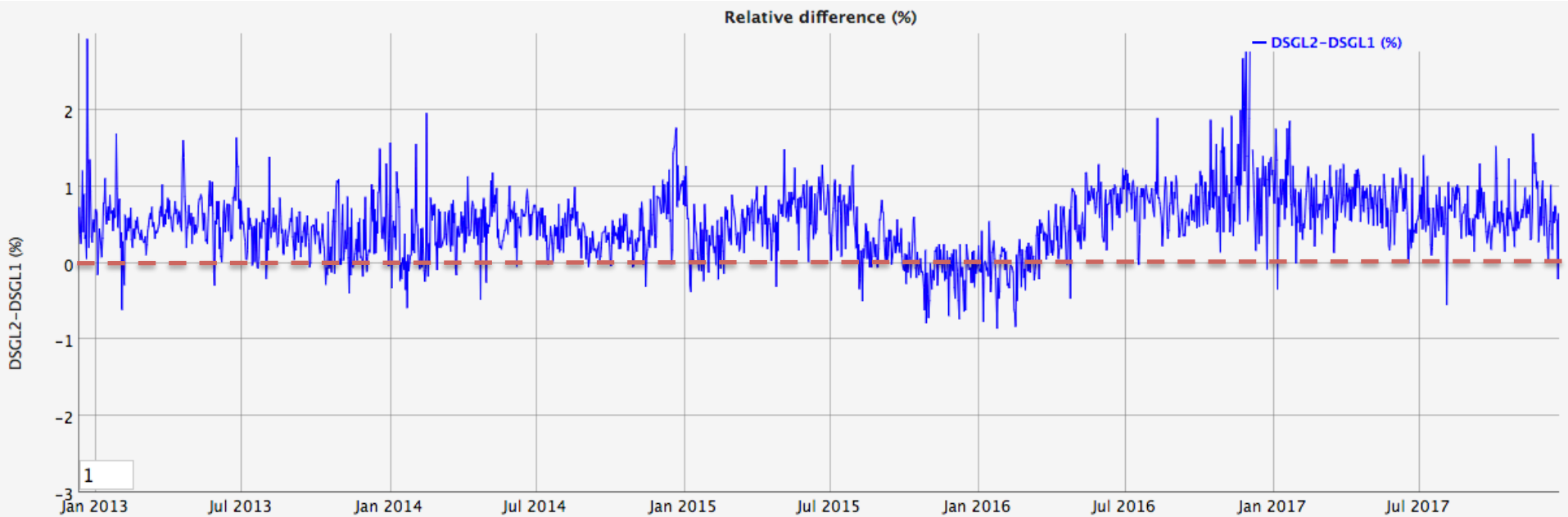
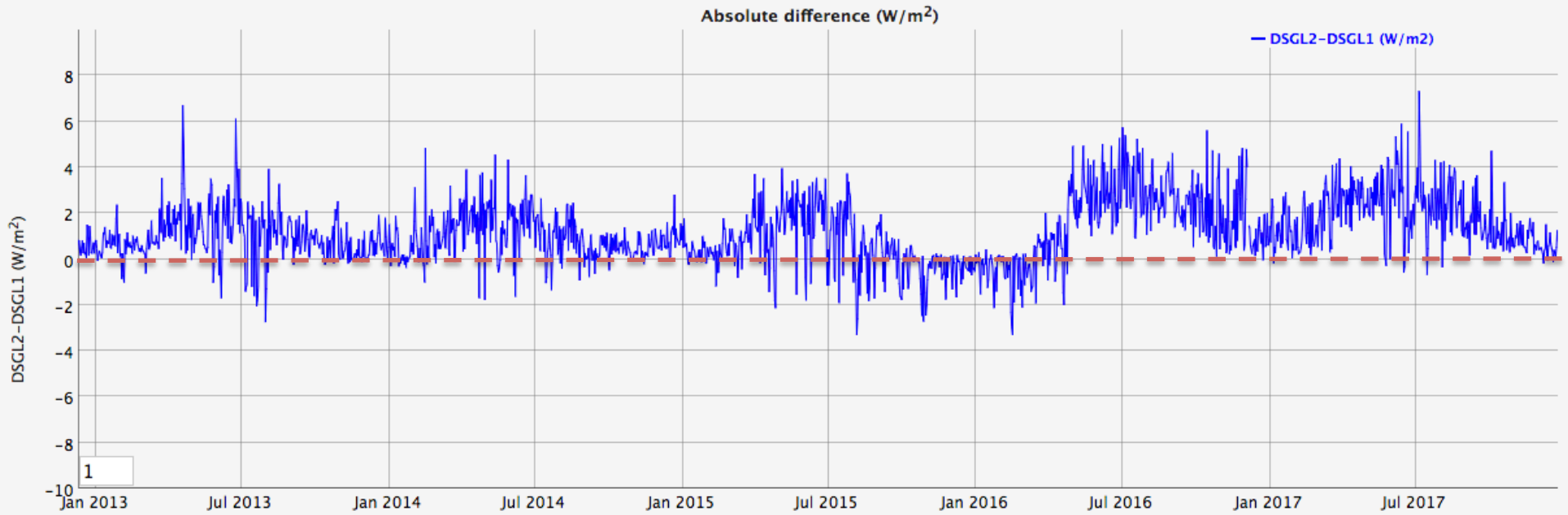
Cabauw, 1 July 2018, RT model



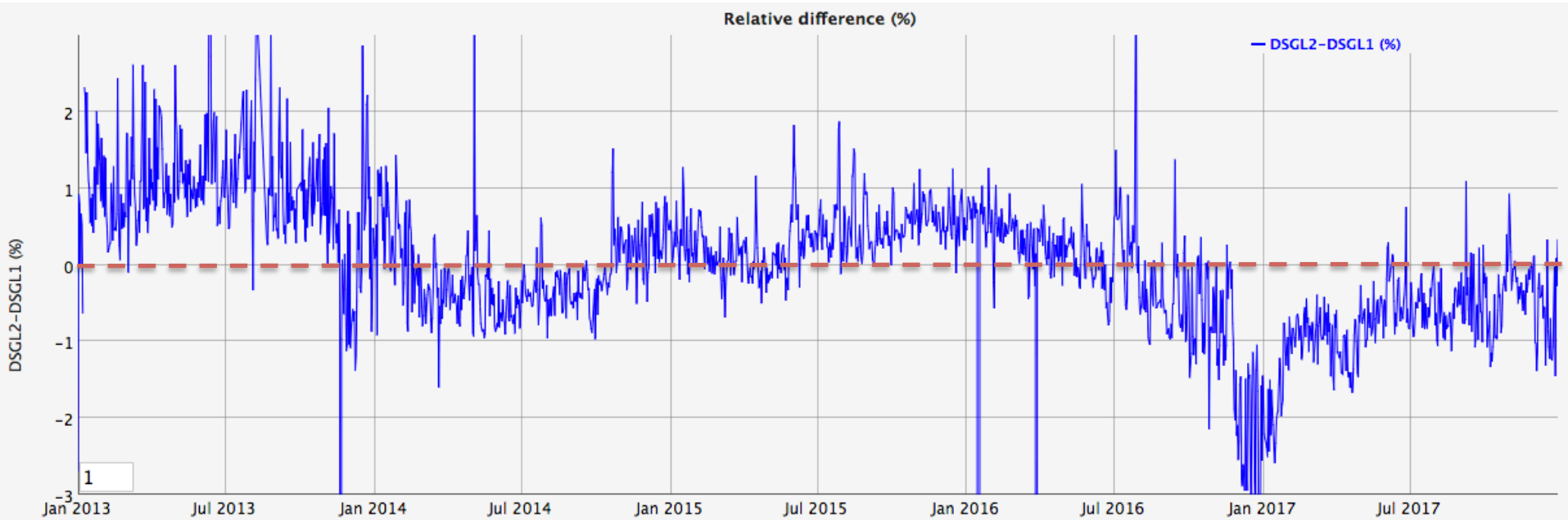
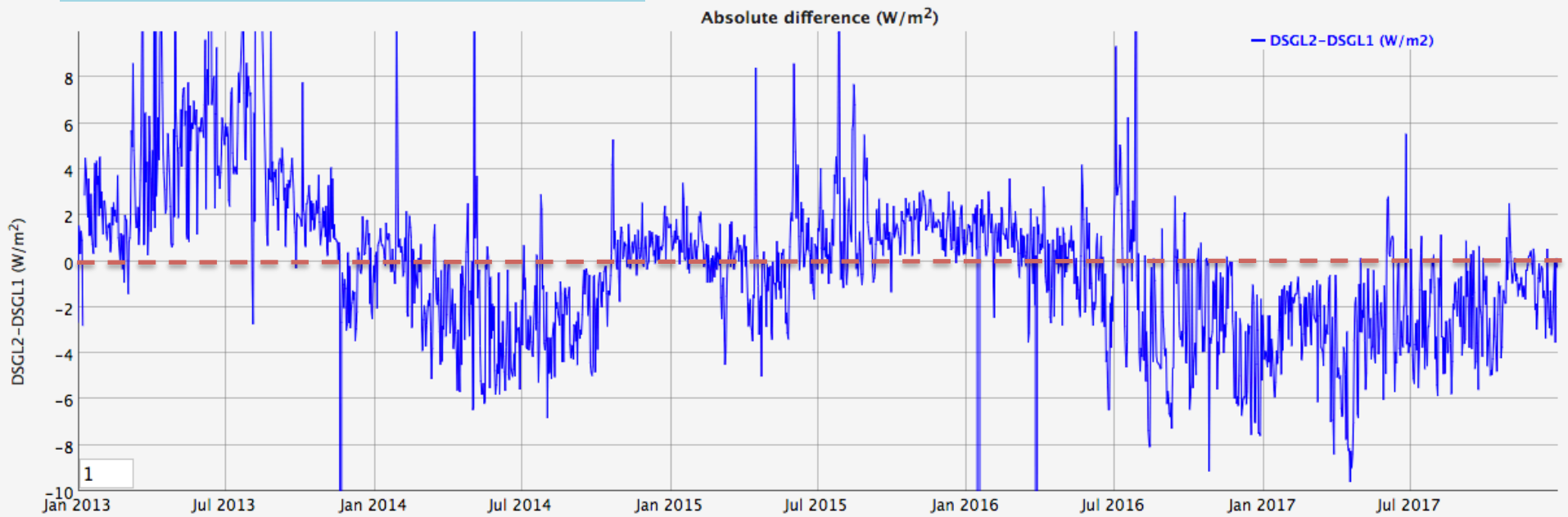
- ❖ Calculate full model residual
- ❖ + cosine/azimuth response pyranometer needed



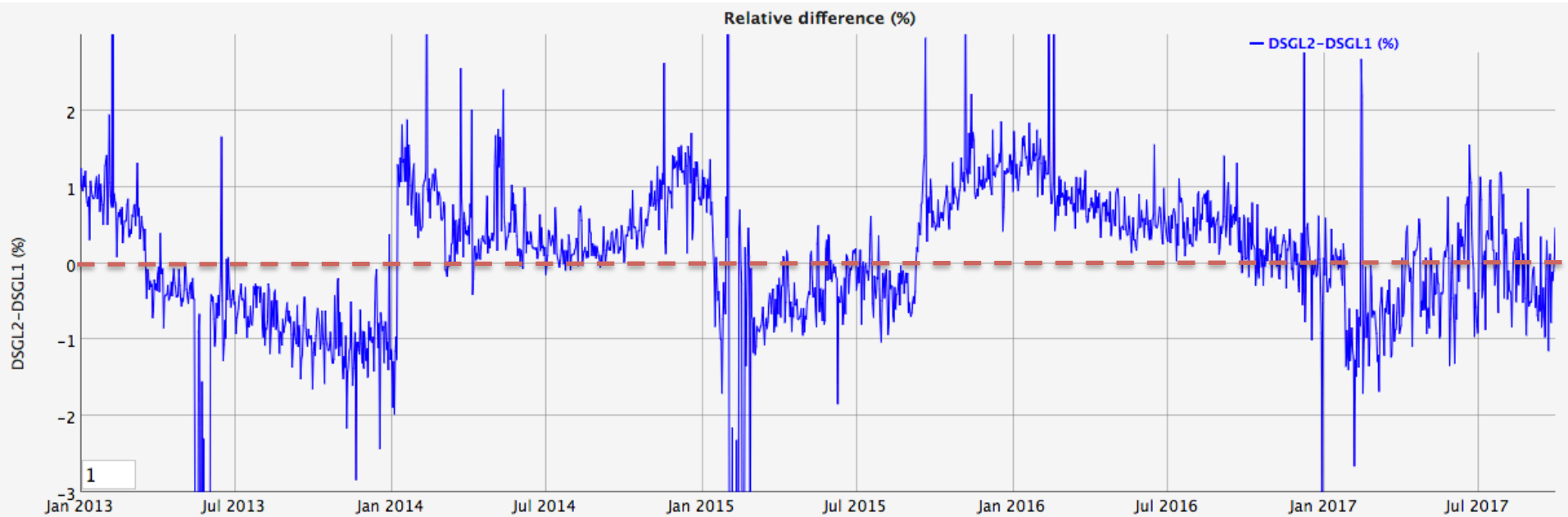
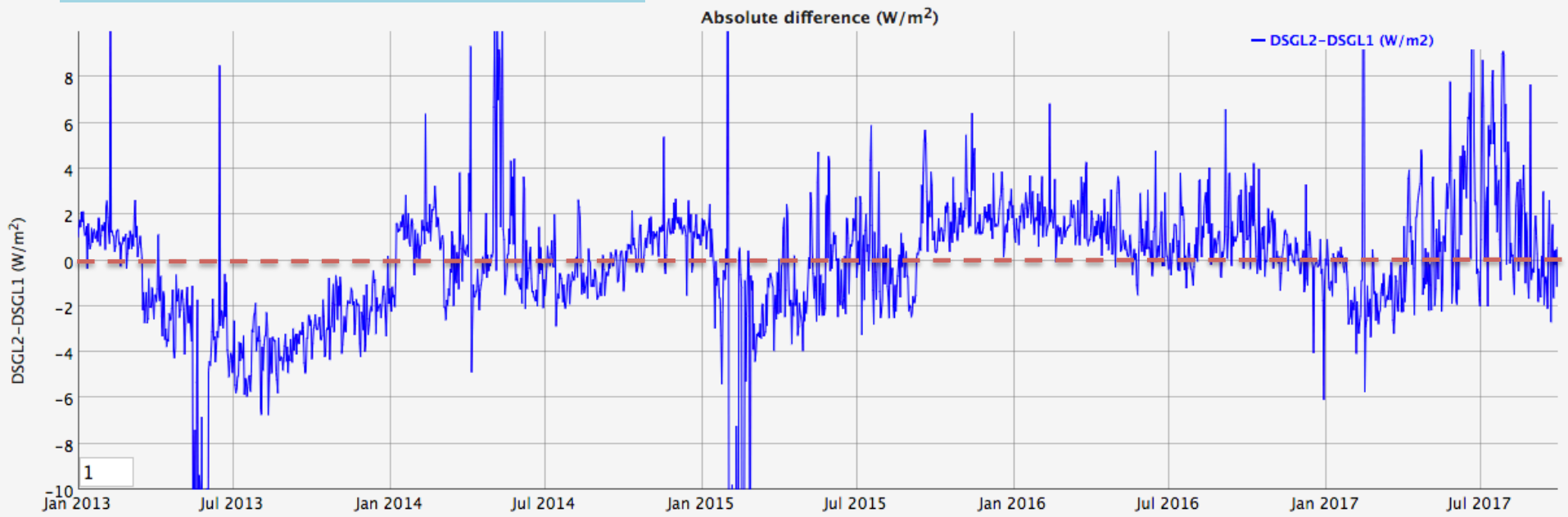
Cabauw - Netherlands



Carpentras - France

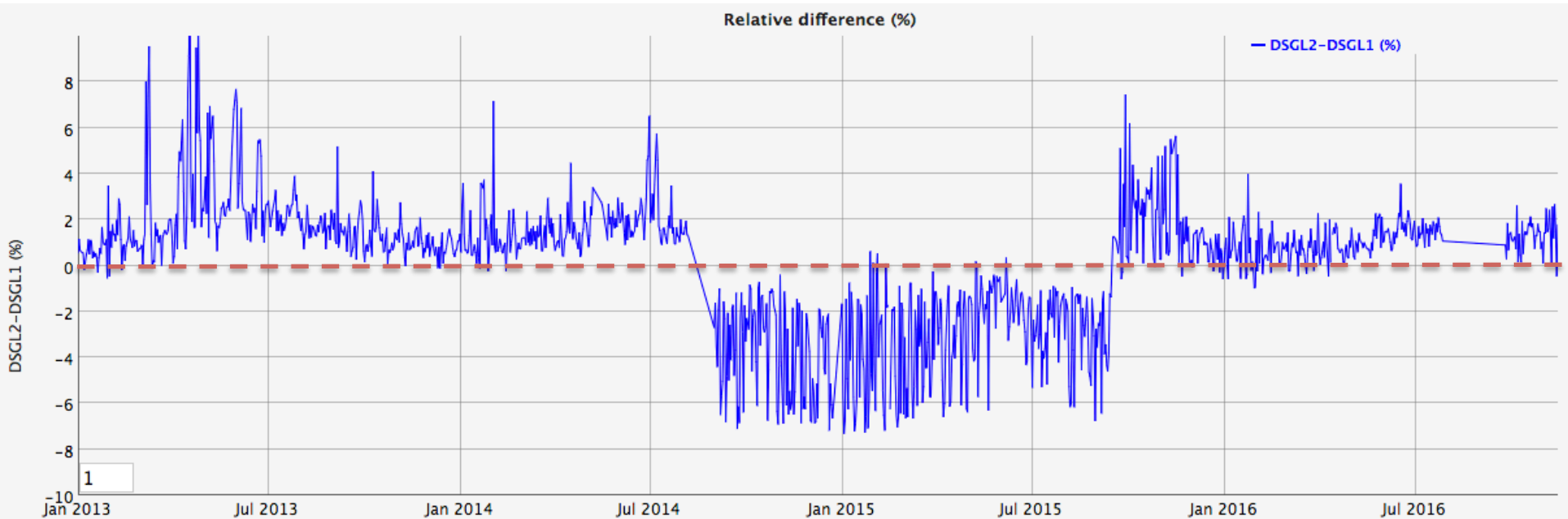
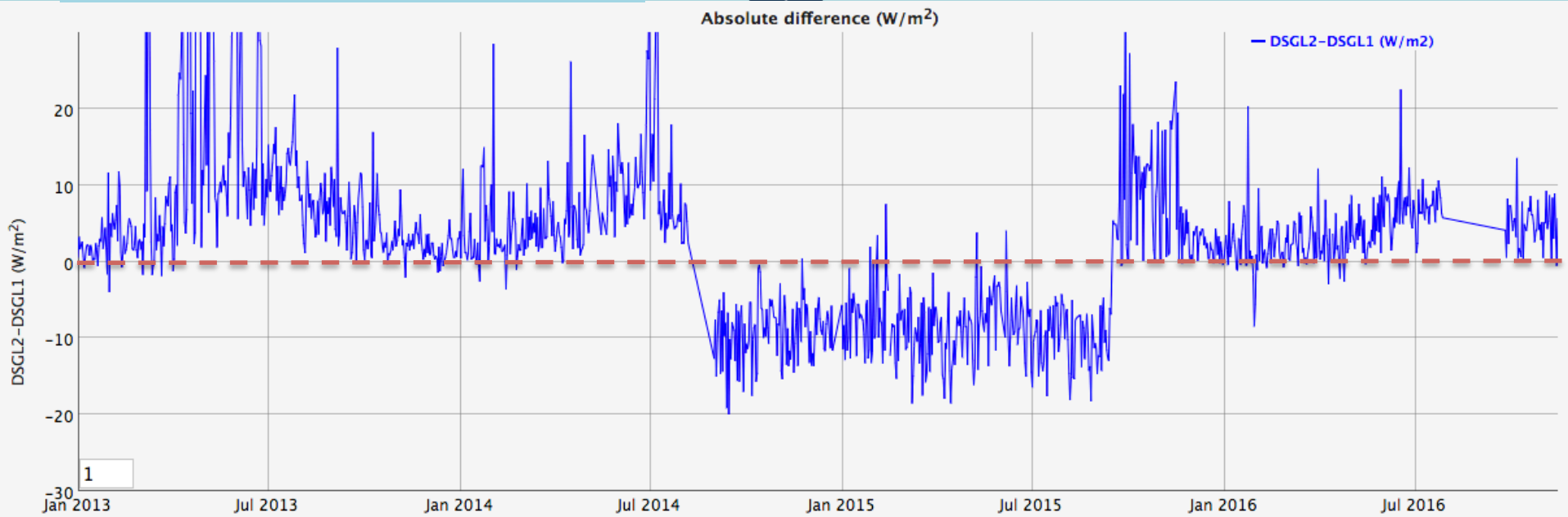


Cener - Spain

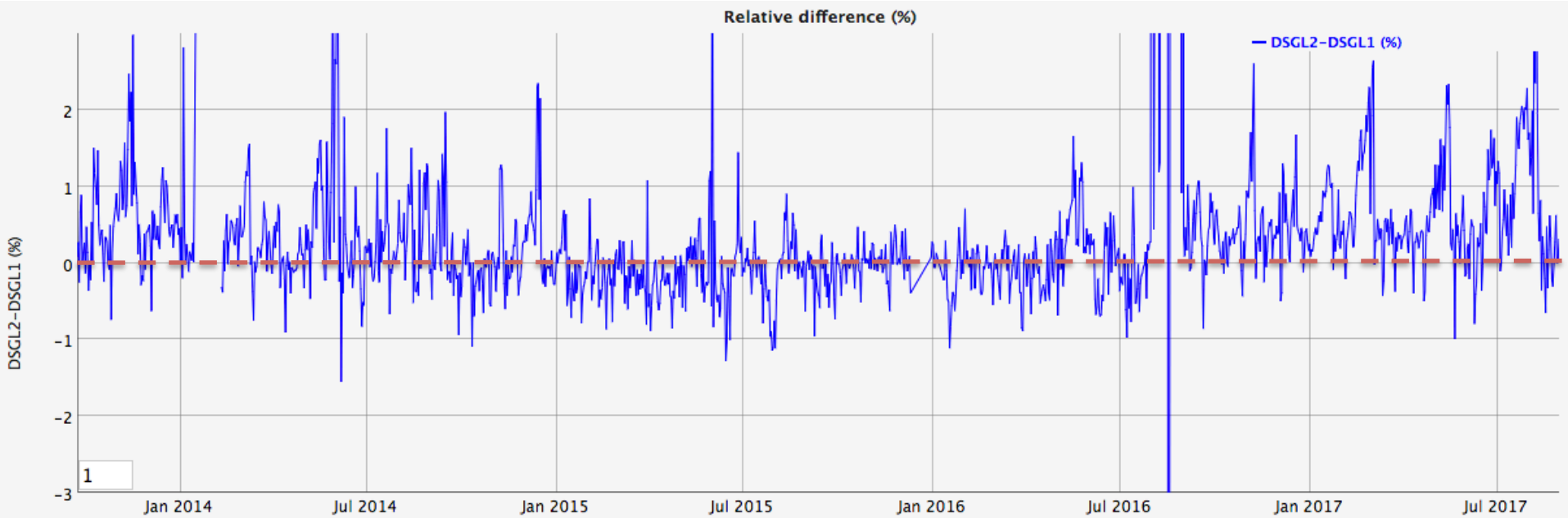
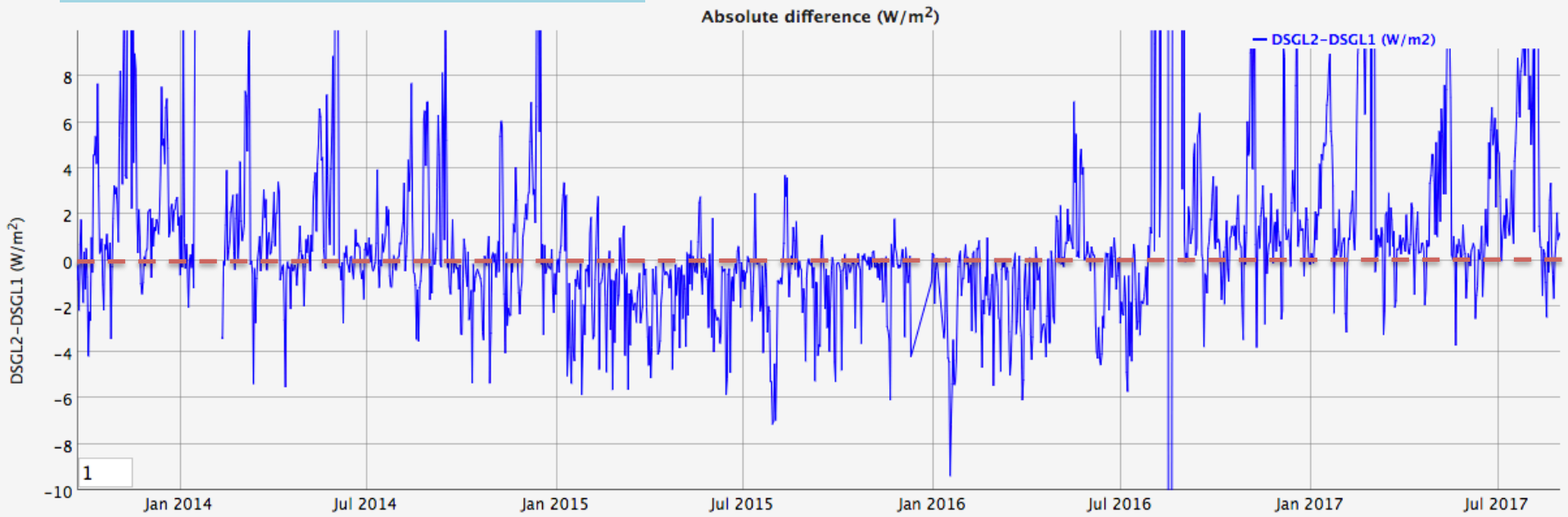


Chesapeake Light - USA

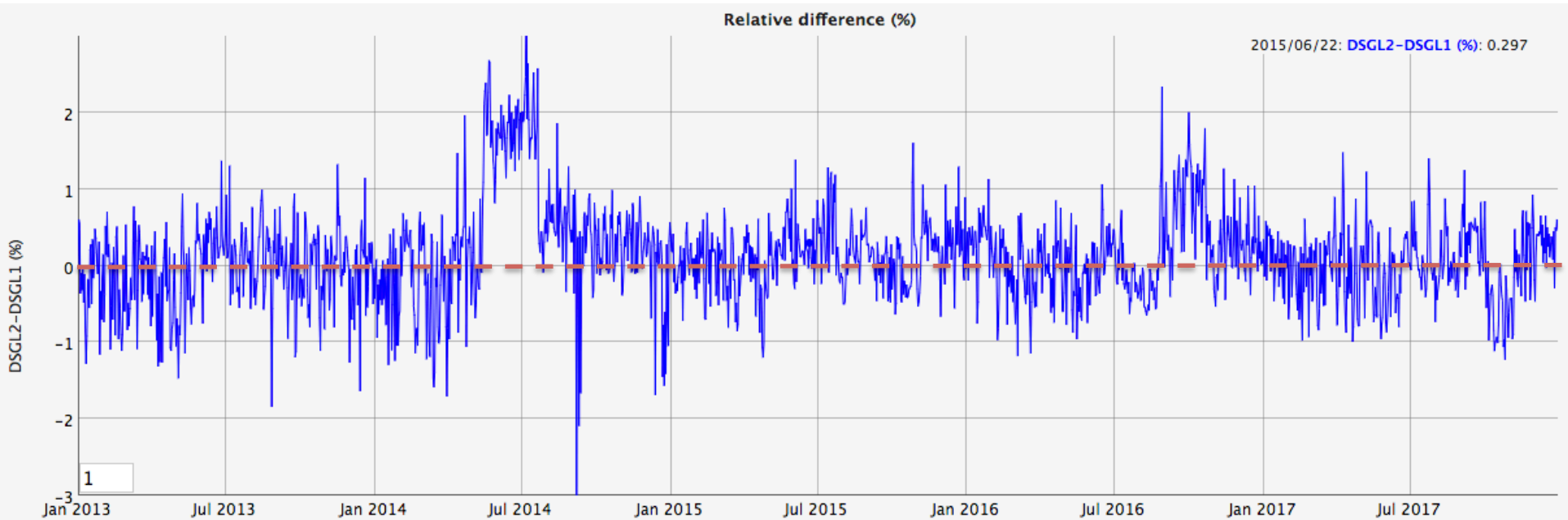
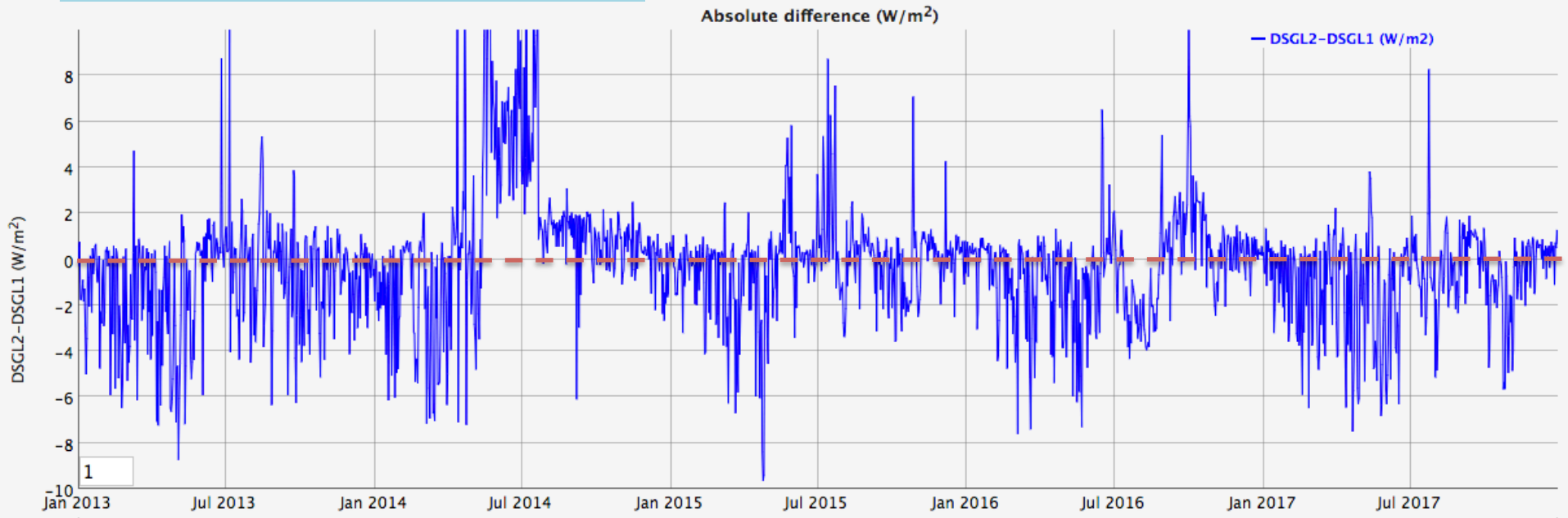
Expanded scales!



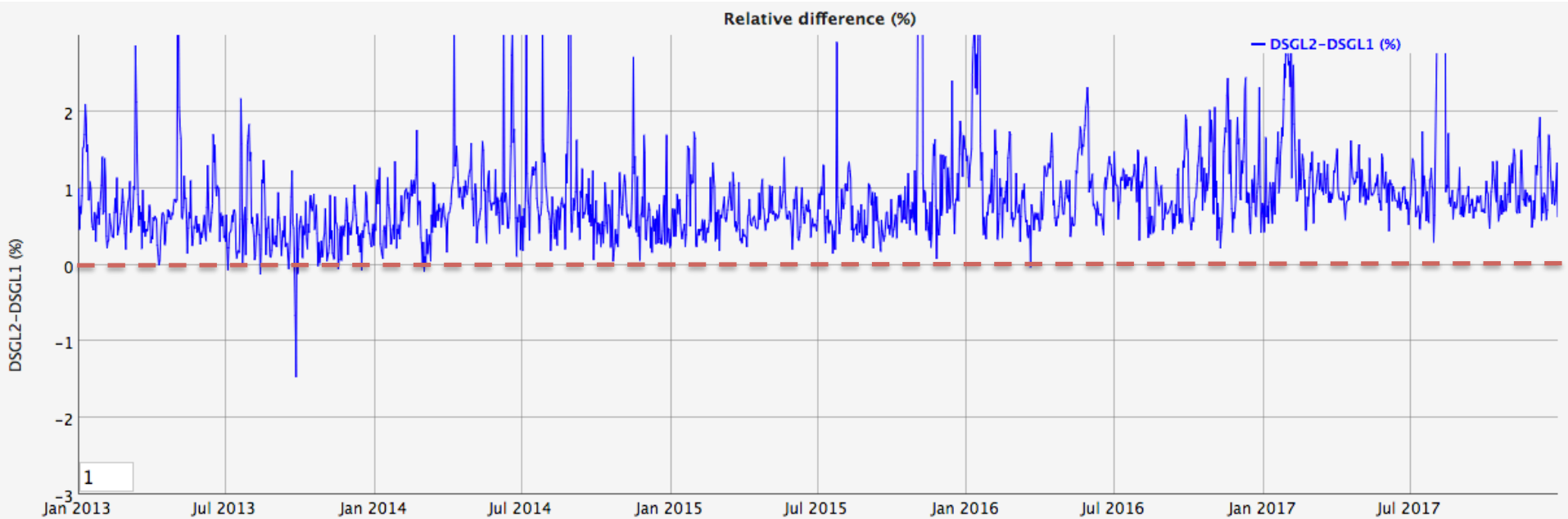
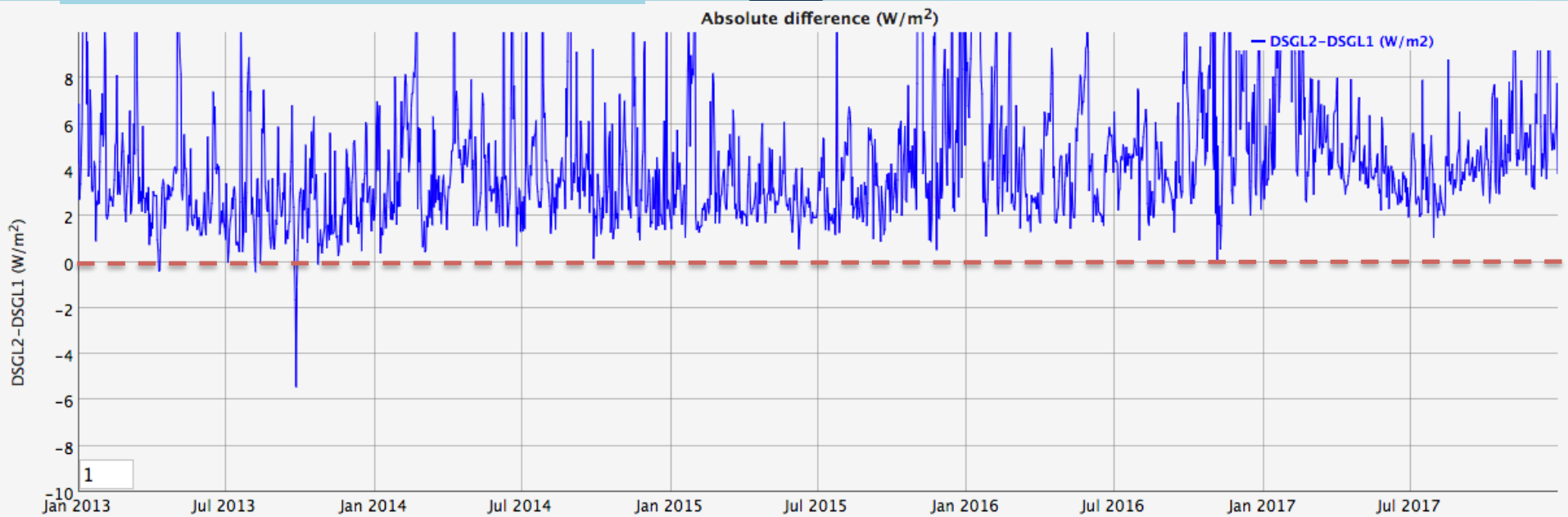
Florianopolis - Brasil



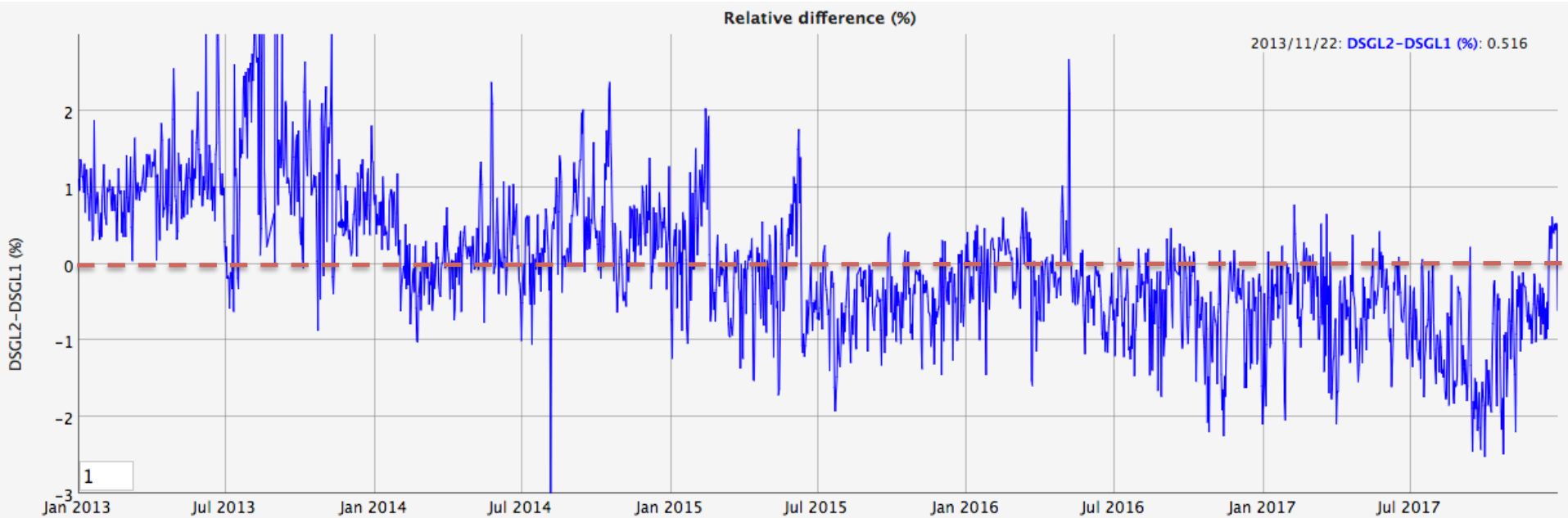
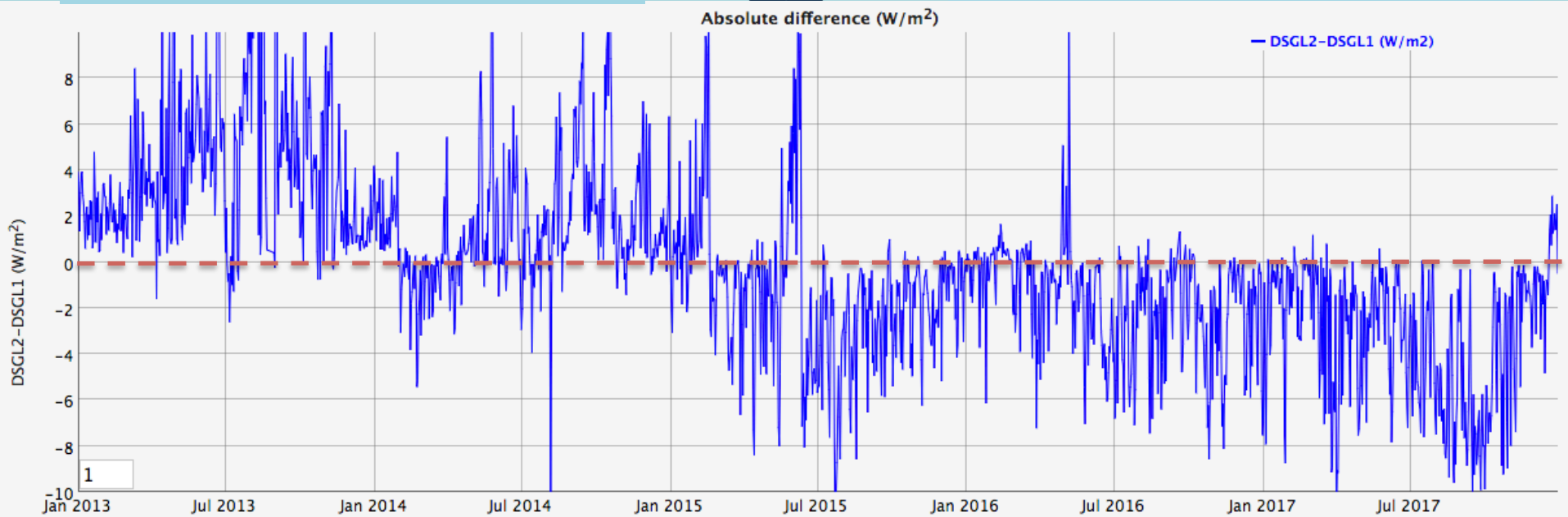
Fukuoka - Japan



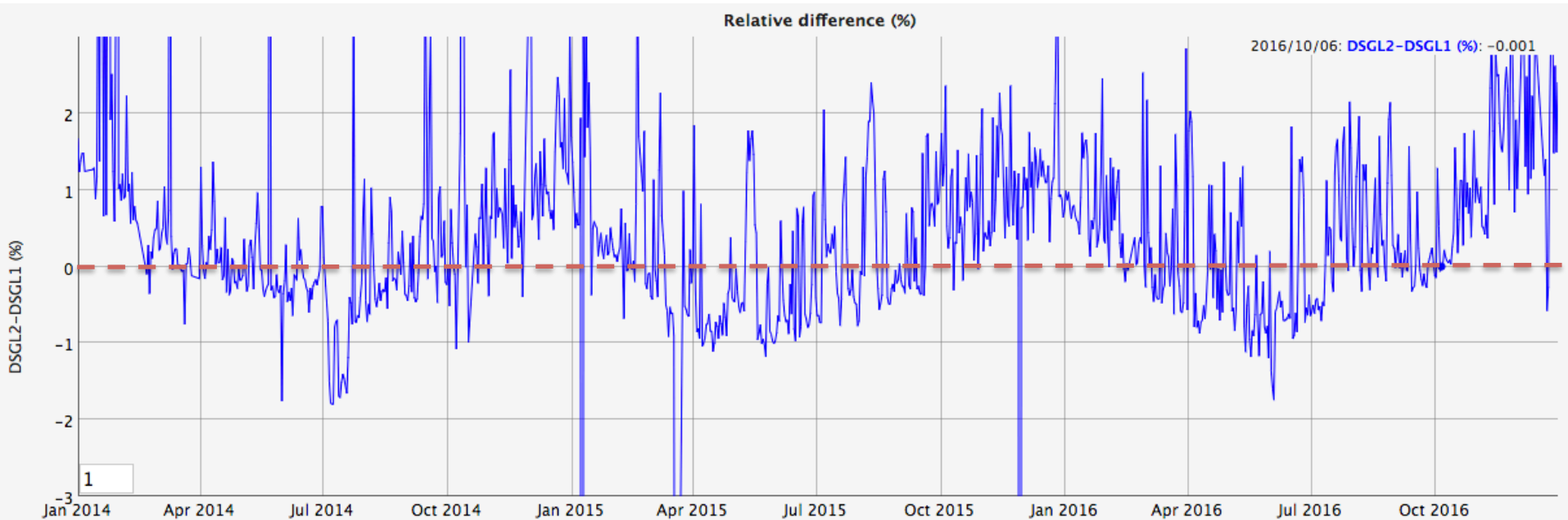
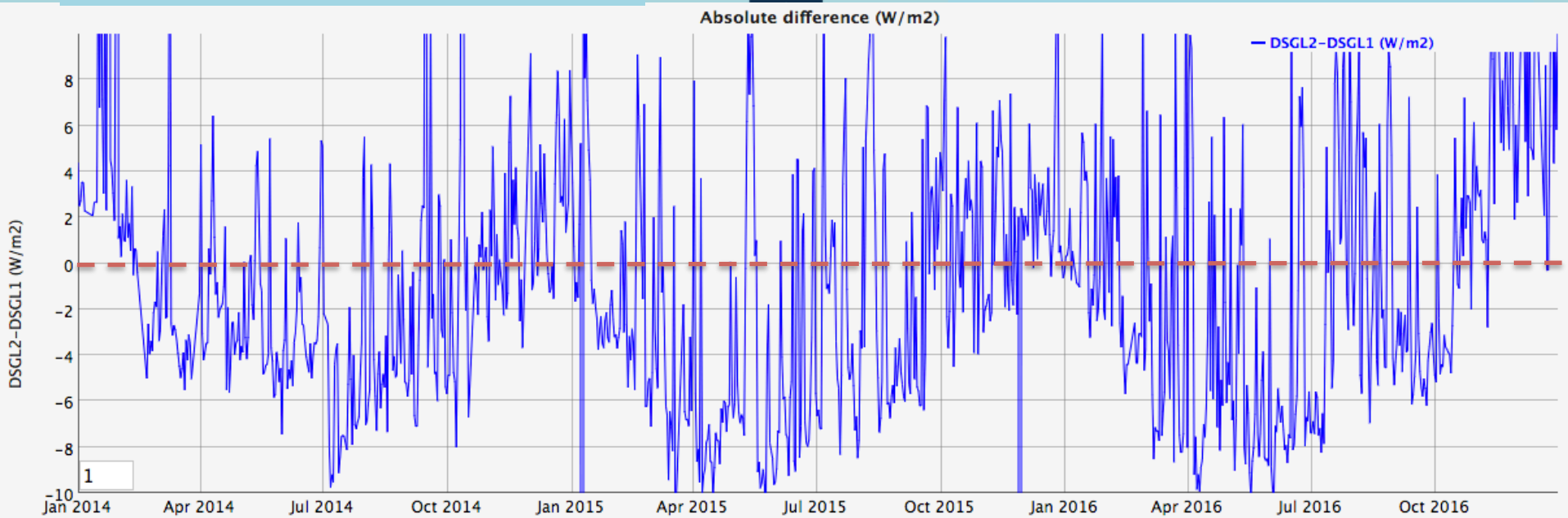
Gobabeb - Namibia



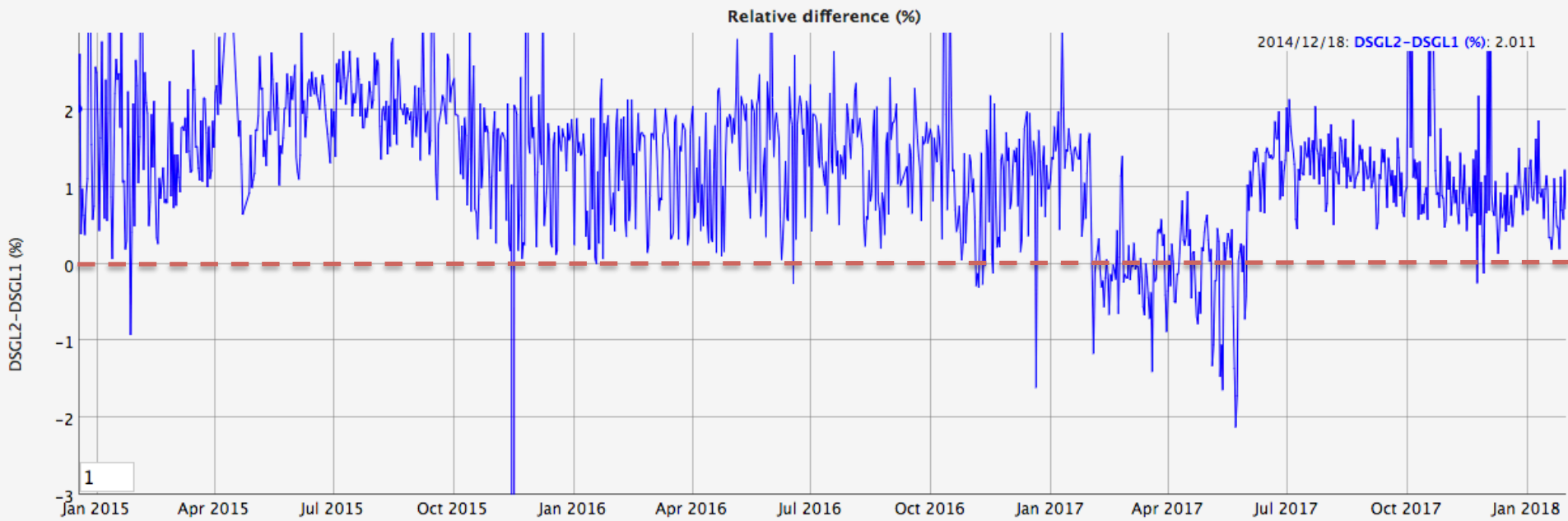
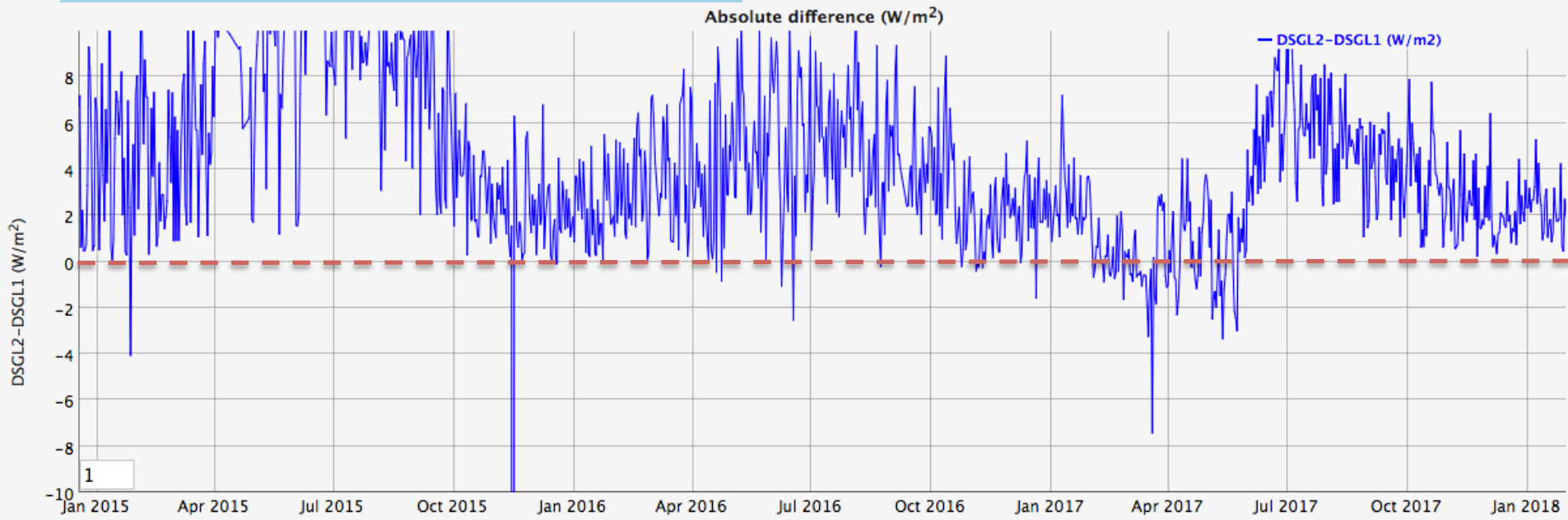
Ishigakijima - Japan



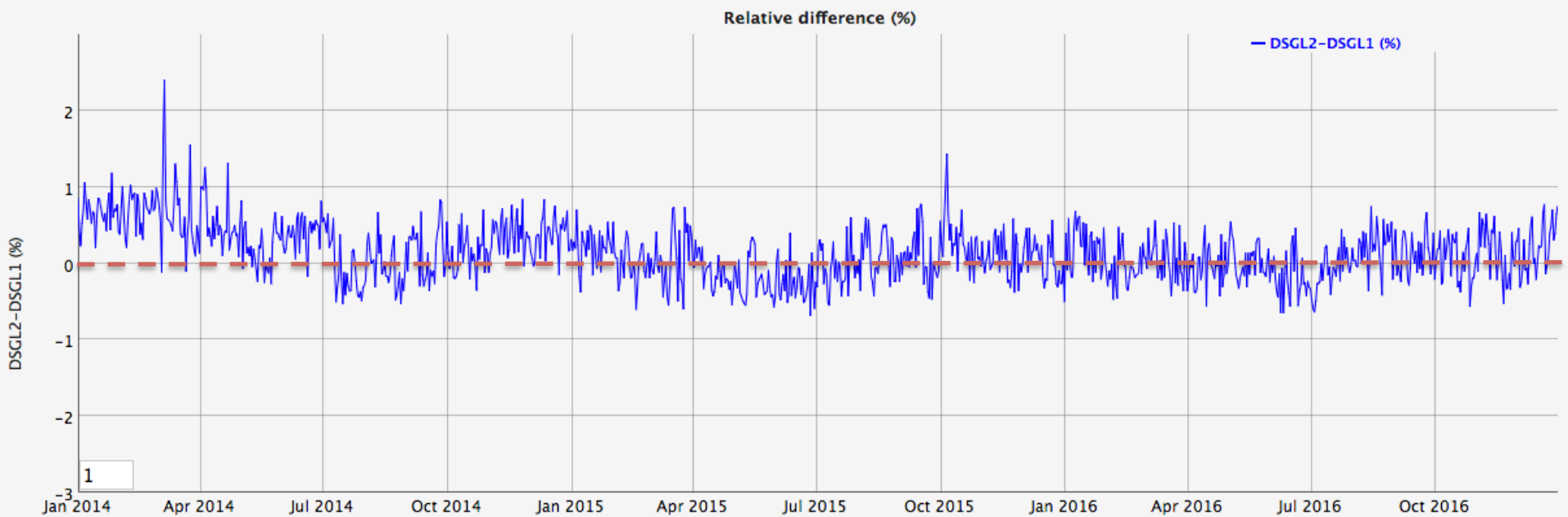
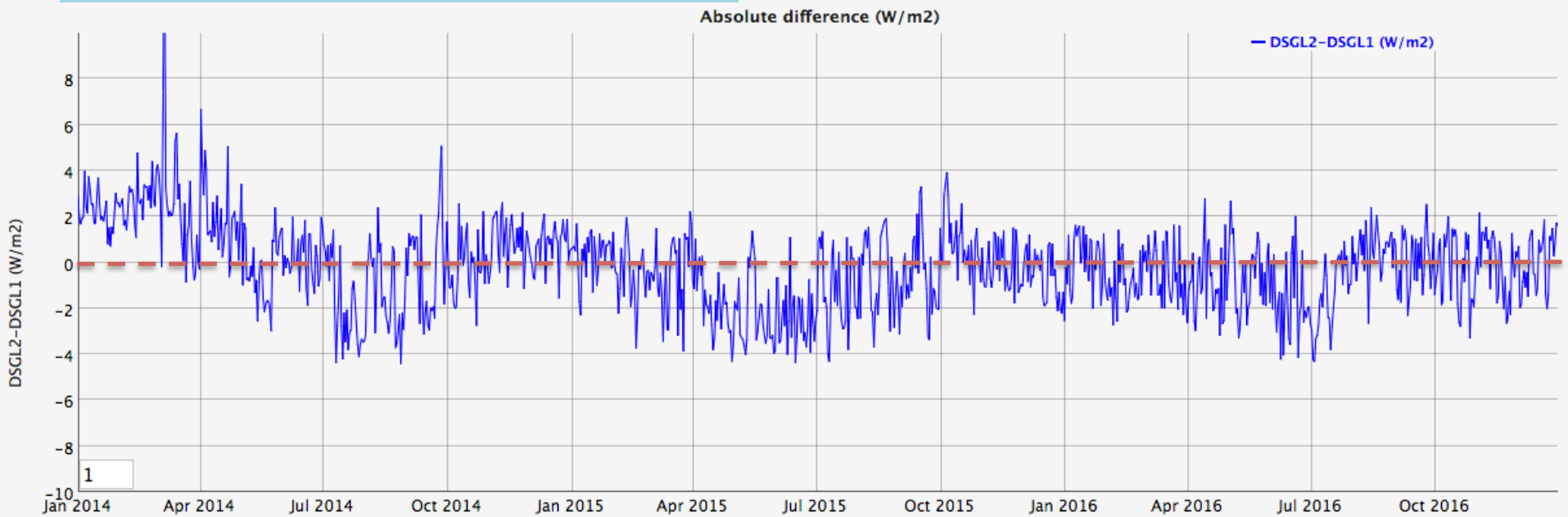
Izana - Spain



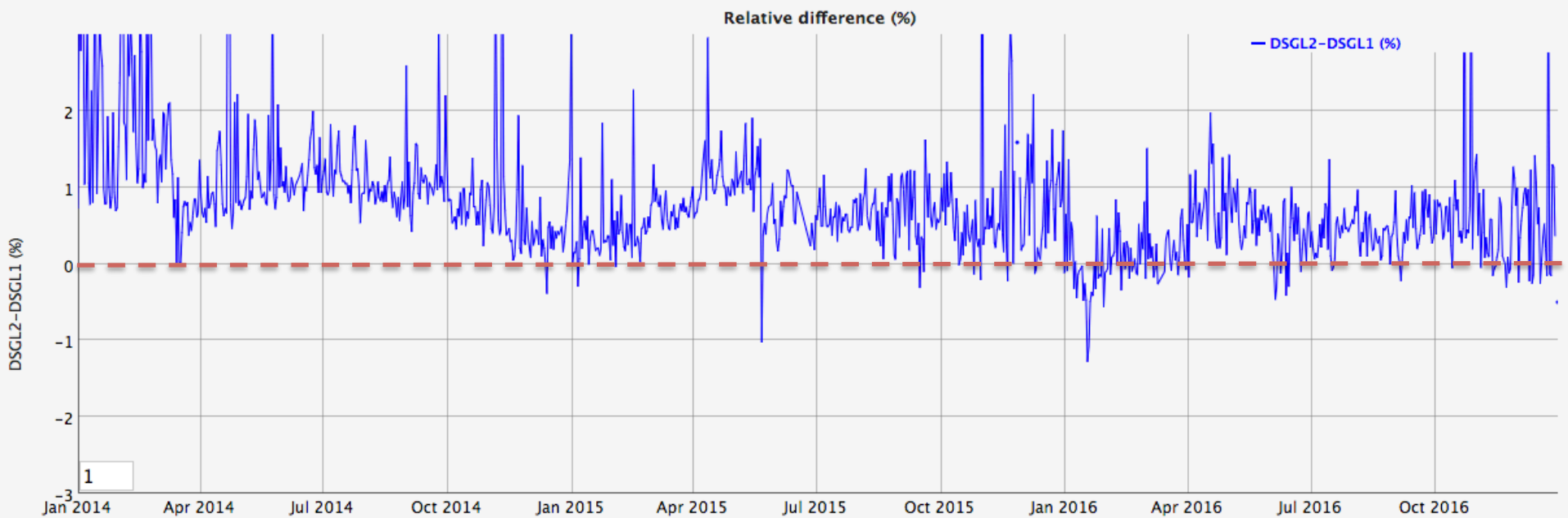
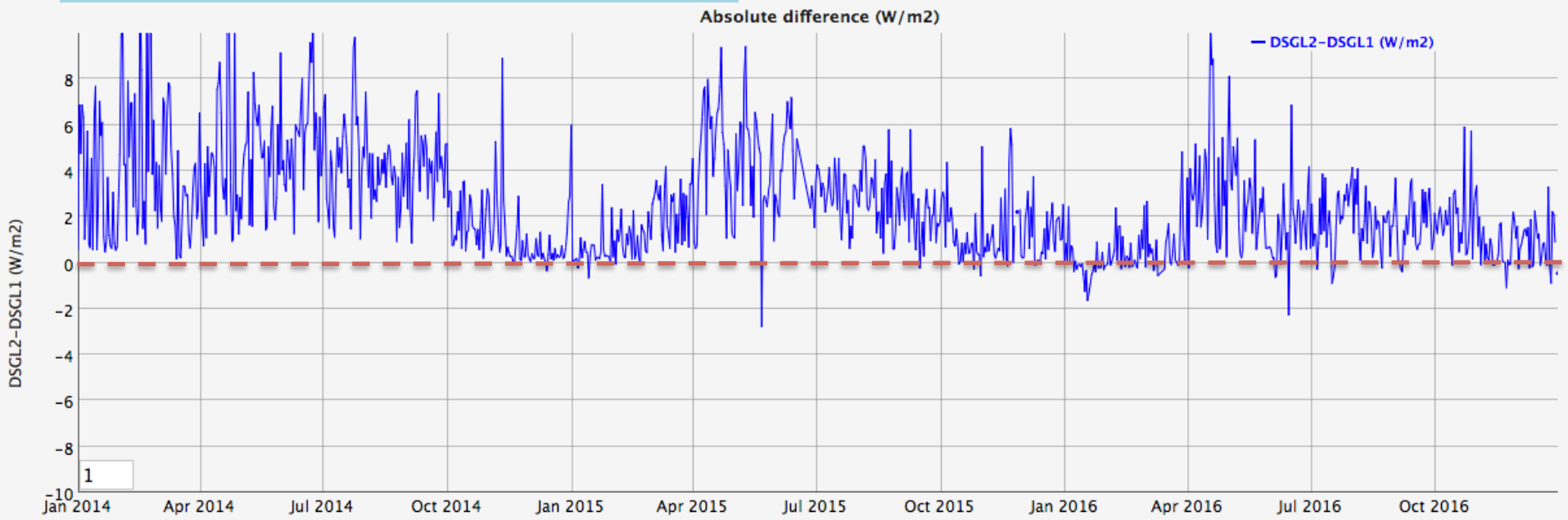
Langley Research C. - USA

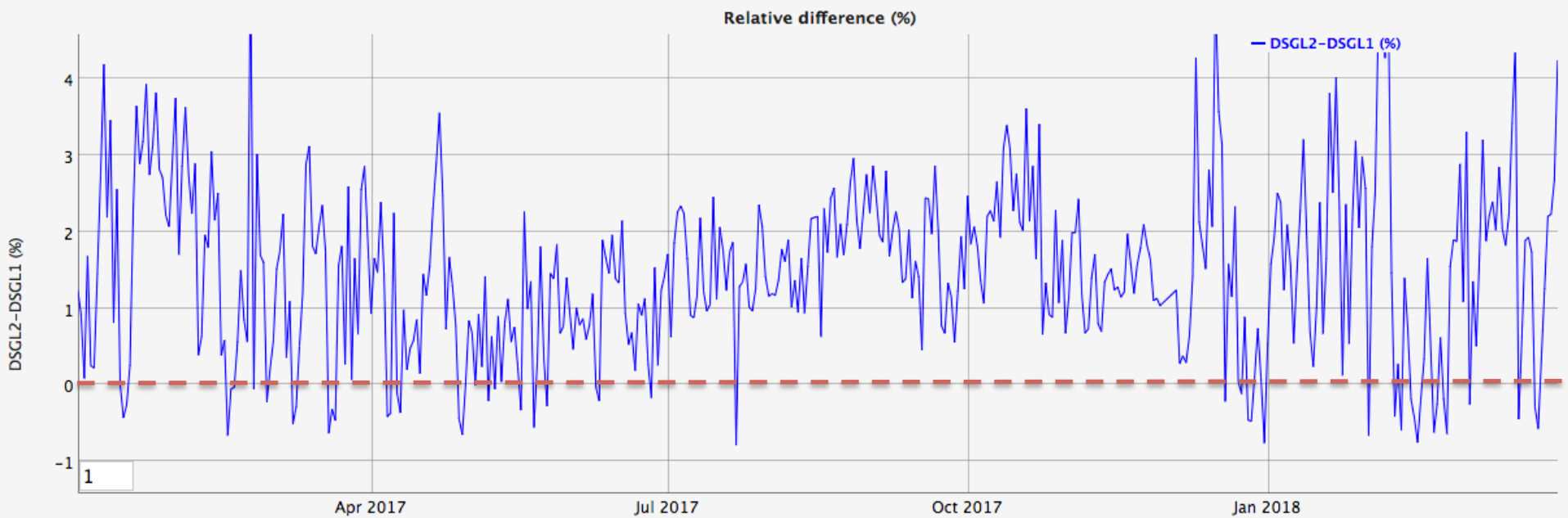
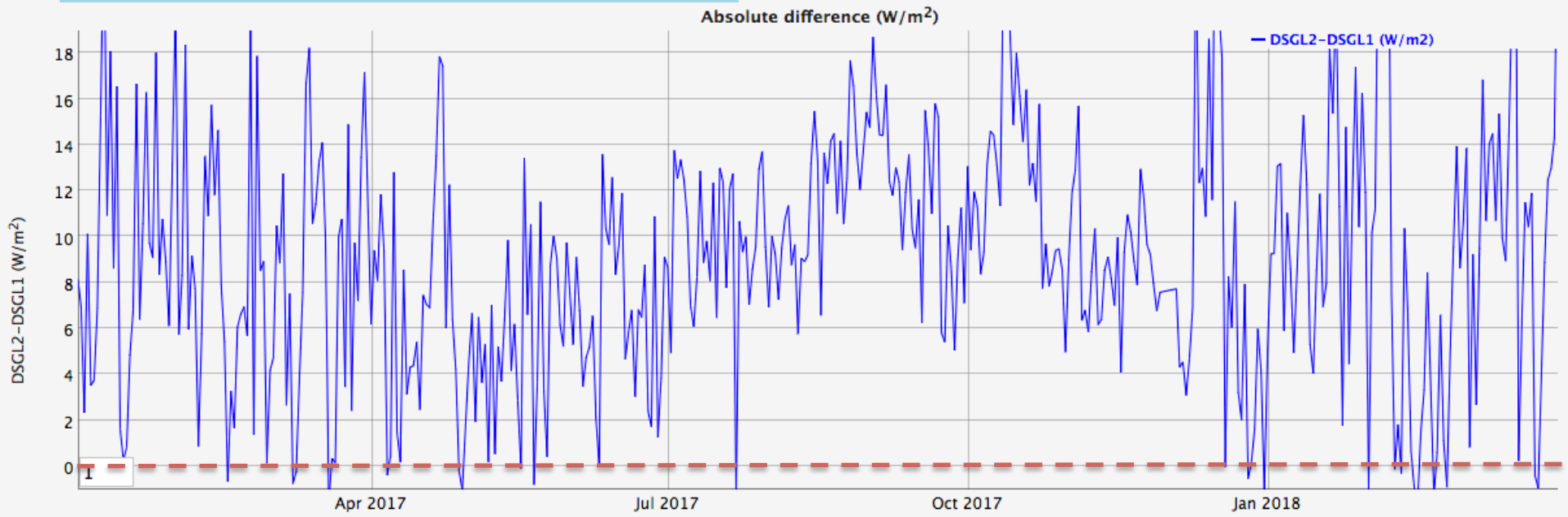


Minamitorishima - Japan



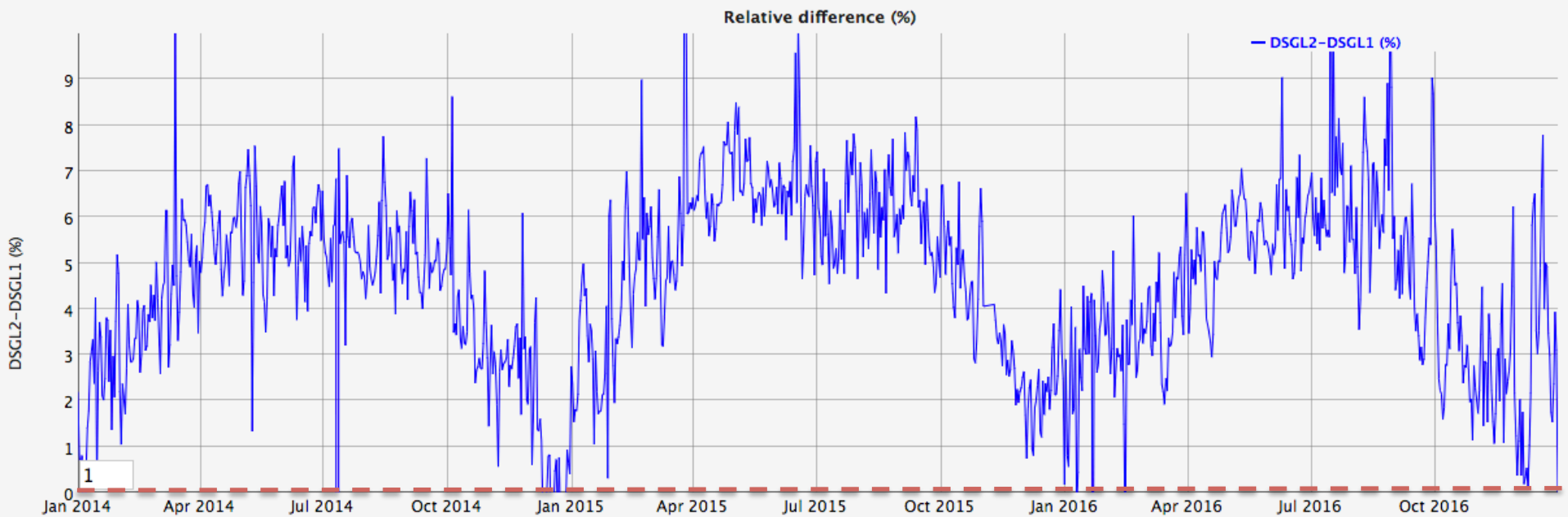
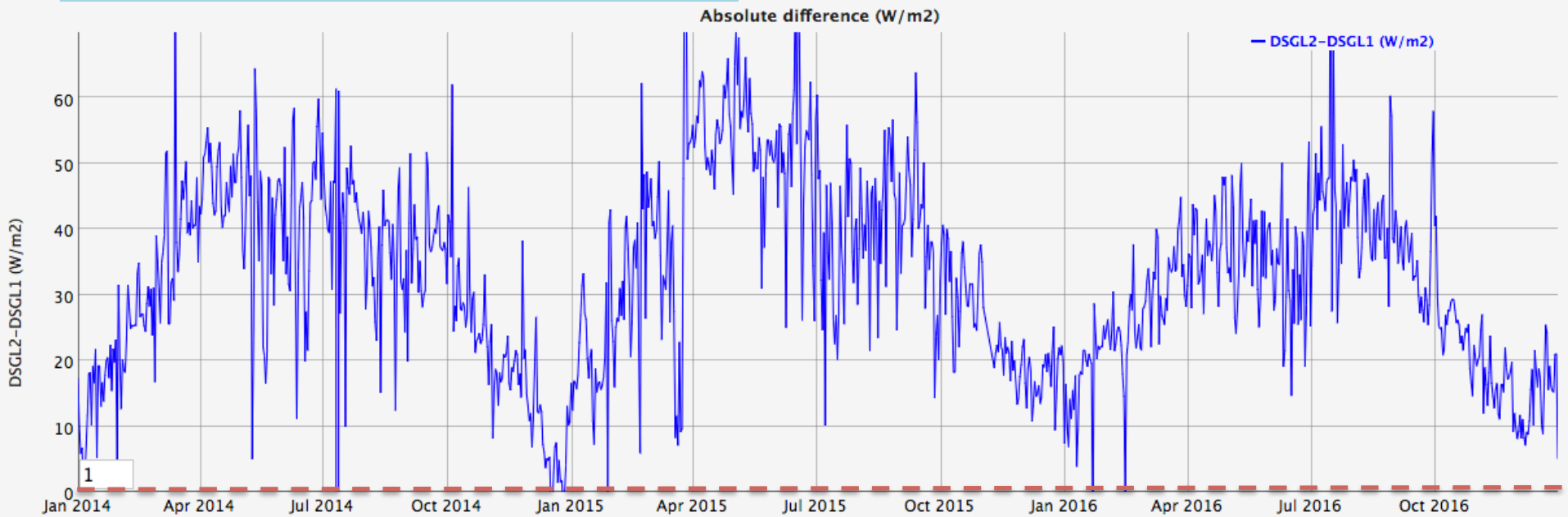
Palaiseau - France



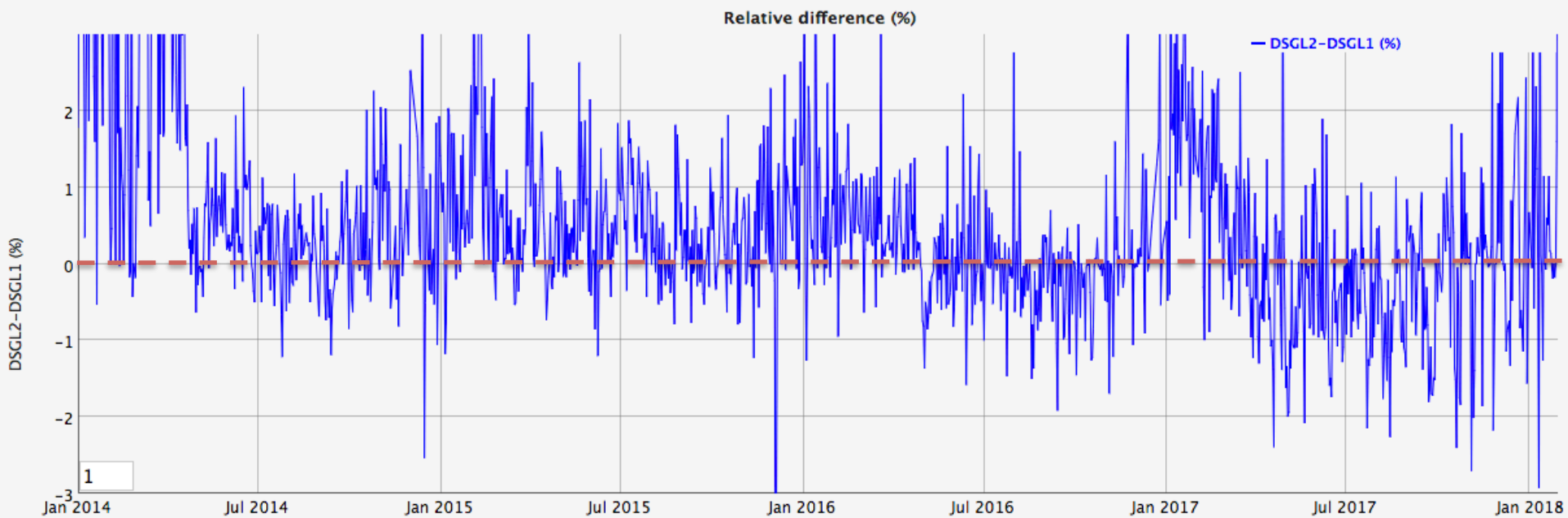
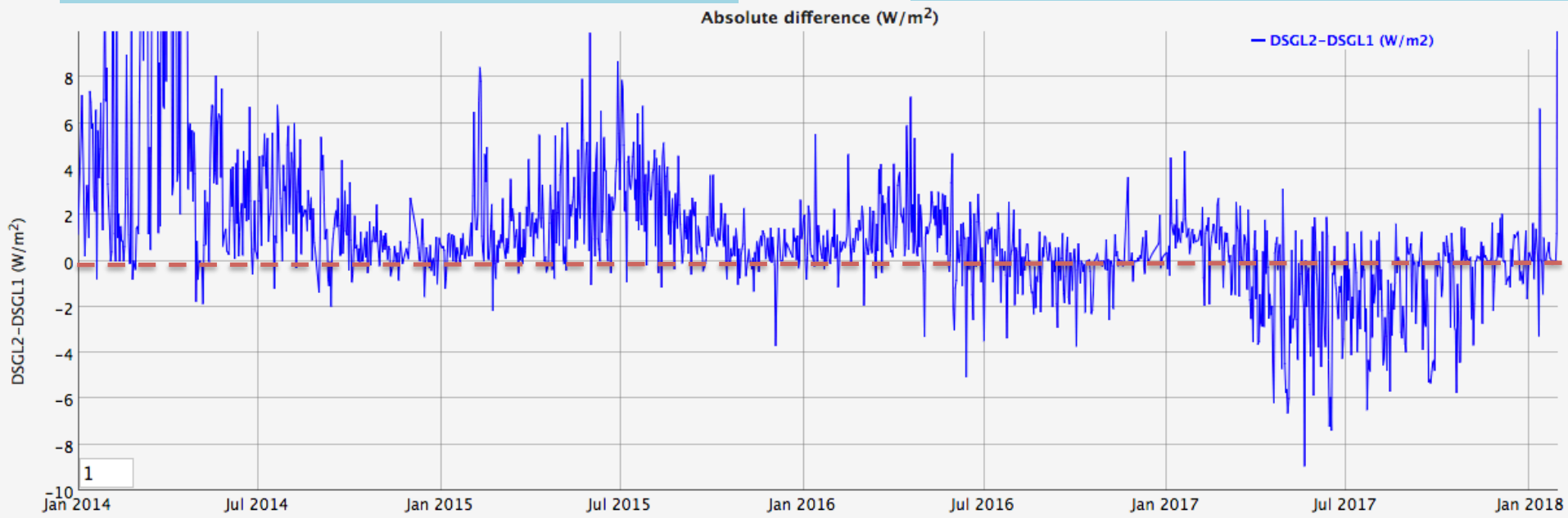


Tamanrasset - Algeria

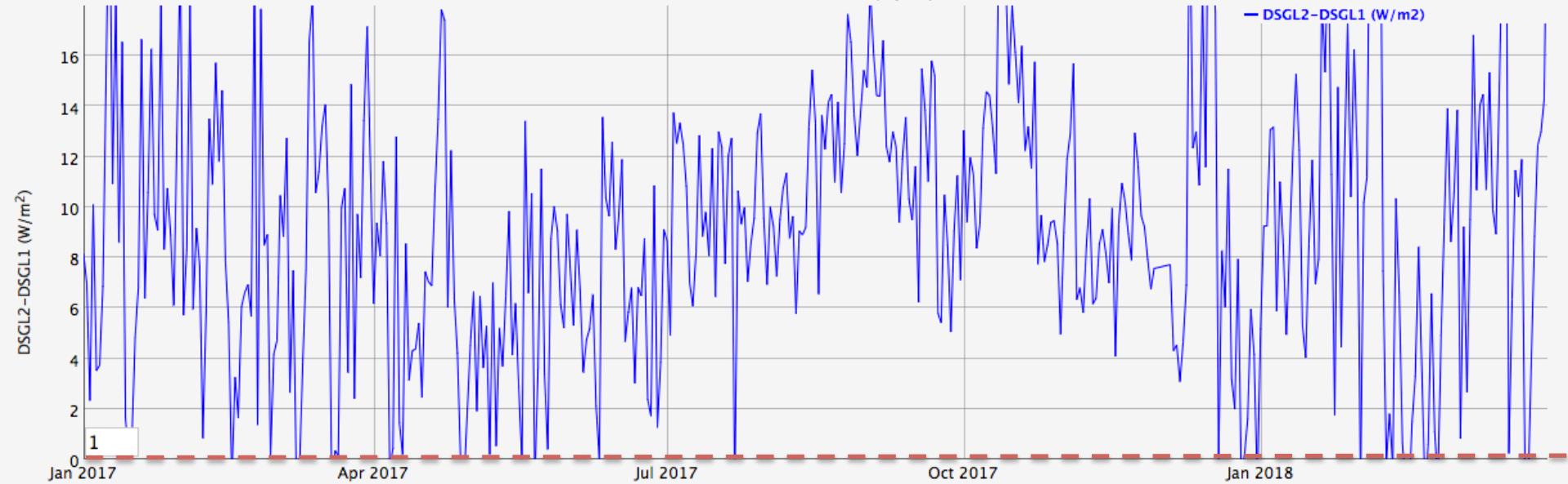
Expanded scales!



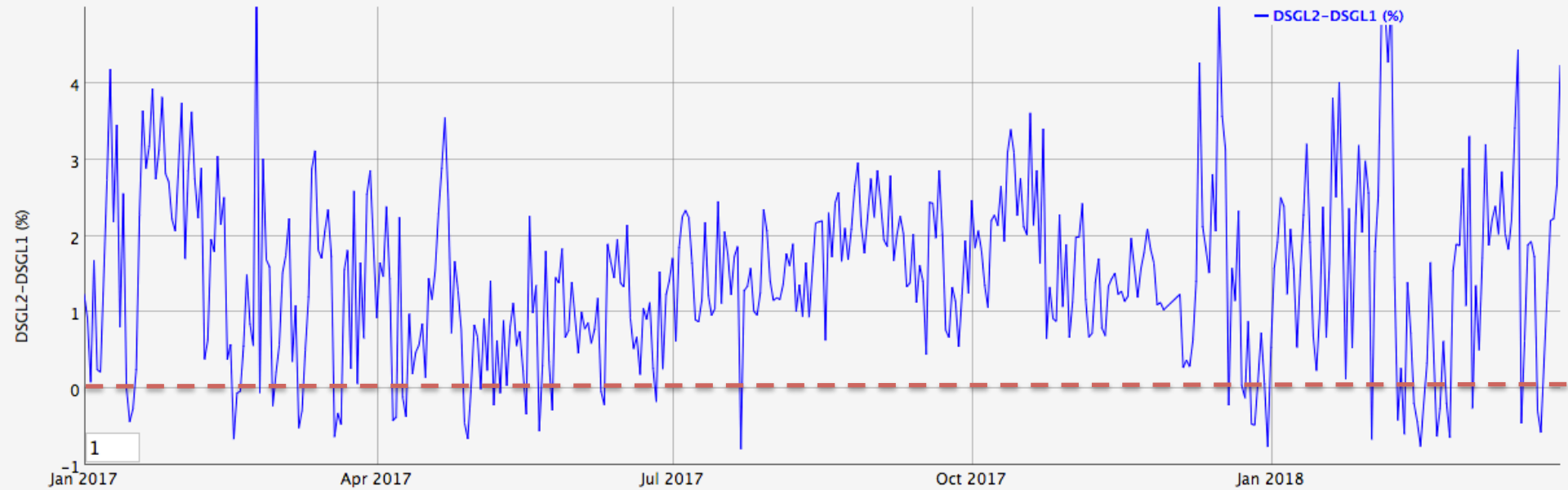
Toravere - Estonia



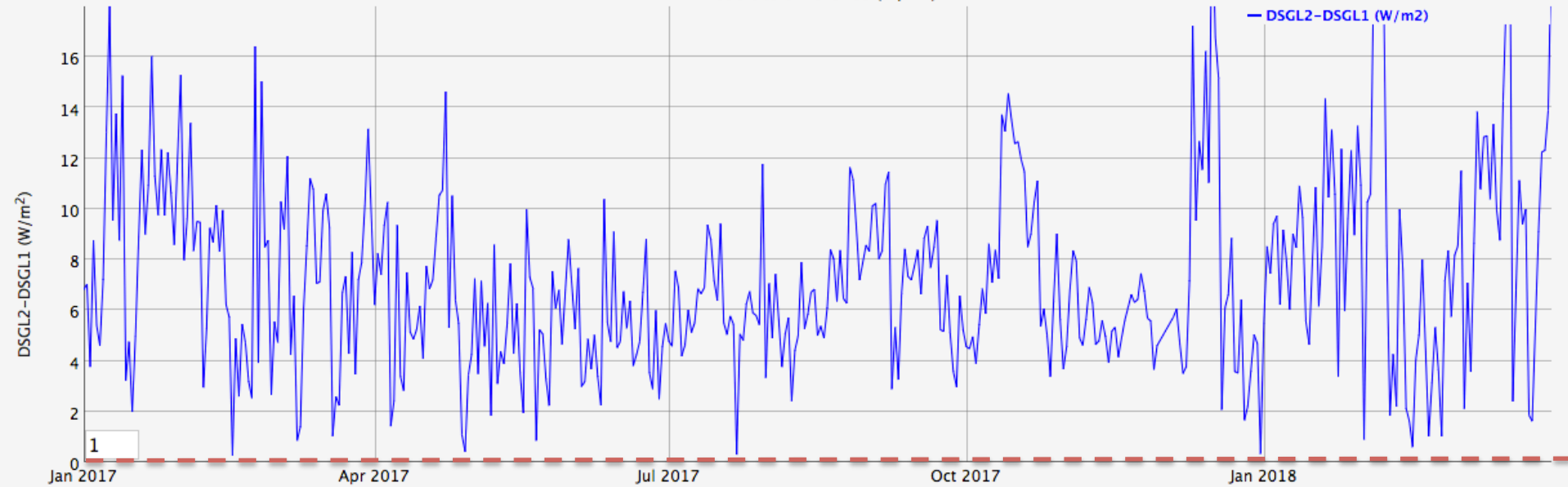
Absolute difference (W/m^2)



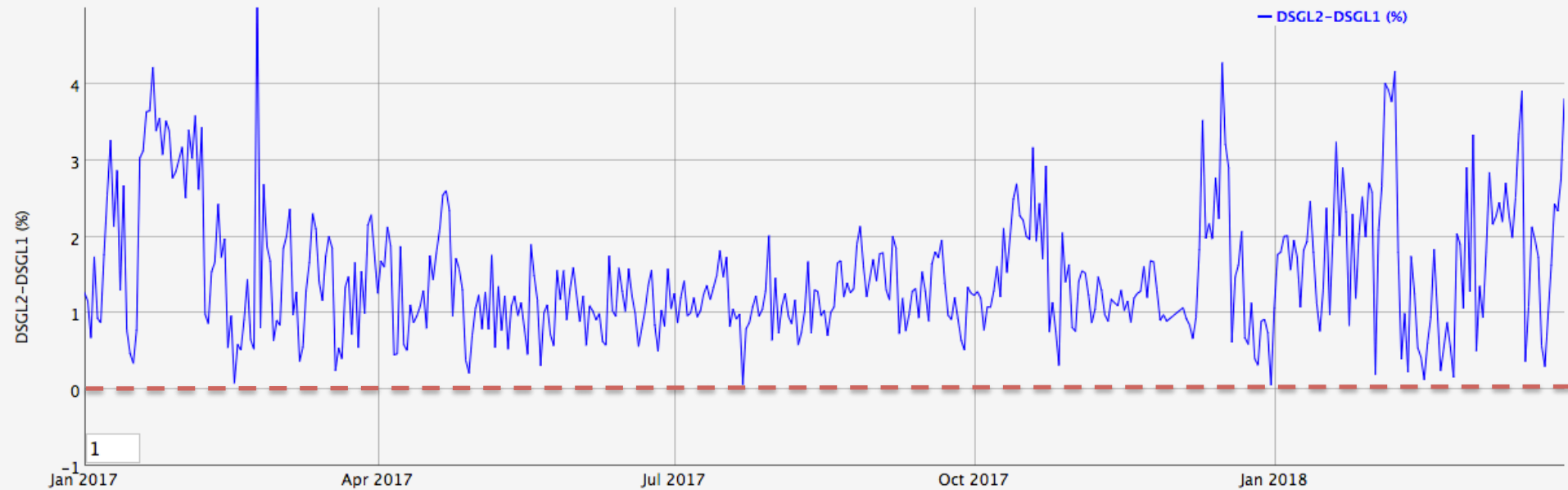
Relative difference (%)



Absolute difference (W/m^2)



Relative difference (%)



BSRN applications

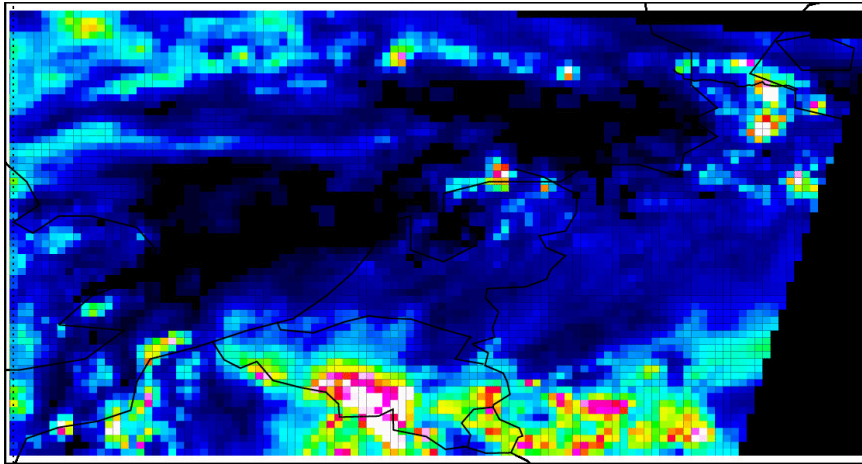
Forecast of solar radiation (0 – 2 h)



Advection of MSG-SEVIRI cloud properties
Using Atmospheric Motion Vectors

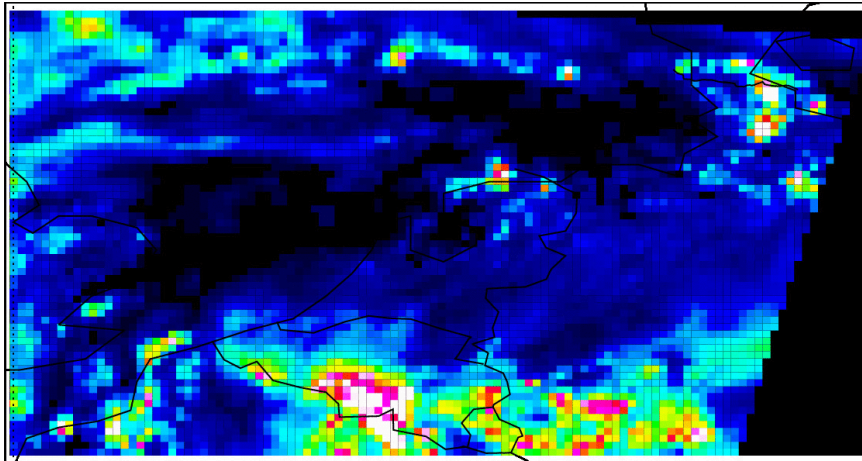
Cloud optical depth

20160616_1000_T000 COT



0 5 10 15 20 25 30 35 40 45 50

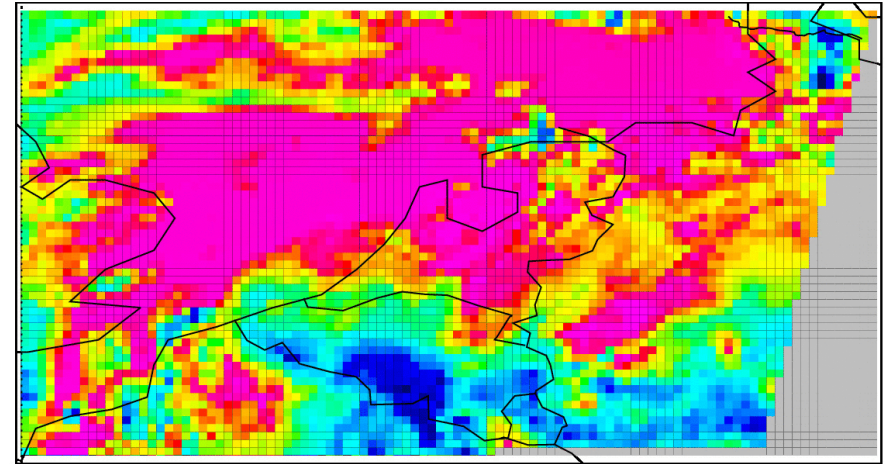
20160616_1000_T000 COT



0 5 10 15 20 25 30 35 40 45 50

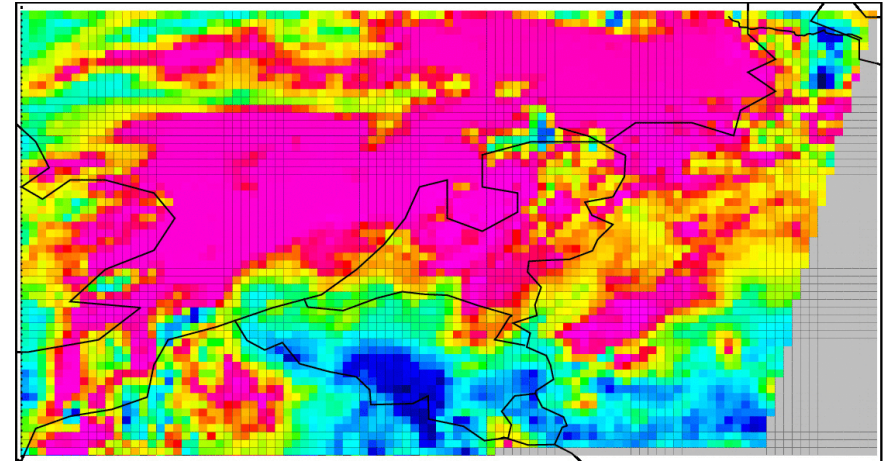
Global radiation

20160616_1000 SDS



0 100 200 300 400 500 600 700 800 900 1000 w/m2

20160616_1000+000 SDS P



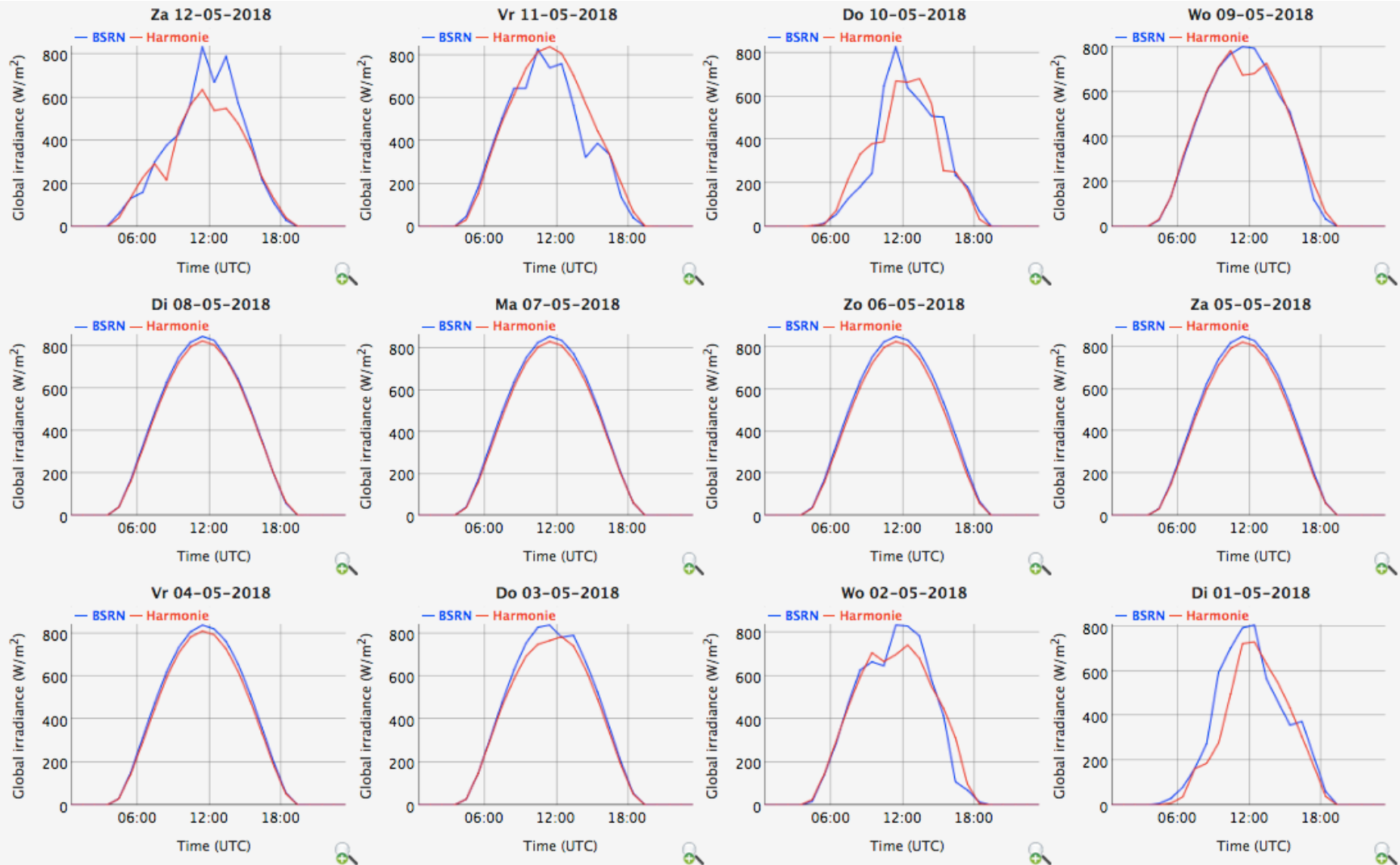
0 100 200 300 400 500 600 700 800 900 1000 w/m2

BSRN applications

Forecast of solar radiation (0 – 48 h)



— BSRN Cabauw
— Harmonie NWP

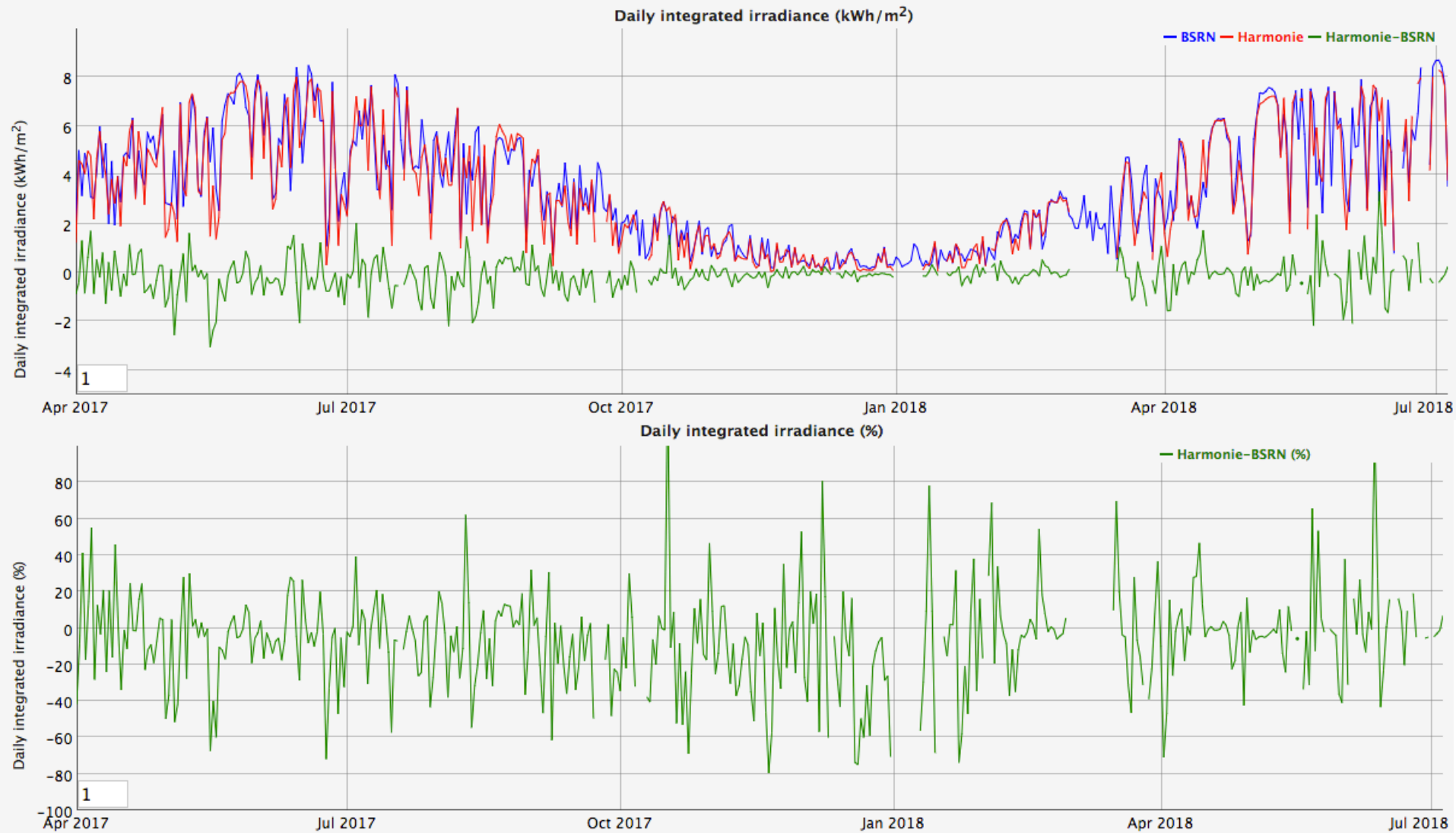


BSRN applications

Forecast of solar radiation (kWh/m^2)



- BSRN Cabauw
- Harmonie NWP
- Difference H-B

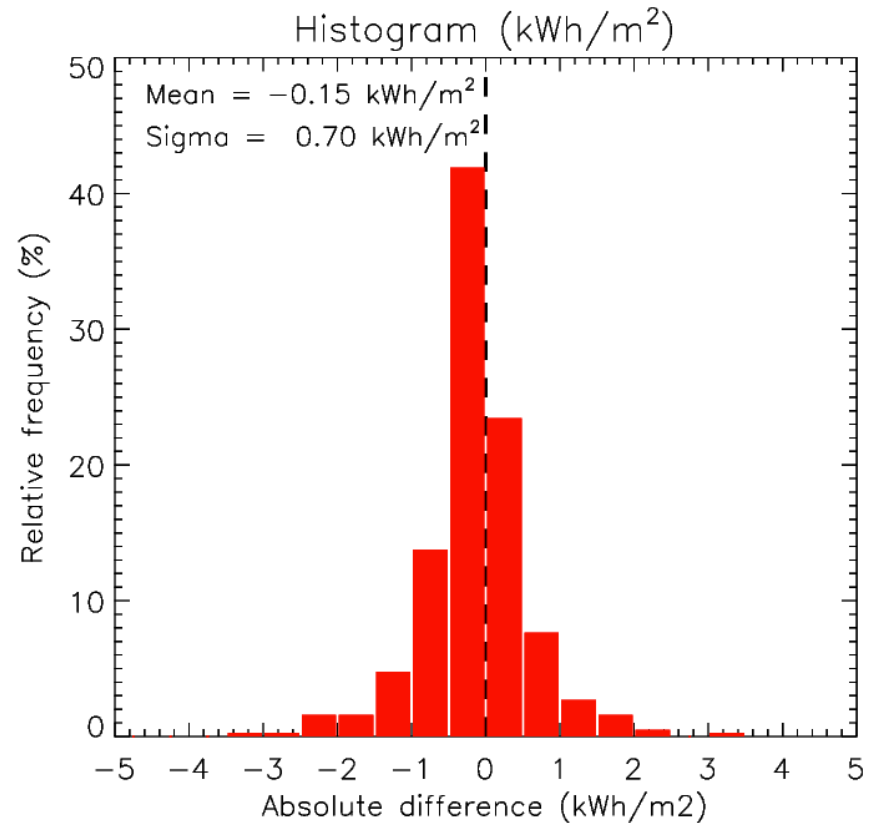
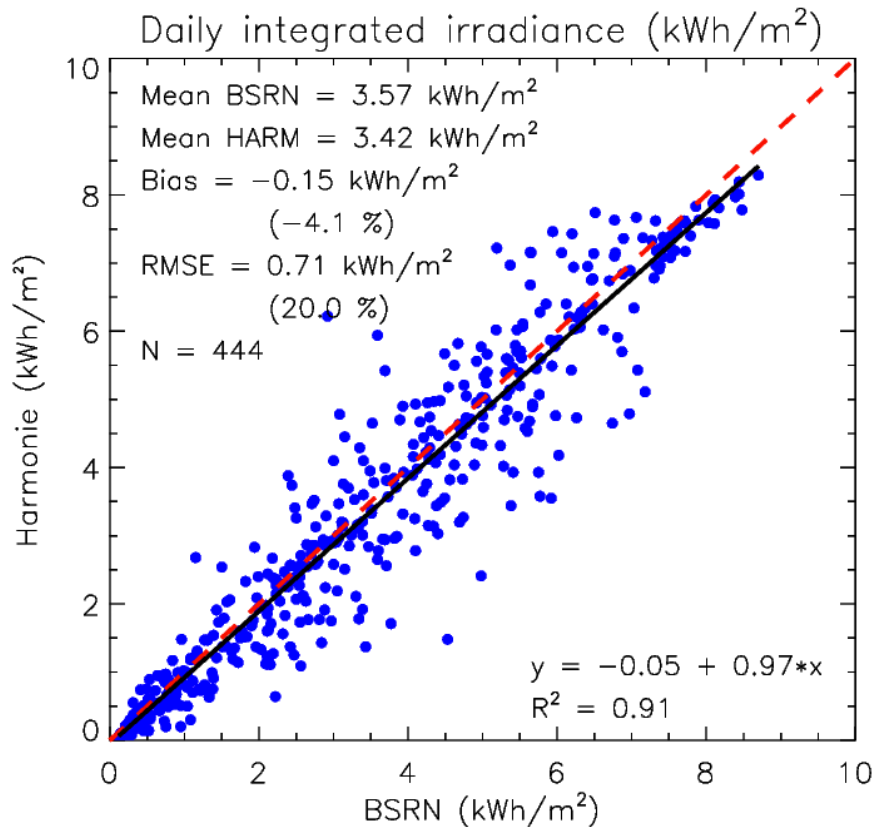


BSRN applications

Forecast of solar radiation (kWh/m²)



Period: April 2017 – now
BSRN station: Cabauw

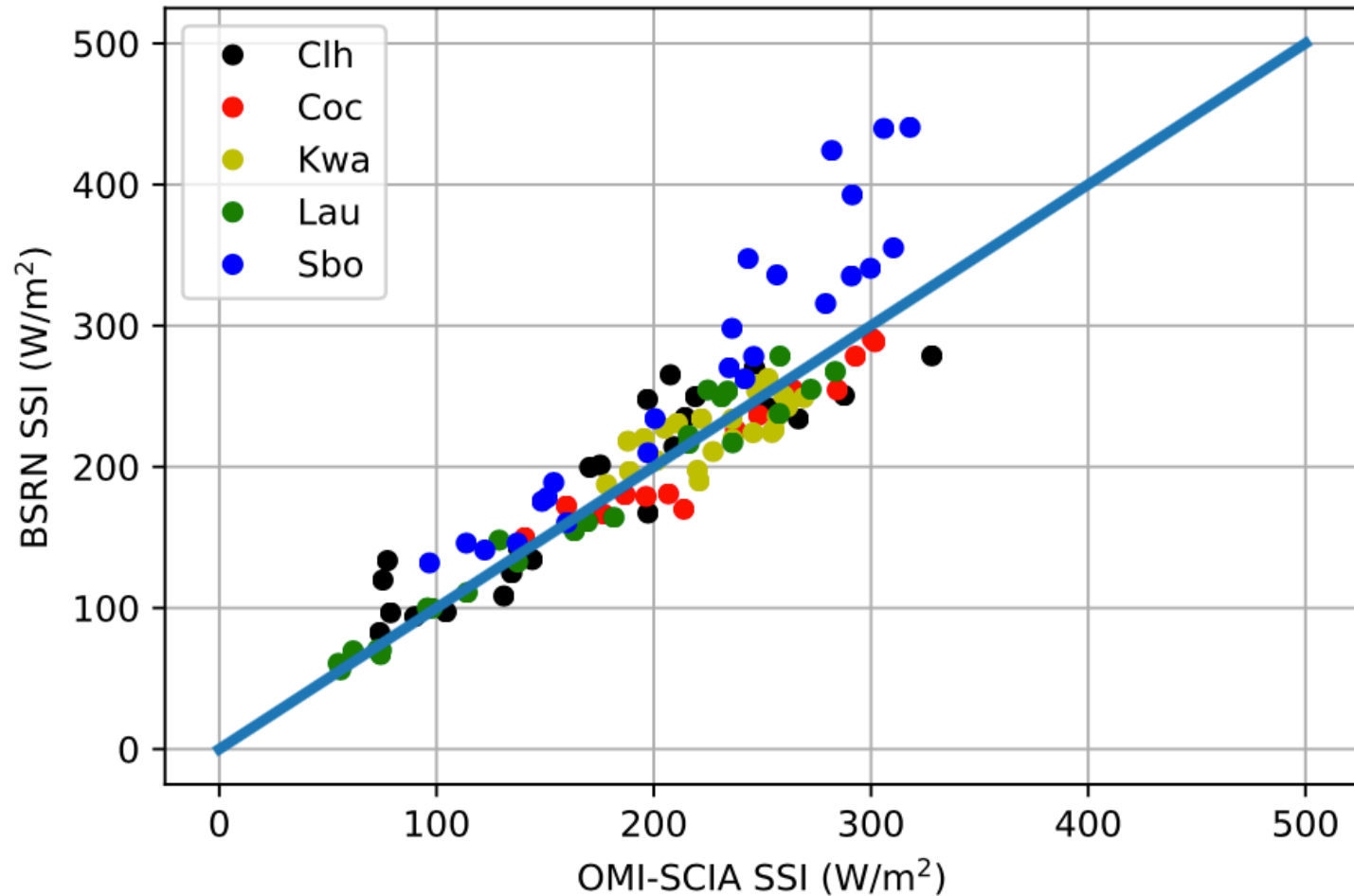


BSRN applications

Validation of satellite products



- OMI-SCIAMACHY SSI product
- Monthly mean SSI 2005-2006
- 15 BSRN stations

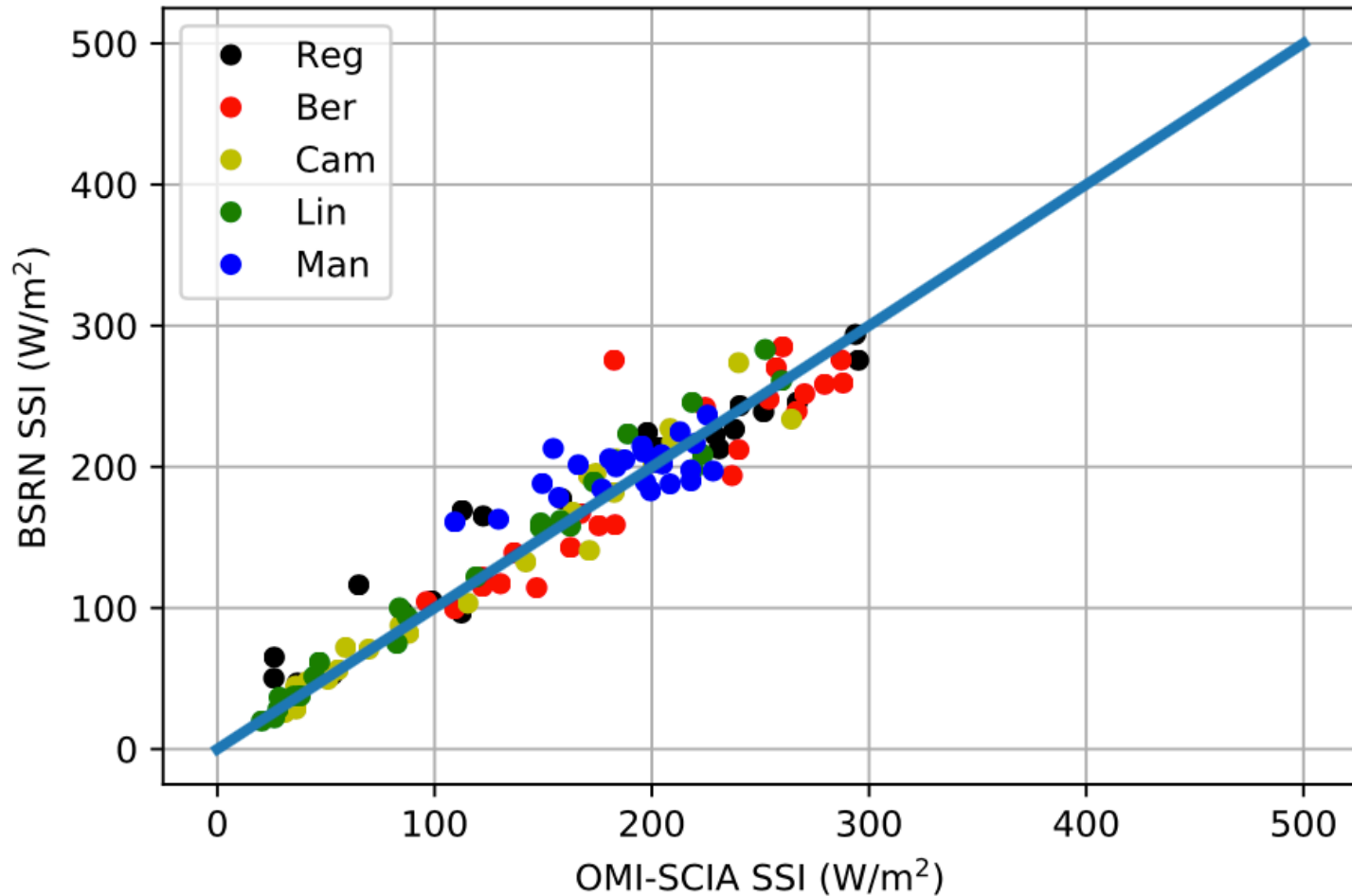


BSRN applications

Validation of satellite products



- OMI-SCIAMACHY SSI product
- Monthly mean SSI 2005-2006
- 15 BSRN stations

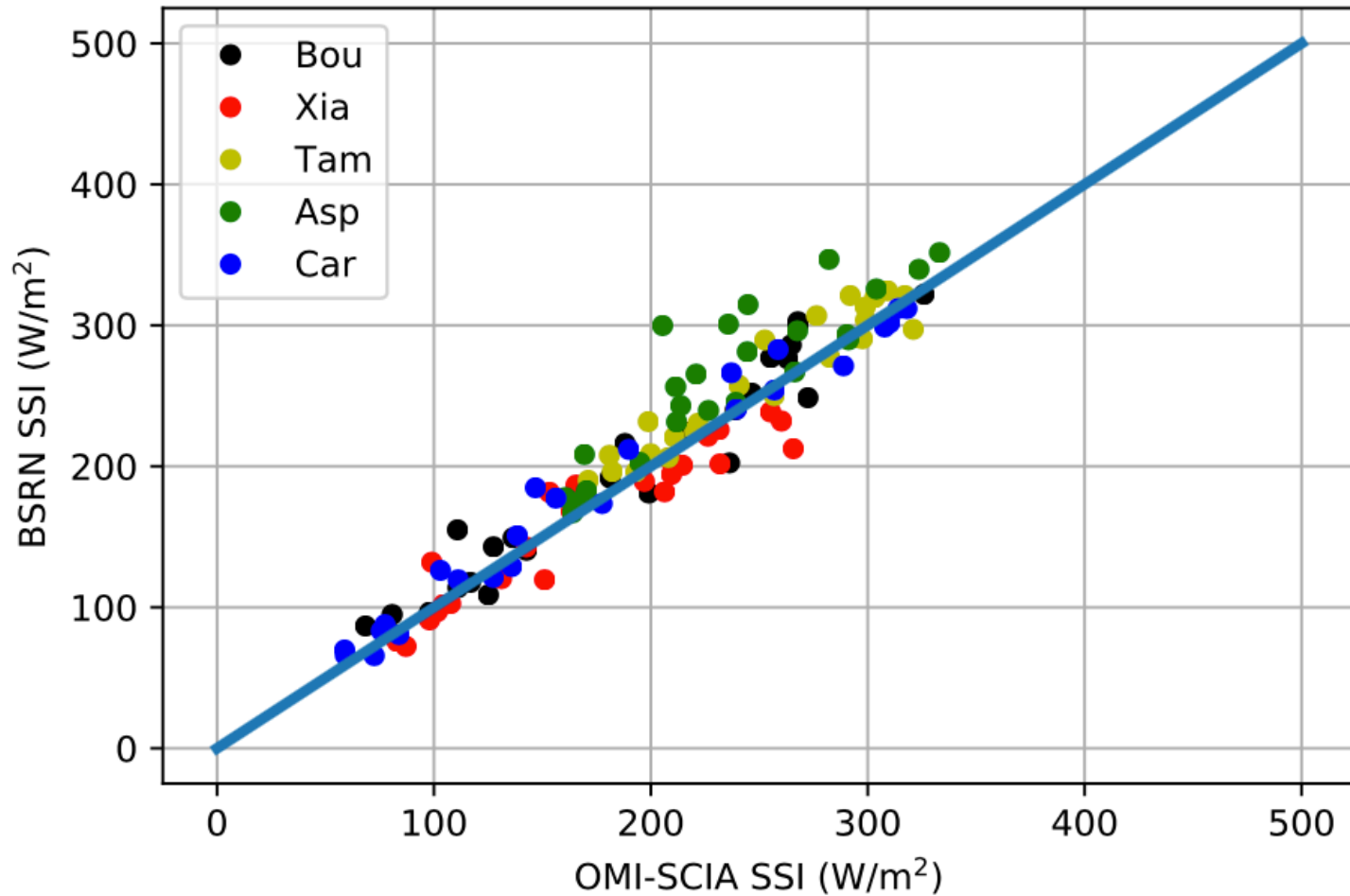


BSRN applications

Validation of satellite products



- OMI-SCIAMACHY SSI product
- Monthly mean SSI 2005-2006
- 15 BSRN stations



Cavity radiometry

HF to AHF conversion (shutter)



Terminal window logs:

```

12:11:36 STATE -> zeroval ShutterClosed - HeaterOff
12:13:16 STATE -> heaterval Q [W/m^2] Vth [54 μV] DAC [322] [bits] ShutterClosed - HeaterOn
12:13:36 STATE -> heater T [K] reached 1300 + 955 (0) + 955.0 W AFTER 20 SEC
12:14:45 STATE -> measure ShutterClosed - HeaterOff
12:26:46 STATE -> setting Q [W/m^2] Vth [0 μV] DAC [0] [bits] ShutterClosed - HeaterOff
    
```

Signal	Value	Units	AD_chan	Mode
T1-STAMP_0	-11446.00	no	8	Q
T1-STAMP_1	16134.00	no	9	Q
T1-CAV_TP_T	15.70	C	1	T
T1-CH1_LT	15.47	C	2	T
T1-CH1_L_T	NAN	C	3	T
T1-LCST	65328.00	no	7	T

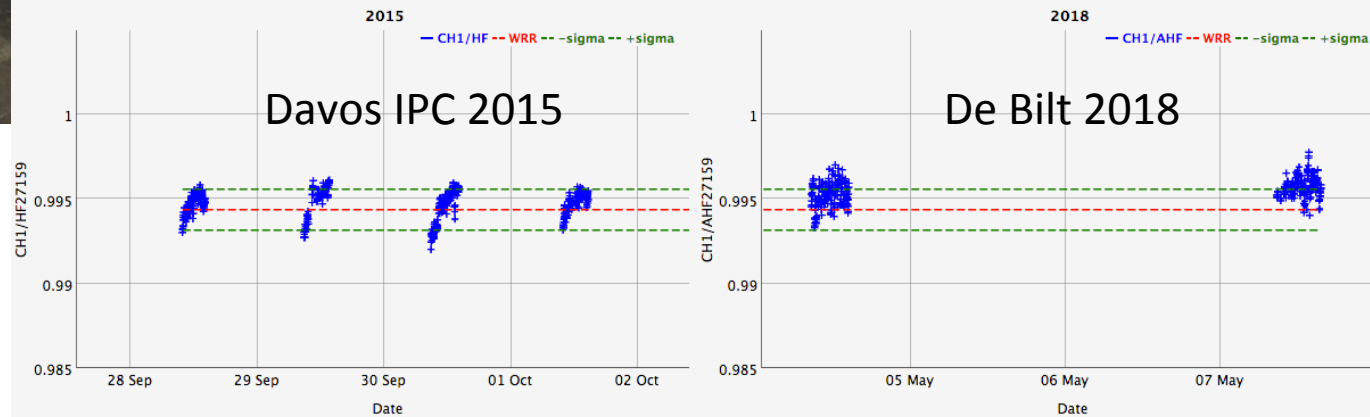
Scheduler window:

12:38:23

IPC 12:46:05

- 5/2/2018 12:41:15 ID - 270 | attention
- 5/2/2018 12:14:45 ID - 270 | heater off
- 5/2/2018 12:41:35 ID - 180 | heater on
- 5/2/2018 11:44:45 ID - 90 | measure
- 5/2/2018 10:44:45 ID + 1180 | waiting
- 5/2/2018 9:44:45 ID - 270 | attention

CH1-020283 vs Cavity radiometer (A)HF27159



Pyranometer intercomp.

1-year period (xx – xx)



Status BSRN Cabauw

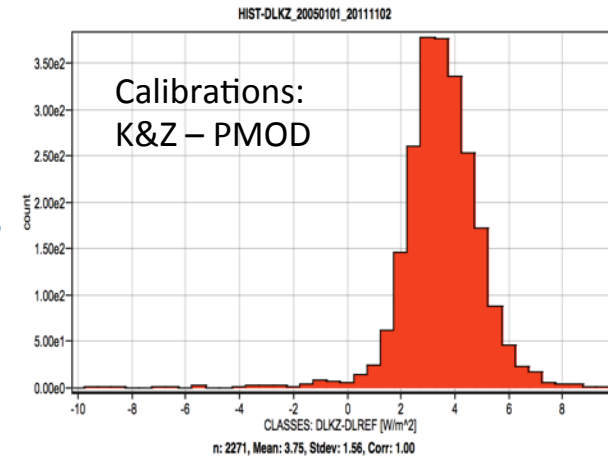
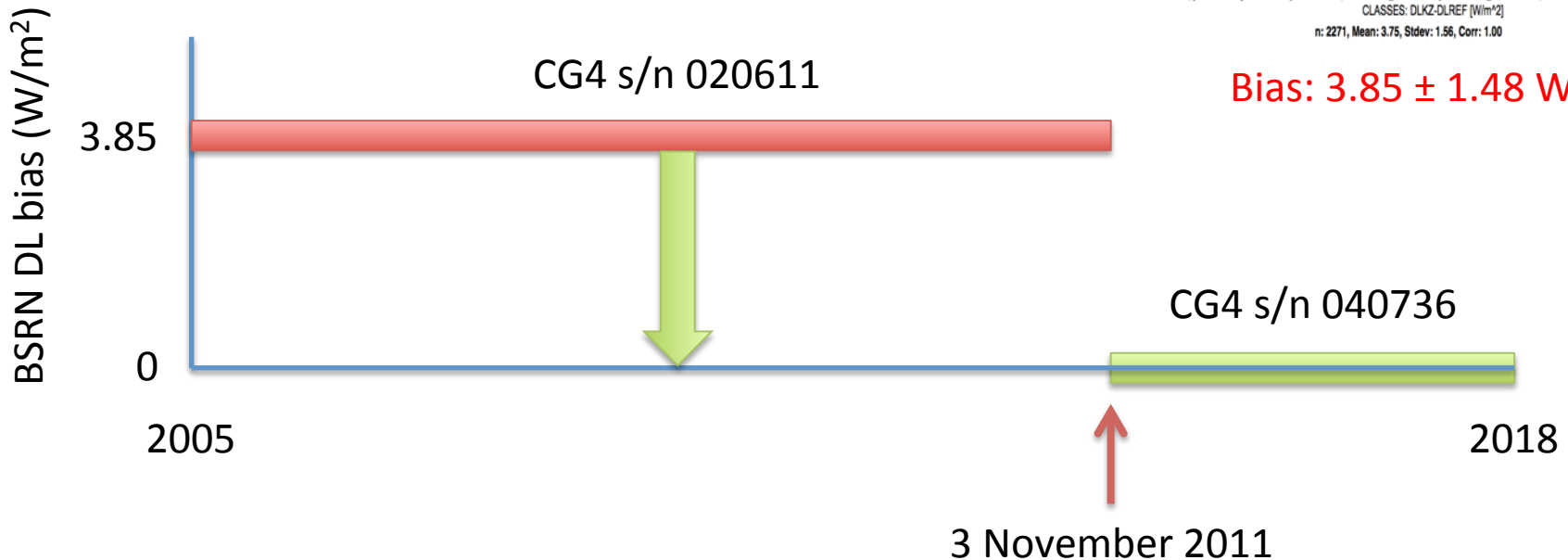
Issue LWD



2015-05-06: Cabauw

On 3 November 2011 there has been a change of instruments used for the measurement of the downward longwave irradiance (DL in LR0100). This change of instruments was accompanied by a calibration change, removing a bias of $+3.85 \pm 1.48 \text{ W/m}^2$ that exists in DL before 3 November 2011. After 3 November 2011, the values of DL are traceable to the WISG. We plan to correct the data (remove the bias) before 3 November 2011 and resubmit the station-to-archive files (February 2005 – November 2011).

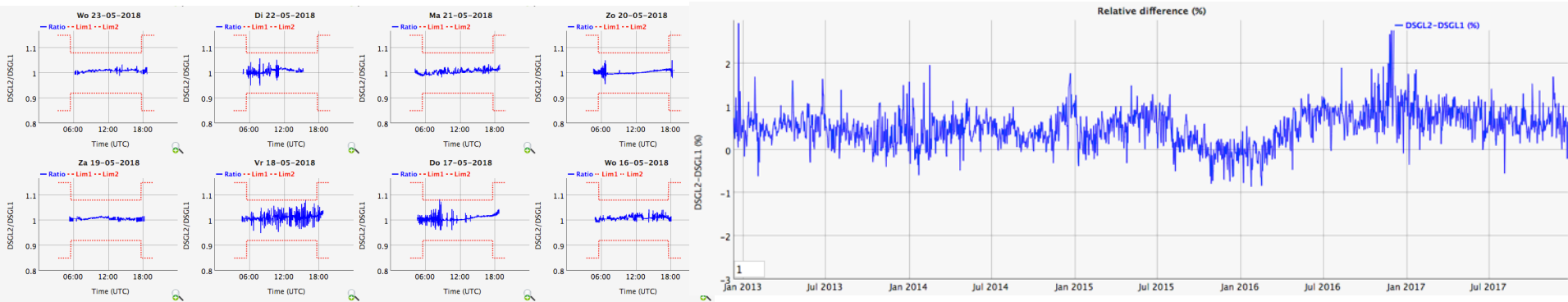
For further information please contact [Wouter Knap](#).



Bias: $3.85 \pm 1.48 \text{ W/m}^2$

Final slide: highlight

Shortwave residual



Considerations:

- ❖ Global/Sum and Global – Sum contain a lot of valuable information
- ❖ Daily cycles and (in particular) time series potentially reveal problems
- ❖ Stations should look at the data
- ❖ Central processing?

Final slide: highlight

Shortwave residual



Buienradar maakt gebruik van c x Weather Netherlands, Belgium, x Waarneming.nl x BSRN station CAB x Baseline Surface Radiation Netv x +

bsrn.awi.de/products/quality-code/comparisons/cabauw-cab/

Search

WRMC-BSRN

World Radiation Monitoring Center- Baseline Surface Radiation Network

Contact | Imprint | Data protection | Sitemap English

- Project
- Stations
- Data
- Products
- Meetings
- News
- Software
- Other

Averages

International Polar Year

Quality code

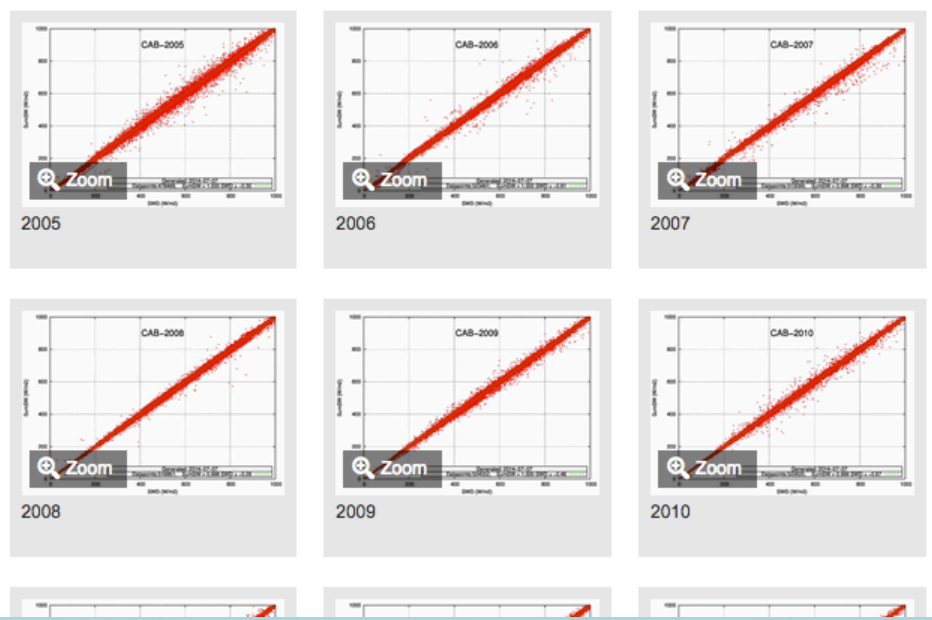
Physically possible limits

Comparisons

- Alert (ALE)
- Alice Springs (ASP)
- Barrow (BAR)
- Bermuda (BER)
- Billings (BIL)
- Bondville (BON)
- Boulder SURFRAD (BOS)
- Boulder (BOU)
- Brasilia (BRB)
- Cabauw (CAB)**
- Camborne (CAM)
- Carpentras (CAR)
- Chesapeake Light (CLH)
- Cener (CNR)
- Cocos Island (COC)
- De Aar (DAA)
- Darwin (DAR)

Home > Products > Quality code > Comparisons > Cabauw (CAB)

Cabauw (CAB)



Contact persons
Related Pages

