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Baseline Surface Radiation Network (BSRN) & World Radiation Monitoring Center (WRMC): a status update

Christian Lanconelli¹, Amelie Diremel², Charles N Long^{3*} on behalf of the BSRN community

2019 AOPC, 18-22 March 2019, Marrakesh, Morocco

- 1- European Commission, Joint Research Centre
- 2- Alfred Wegener Institute
- 3* - CIRES/NOAA (retired 2018)



<https://bsrn.awi.de/>



BSRN Scientific Review and Workshop

- 15th BSRN Scientific Review Workshop
- 16-20 July 2018, Boulder, Colorado, USA
- Hosted by University of Colorado Cooperative Institute for Research in the Environmental Sciences (CIRES) and the NOAA ESRL Global Monitoring Division (NOAA ESRL GMD)
- Chaired by Chuck Long

76 scientists, station managers, and data users from 24 countries representing 49 different organizations presented 37 talks and 31 posters!



<http://www.gewex.org/resources/gewex-news/>

https://www.wcrp-climate.org/WCRP-publications/2018/WCRP-Report-No20-2018_BSRN-15.pdf

15th Baseline Surface Radiation Network (BSRN) Scientific Review and Workshop

16-20 July 2018, Boulder, Colorado, USA



November 2018

WCRP Publication No.: 20/2018

GEWEX NEWS

GEWEX is a Core Project of WCRP on Global Energy and Water Exchanges



WORLD METEOROLOGICAL ORGANIZATION



International Science Council

Vol. 29 No. 4, November 2018



15th Baseline Surface Radiation Network (BSRN) Scientific Review and Workshop

Boulder, Colorado, USA
16-20 July 2018

Chuck Long¹, Amelie Drieme², and Christian Lanconelli³

¹NOAA ESRL GMD and CIRES, Boulder, CO, USA; ²Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany; ³European Commission, Joint Research Centre, Ispra, Italy

Seventy-six scientists, station managers, and data users from 24 countries representing 49 different organizations gathered for the 15th BSRN Scientific Review and Workshop held at

all aspects of BSRN, and potentially installing a Deputy Project Manager for succession planning. Finally, Dr. Long announced that he would be retiring and stepping down as BSRN Project Manager. Dr. Christian Lanconelli, currently with the European Commission Joint Research Centre, has been appointed as the new BSRN Project Manager. He previously served as the station scientist for the BSRN Dome-C site in Antarctica, and hosted the 13th BSRN Workshop in Bologna, Italy.

Tim Oakley welcomed the participants on behalf of the Global Climate Observing System (GCOS) Director Carolin Richter. He explained the vision of GCOS, how the program is involved across the whole observing cycle, and the key documents that govern its work. He explained in more detail the pertinent sections of the Implementation Plan and two actions, A11 and A12, which are of direct relevance to BSRN. A11 and A12 are

<http://www.gewex.org/resources/gewex-news/>

https://www.wcrp-climate.org/WCRP_Reports/2018/WCRP_Report_20_2018_15th_BSRN_Meeting_Report.pdf



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European Commission



WRMC-BSRN

World Radiation Monitoring Center - Baseline Surface Radiation Network

Welcome

to the World Radiation Monitoring Center (WRMC), the central archive of the Baseline Surface Radiation Network (BSRN). All radiation measurements are stored together with collocated surface and upper-air meteorological observations and station metadata in an integrated database. These pages offer both: Information for all scientists who will use BSRN-data as well as information to any station scientist who delivers data.

BSRN is a project of the [Data and Assessments Panel](#) from the [Global Energy and Water Cycle Experiment \(GEWEX\)](#) under the umbrella of the [World Climate Research Programme \(WCRP\)](#) and as such is aimed at detecting important changes in the Earth's radiation field at the Earth's surface which may be related to climate changes.

The data are of primary importance in supporting the validation and confirmation of satellite and computer model estimates of these

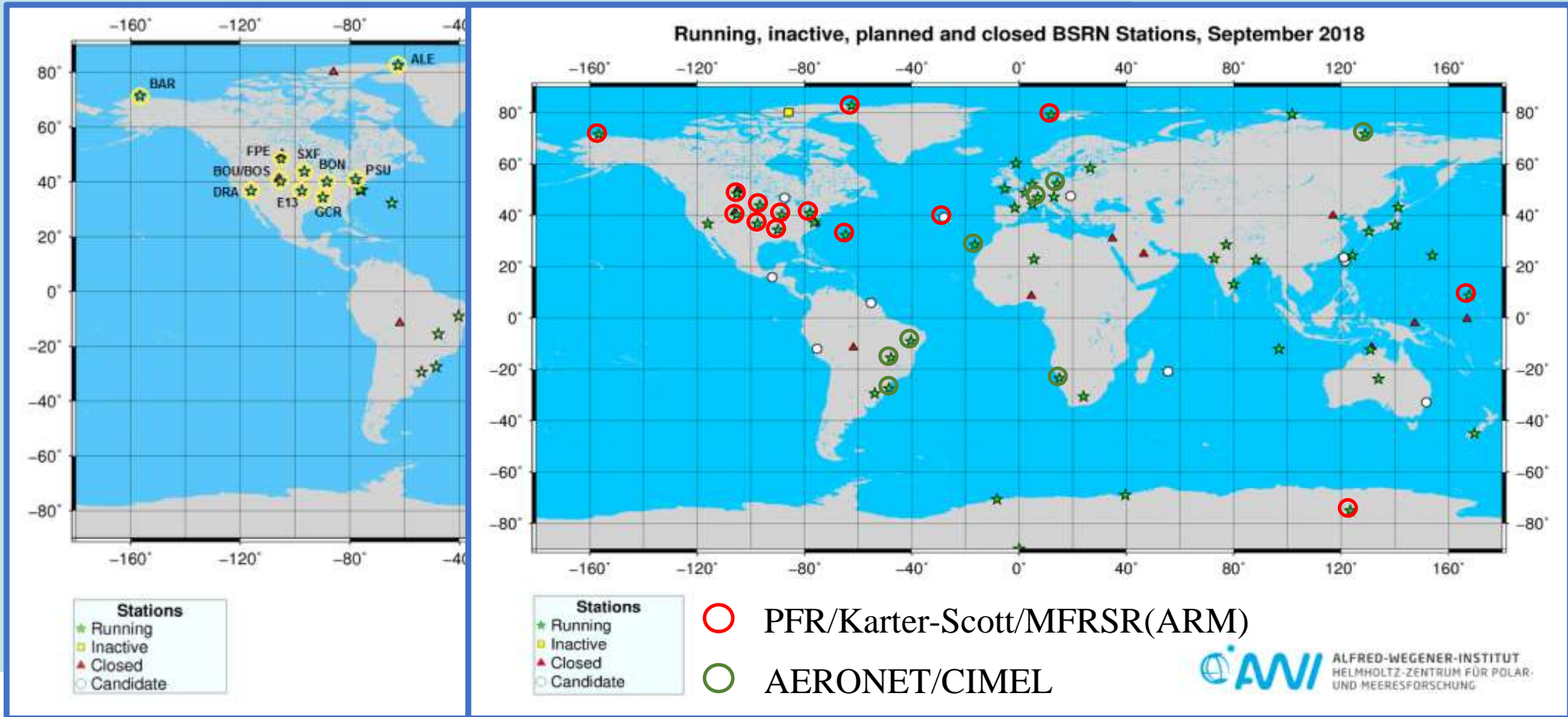
[Contact persons](#)

[Related Pages](#)



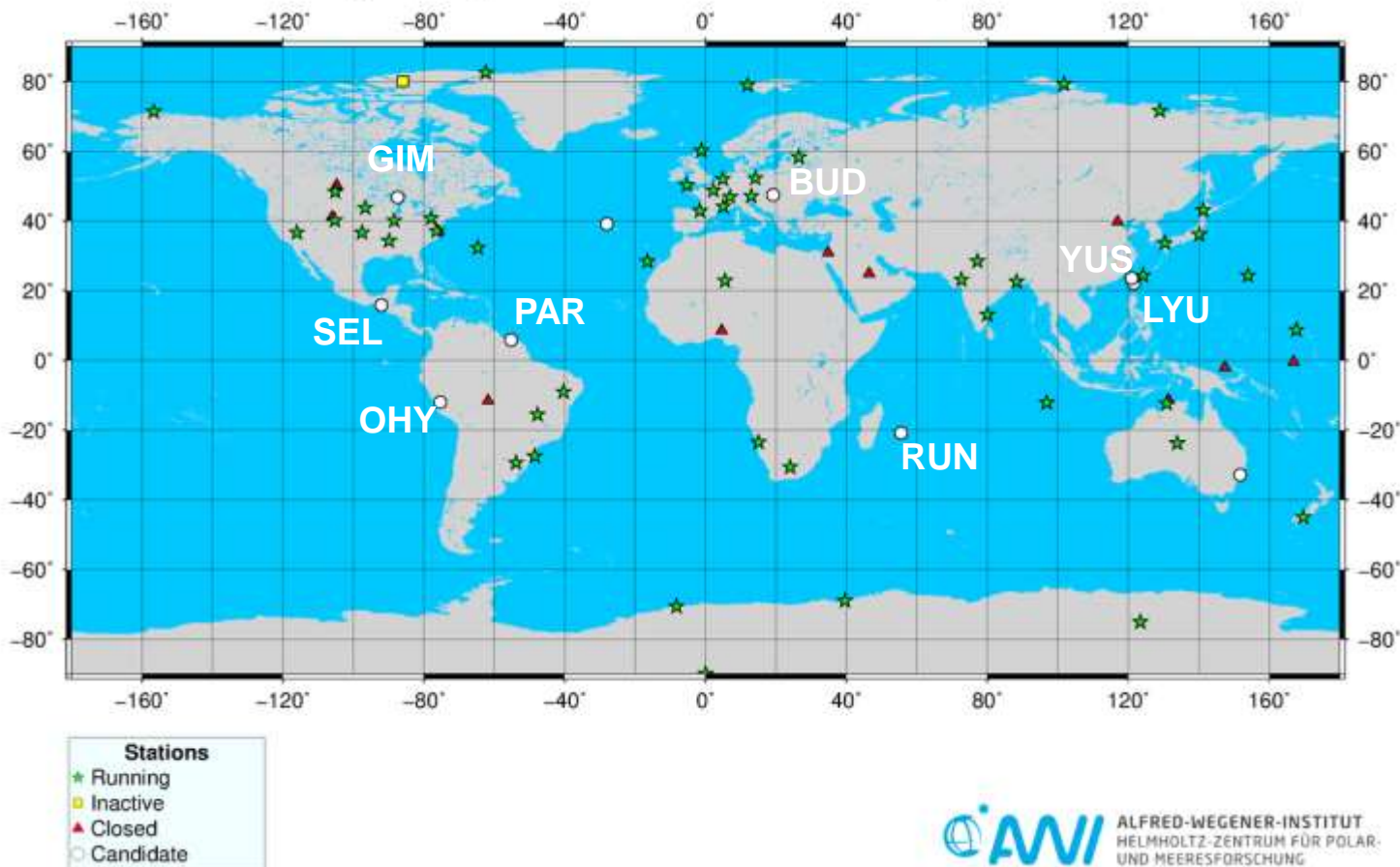
Stations with the total budget (LR0300+)

Stations with the AOD measurements



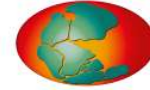
New sites accepted in 2018 (candidate status)

Running, inactive, planned and closed BSRN Stations, September 2018



• Accepted during 2018 workshop

- SEL, Selegua, Mexico
- PAR, Paramaribo, Suriname
- OHY, Huancayo, Peru
- GIM, Granite Island, Lake Superior
- RUN, Reunion Island
- YUS, Mt. Jude, Taiwan
- LYU, Orchid Island, Taiwan
- BUD, Budapest, Hungary



Station status

<https://www.pangaea.de/ddi?request=bsrn/BSRNEvent&format=html&title=BSRN+Stations>

- **64 Total stations submitted LR0100 data (basic meas, >1993)**
 - 11 station closed (total), 1 inactive (EUR)
- **+9 new sites proposed at 2018 meeting**
 - 8 provisionally accepted as *candidate* BSRN sites
 - 1 needs consideration concerning its location, invited to the 2020 Workshop to present its progress
 - 2018-2019: Two additional expression of interest (BUC, CYP, ... counting)**
- Two former sites closed: Ilorin (**ILO**, Nigeria), Solar Village (**SOV**, Saudi Arabia)
- 21 stations in the **southern hemisphere** (4 closed), including candidate
- 55 in the **northern hemisphere** (6 closed), including candidate
- **~20 stations with spectral measurements (AOD) and/or complete budget**

Data overview & status

<https://bsrn.awi.de/data/conditions-of-data-release/>

Available Data Summaries

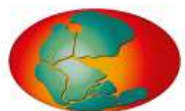
- [LR 0100 + LR 0300 \(Basic radiation and other radiation measurements\)](#)
- [LR 0300 \(Other radiation measurements only, including net and upward fluxes\)](#)
- [LR 0500 \(Ultra-violet measurements\)](#)
- [LR 1000 \(Meteorological synoptical observations\)](#)
- [LR 1100 \(Radiosonde measurements\)](#)
- [LR 1200 \(Ozone measurements\)](#)
- [LR 1300 \(Expanded measurements\), Part I](#)
- [LR 3010 \(Other radiation measurements at 10 m, including upward fluxes\)](#)
- [LR 3030 \(Other radiation measurements at 30 m, including upward fluxes\)](#)
- [LR 3300 \(Other radiation measurements at 300 m, including upward fluxes\)](#)
- [All logical records](#)

Baseline Surface Radiation Network – Status

[BSRN homepage] - [Staff] | Stations | Parameter | Methods | - [LR0100 | LR0300 | LR0500 | LR1000 | LR1100 | LR1200 | LR1300 | LR3010 | LR3030 | LR3300 | All | later

Click on a number shows a list of all datasets for selected year and station.

Station	Short name	Station scientist currently in charge	pre BSRN	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Alert	ALE	Christopher Cox (christopher.j.cox@noaa.gov)												
Alice Springs	ASP	Matt Tully (m.tully@bom.gov.au)					12	12	12	12	12	12	11	
Barrow	BAR	Sara Morris (Sara.Morris@noaa.gov)		12	12	12	12	12	12	12	12	12	12	
Bermuda	BER	Sara Morris (Sara.Morris@noaa.gov)		12	12	12	12	12	12	12	12	12	12	
Billings	BIL	Charles Long (chuck.long@noaa.gov)			4	12	12	12	12	12	12	12	11	
Bondville	BON	John Augustine (John.A.Augustine@noaa.gov)					12	12	12	12	12	12	12	
Boulder, SURFRAD	BOS	John Augustine (John.A.Augustine@noaa.gov)					5	12	12	12	12	12	12	
Boulder	BOU	** Station closed in July 2016 **		12	12	12	12	12	12	12	12	12	12	
Brasilia	BRB	Eric Bueno Pereira (eric.pereira@inpe.br)												
Cabauw	CAB	Wouter Knap (knap@knmi.nl)												
Camborne	CAM	Fraser Cunningham (fraser.cunningham@metoffice.gov.uk)												12
Cape Baranovo	CAP	Vasilii Kustov (kustov@aan.ru)												
Carpentras	CAR	Thierry Duprat (thierry.duprat@meteo.fr)						4	12	12	12	12	12	
Chesapeake Light	CLH	** Closed in Dec 2016, structural issues **										8	12	
Cener	CNR	Xabier Olano (xolano@cener.com)												
Cocos Island	COC	Matt Tully (m.tully@bom.gov.au)												
De Aar	DAA	Lucky Ntsangwane (lucky.ntsangwane@weathersa.co.za)											7	6
Darwin	DAR	** Station closed in Jan 2015 **												
Desert Rock	DRA	John Augustine (John.A.Augustine@noaa.gov)								10	12	12	12	
Concordia Station	DOM	Angelo Lupi (a.lupi@isac.cnr.it)												
Darwin Met Office	DWN	Matt Tully (m.tully@bom.gov.au)												
Eastern North Atlantic	ENA	Charles Long (chuck.long@noaa.gov)												
Eureka	EUR	** Inactive since end of 2011, being revitalized **												



PANGAEA.

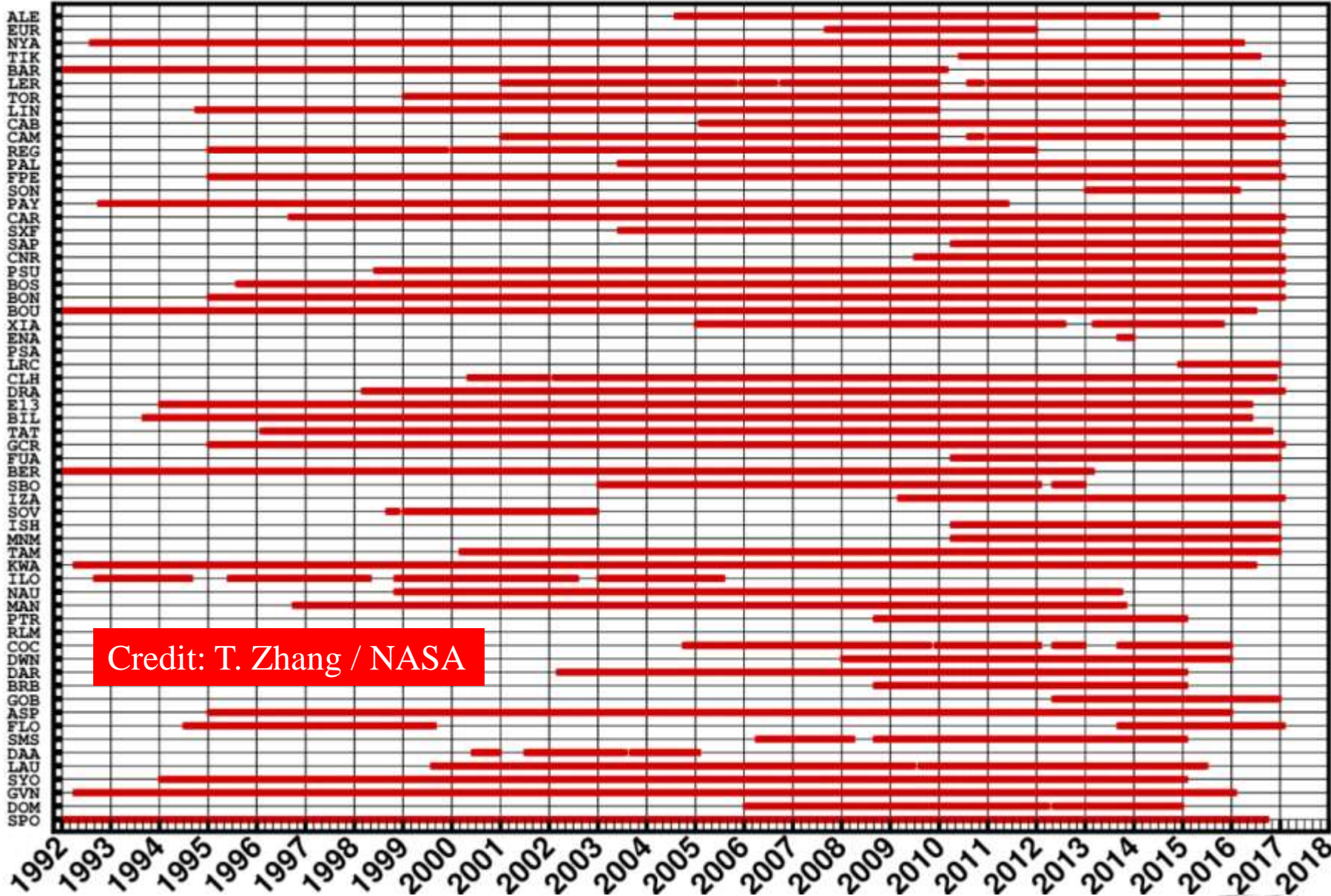
Data Publisher for Earth & Environmental Science



European Commission

Data
(as per

9688 Available Site-Months of BSRN Data from 61 Sites as of 2017-02-10



1	LR
2	LR
3	LR
4	LR
5	LR
6	LR
7	LR
8	LR

Monthly in the five
(9900)
2766
2016
4012
5198
1755
781
8 (11)
302 (2)

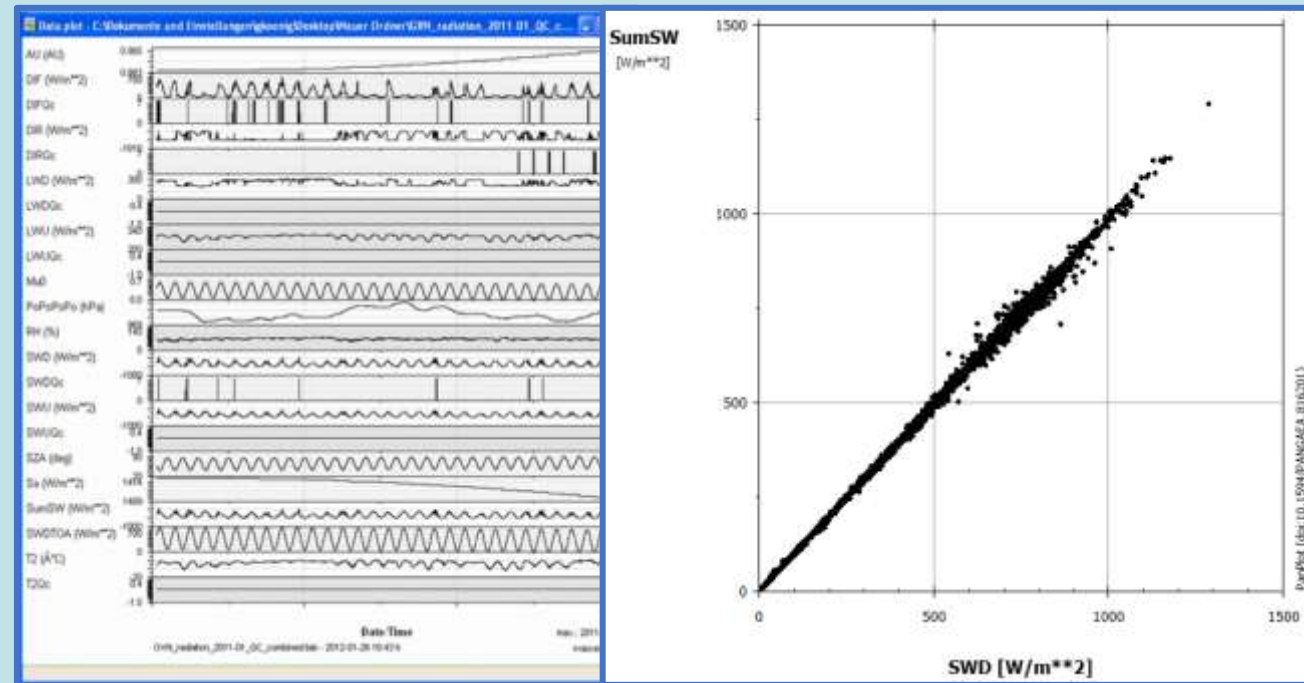
<https://dataportals.pangaea.de/bsrn/?q=LR0100>



European
Commission

BSRN key features

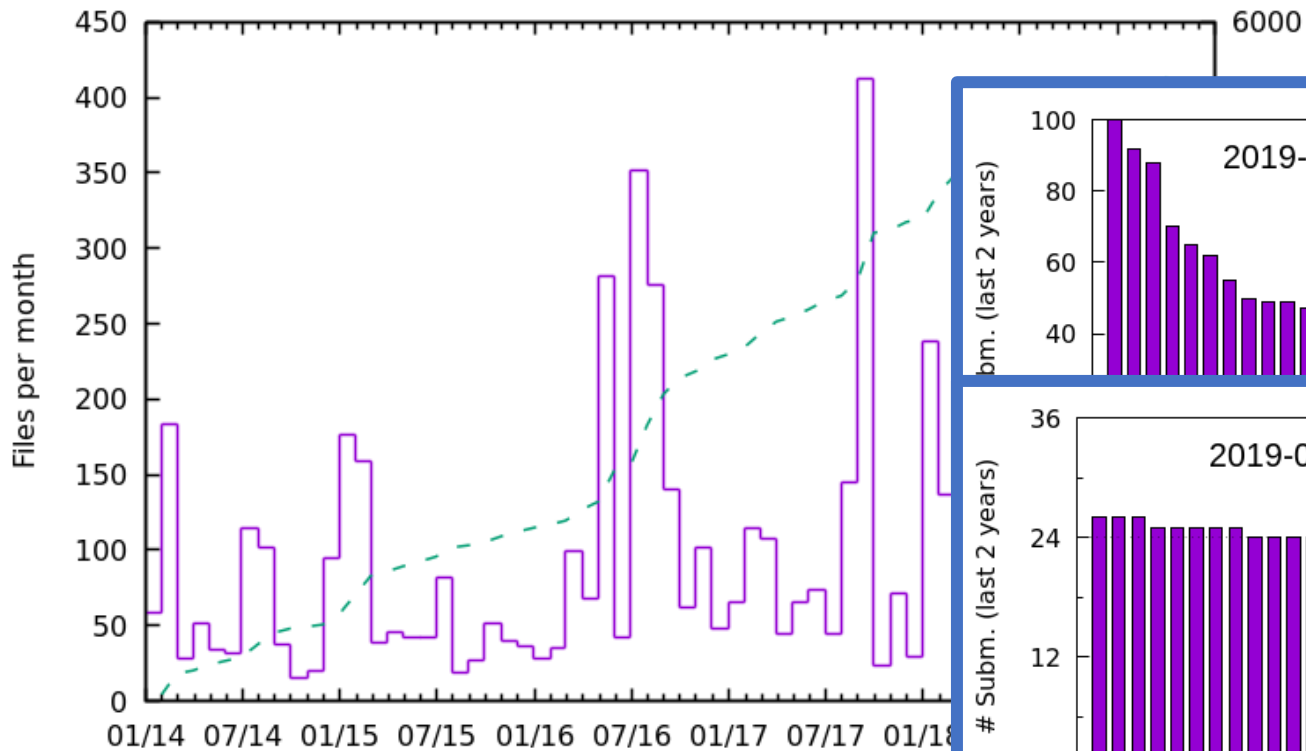
- Traceability of **SW** and **LW** to standards **WRR** & **WISG** respectively (maintained by **PMOD/WRDC**)
- Secondary standards instruments (sometimes Abs.Cavity Radiom.)
- High freq. sampling (1sec/1min storage)
- PPL Physically possible limits
- ERL Extremely rate limit
- Cross comparisons



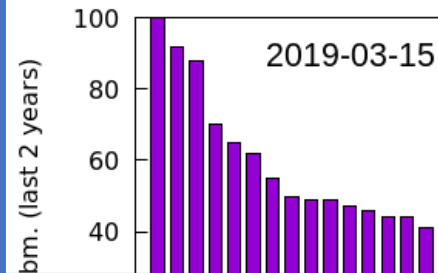
https://wiki.pangaea.de/wiki/BSRN_Toolbox#Quality_Check

Data overview and status

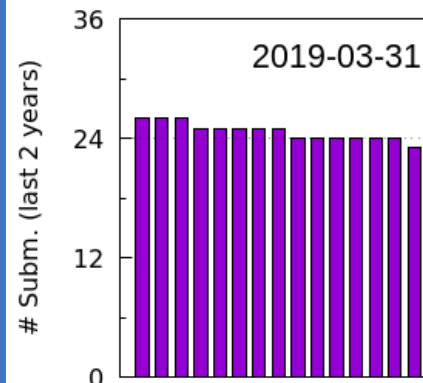
SUBMISSION OVER TIME (since 2014-01-01)



- **+52 Files/month (median over the last 4 years)**



- Efforts of stations to maintain their data?
Submitted by **2018-03-15 (and 2 years before)** for all time data: can include reanalysis, extension dataset, ...



- How much the database is up/out-dated?
Submitted by **2019-03-31 (and 2 years before)** but data relevant to the last two years only

Data download

Access to download

Aug 2016-Aug 2018 (2017)

- Total 286 (138) access requests from 49 (35) different countries








Web of Science

- Cited over 2650 (2200) times without self-citations
- In almost 2000 (1700) articles
- Producing an h-index of 25 (23)
- And climbing!

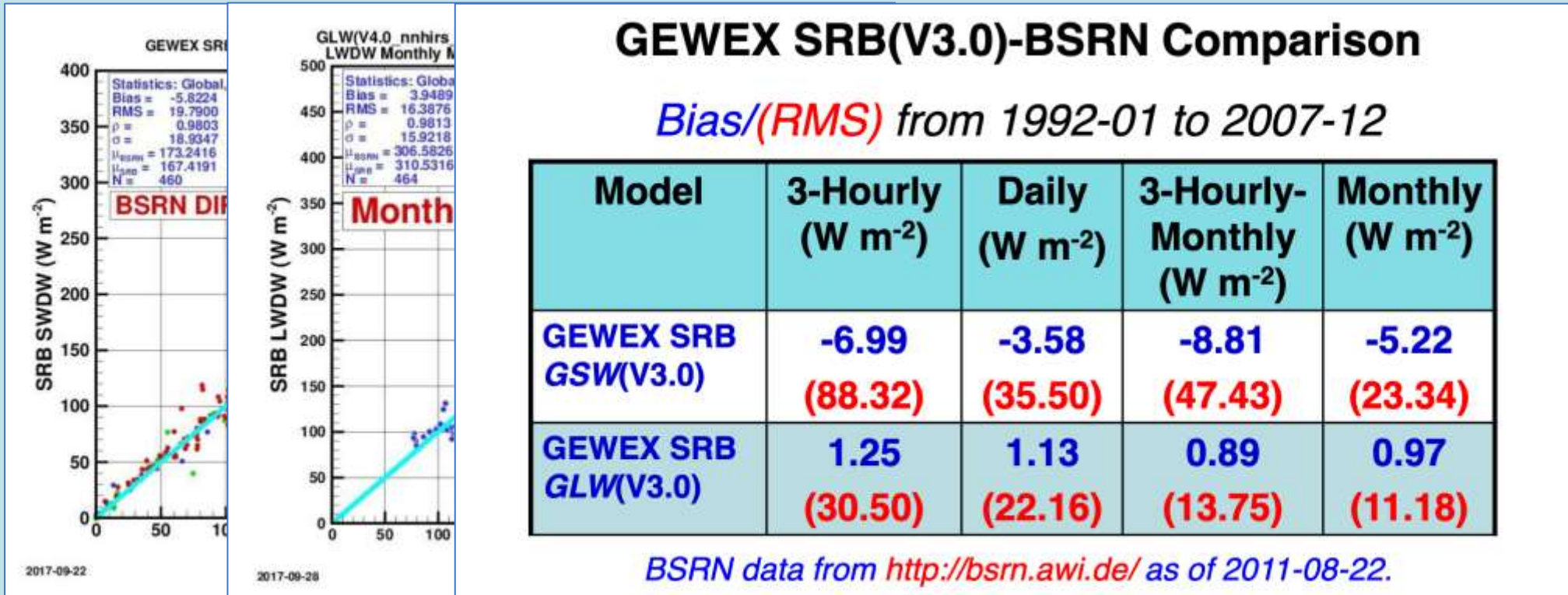


Publications

<https://bsrn.awi.de/other/publications/> picked pseudo-randomly

		<p>Earth Syst. Sci. Data, 9 https://doi.org/10.5194/earth-syst-sci-data-9-1-2017 © Author(s) 2017. This article is distributed under the terms of the Creative Commons Attribution License (https://creativecommons.org/licenses/by/4.0/).</p>	<h1>JGR</h1> <p>Research Article</p> <h2>From point</h2>		<h2>Solar Energy</h2> <p>Volume 177, 1 January 2019, Pages 47-58</p>  <h3>Surface solar radiation forecasts by advecting cloud physical</h3>
		<p>Atmospheric Measurement Techniques An interactive open access journal EGU.eu EGU Publications Office</p> <p>Atmos. Meas. Tech. https://doi.org/10.5194/amt-12-1-2019 © Author(s) 2019. This article is distributed under the terms of the Creative Commons Attribution License (https://creativecommons.org/licenses/by/4.0/).</p>	<h1>Energies 2</h1> <p>Article</p> <h2>A New Solar I</h2> <p>Martin Ho</p>		<h2>Trends in surface radiation and cloud radiative effect at four Swiss sites for the 1996–2015 period</h2> <p>Stephan Nyeki¹, Stefan Wacker², Christine Aebi^{1,3}, Julian Gröbner¹, Giovanni Martucci⁴, and Laurent Vuilleumier^{1,4}</p> <p>¹Physikalisch-Meteorologisches Observatorium/World Radiation Center, Davos, Switzerland ²Deutscher Wetterdienst, Meteorologisches Observatorium Lindenberg/Richard-Aßmann-Observatorium, Lindenberg, Germany ³Oeschger Center for Climate Change Research and Institute of Applied Physics, University of Bern, Bern, Switzerland ⁴Federal Office of Meteorology and Climatology MeteoSwiss, Payerne, Switzerland</p> <p>Received: 13 Oct 2018 – Accepted for review: 27 Jan 2019 – Discussion started: 29 Jan 2019</p>

Contribution to Validation (Example)



on activities

www.esrl.noaa.gov

±20W/m²)

= 16W/m²)

)/10mmIWV

on IWV

mIWV.

consistency

Credits: P. Stackhouse, T. Zhang

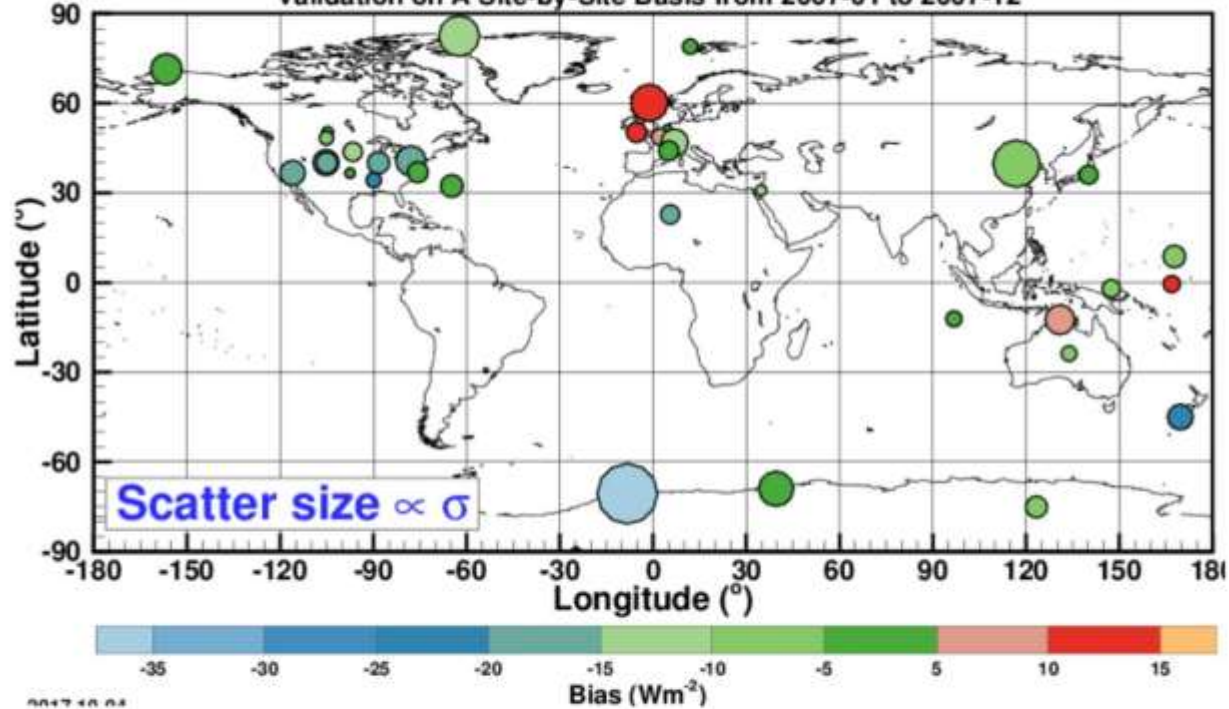
https://www.esrl.noaa.gov/gmd/grad/meetings/BSRN2018_documents/Tu1_Tristan_GDAP.pdf

https://www.esrl.noaa.gov/gmd/grad/meetings/BSRN2018_documents/Th1_SRB_Stackhouse.pdf



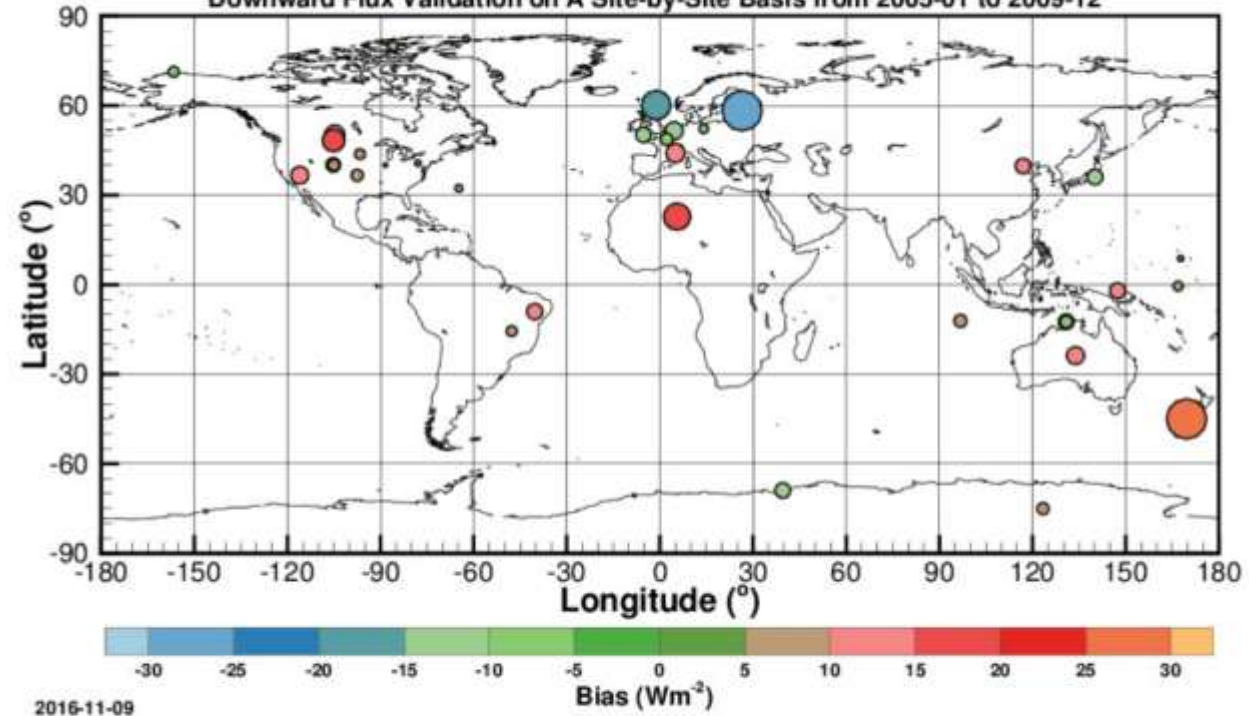
Contribution to Validation (regionalize)

GEWEX SRB GSW(V4.0 nu)-BSRN Monthly Mean Shortwave Downward Flux
Validation on A Site-by-Site Basis from 2007-01 to 2007-12



Downwelling SW

GEWEX SRB GLW(V4.0 nnhirs_combskinmerra_betacl)-BSRN Monthly Mean Longwave
Downward Flux Validation on A Site-by-Site Basis from 2005-01 to 2009-12



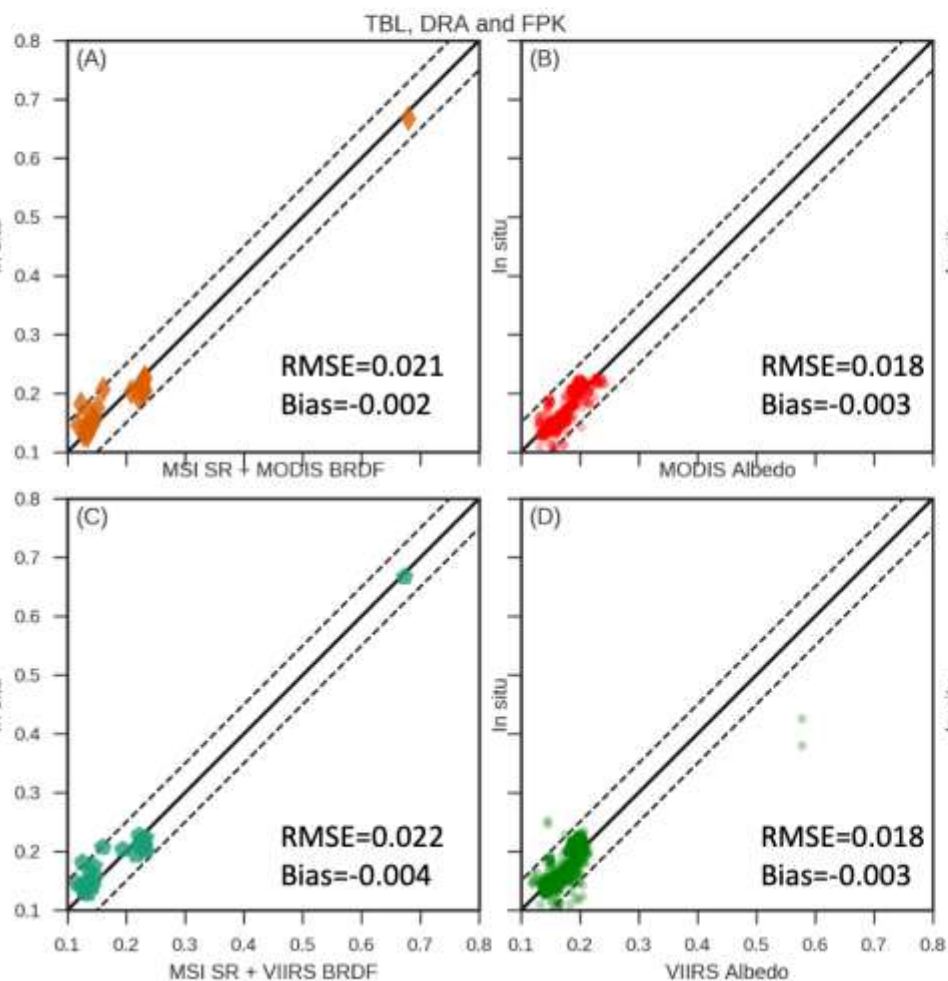
Downwelling LW



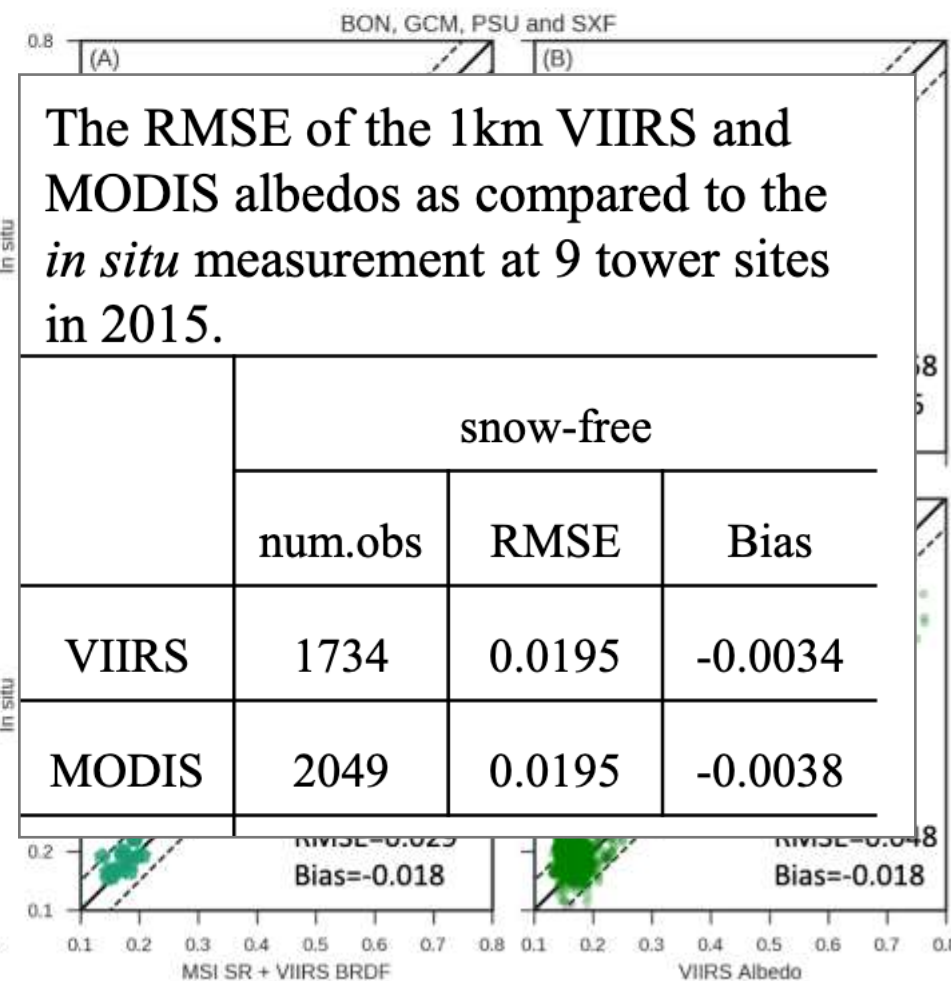
Product	Temporal Coverage
MERIS/SPOT-VGT	1999-2015
AVHRR	1981-2015
MODIS	2000-2015
VEGETATION	1998-2015
GLASS (MODIS,AVHRR)	1998-2015
MISR	2001-2015
VIIRS (NOAA)	2015-2015
CERES	2000-2015
MSG SEVERI	2002-2015
POLDER	2002-2015
Meteosat	2002-2015

Net
FLU
BSR
NEO
GC-

SURFRAD sites *representative* for coarse-resolution albedo products



SURFRAD sites *not representative* for coarse-resolution albedo products



GDAP point related to BSRN

(Credits: T. L'Ecuyer)

- Reiterated value of BSRN as calibration standard for global surface radiation products and studies
- Strong support for ongoing efforts to establish absolute IR calibration standards
- Request from global surface radiation product developers for BSRN sites to add 2m temperature and humidity to standard BSRN observation suite
- Need to establish accuracy standards for oceanic (buoy) sites
 - GDAP could oversee a community survey to define current capabilities and reasonable target
 - Follow-up workshop to define standards

Final remarks

- Reinforce the Data Quality check (Data Quality WG) (*)
- Reinforce the knowledge exchanges with WMO-CIMO with direct BSRN membership within Task Team/Expert Team (*)
- BSRN Manual Update (*)
- Establish Web meetings for WG progress discussion (*)
- Nominate a deputy BSRN Project Manager (*)
- Setup a knowledge expertize network to support station leaders and data users
- Promote the use of dismissed, unwanted equipment to increase upwelling components coverage through BSRN stations
- Share of data analysis computer code/station-to-archive formatters (to support early release of data)
- Promoting coverage of geographical gaps of the network? Which \$ support? Capacity building/Africa framework
- Promote community join scientific/best practice publication/docs/CIMO/GCOS
- Establish L2 BSRN product (monthly avgs, clearId, early-release, ...)



Thank you

... and the whole BSRN
community

