Status and implementation plan of BSRN in GCOS

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2. Recent progress of BSRN activities reviewed in the GCOS status report
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1. Background

Surface radiation budget is a fundamental component for climate monitoring and designated one of the GCOS ECVs.

BSRN: global baseline network for surface radiation budget obs.

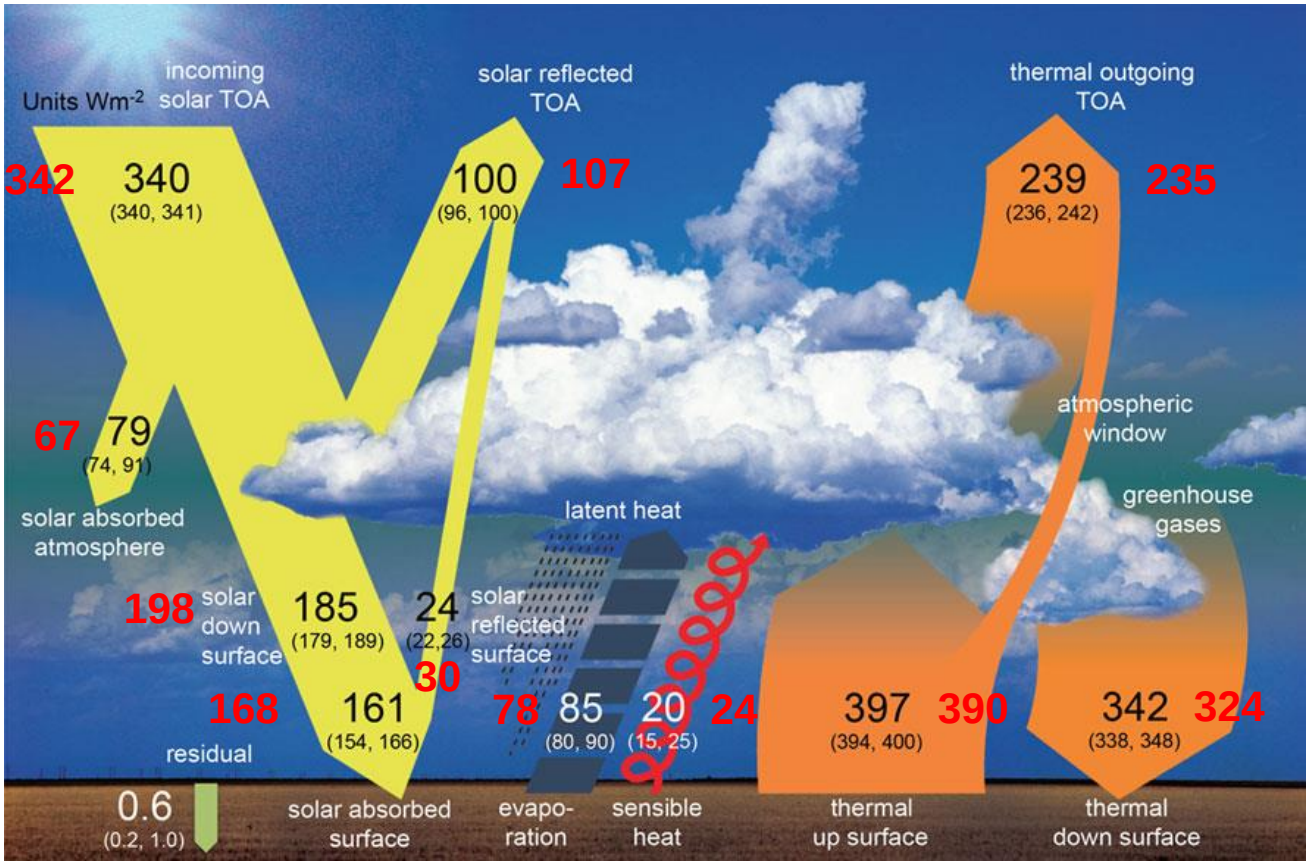
Domain	GCOS Essential Climate Variables	
Atmospheric (over land, sea and ice)	Surface:	Air temperature, Wind speed and direction, Water vapour, Pressure, Precipitation, **Surface radiation budget**.
	Upper-air:	Temperature, Wind speed and direction, Water vapour, Cloud properties, Earth radiation budget (including solar irradiance).
	Composition:	Carbon dioxide, Methane, and other long-lived greenhouse gases, Ozone and Aerosol, supported by their precursors.
Oceanic	Surface:	Sea-surface temperature, Sea-surface salinity, Sea level, Sea state, Sea ice, Surface current, Ocean colour, Carbon dioxide partial pressure, Ocean acidity, Phytoplankton.
	Sub-surface:	Temperature, Salinity, Current, Nutrients, Carbon dioxide partial pressure, Ocean acidity, Oxygen, Tracers.
Terrestrial	River discharge, Water use, Groundwater, Lakes, Snow cover, Glaciers and ice caps, Ice sheets, Permafrost, Albedo, Land cover (including vegetation type), Fraction of absorbed photosynthetically active radiation (FAPAR), Leaf area index (LAI), Above-ground biomass, Soil carbon, Fire disturbance, Soil moisture.	

➢ Use of the data for climate research

Estimate and monitor of radiative energy balance

1） Global mean energy balance

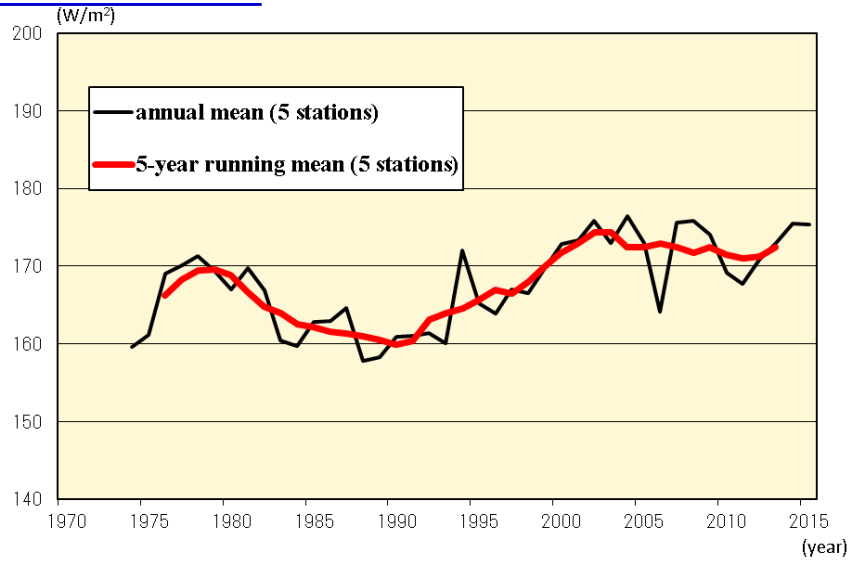
Update the value of each elements → IPCC AR5



Schematic diagram of the global mean energy balance of the Earth at the beginning of the 21st century.（Wild et al. 2012 / IPCC 2013）

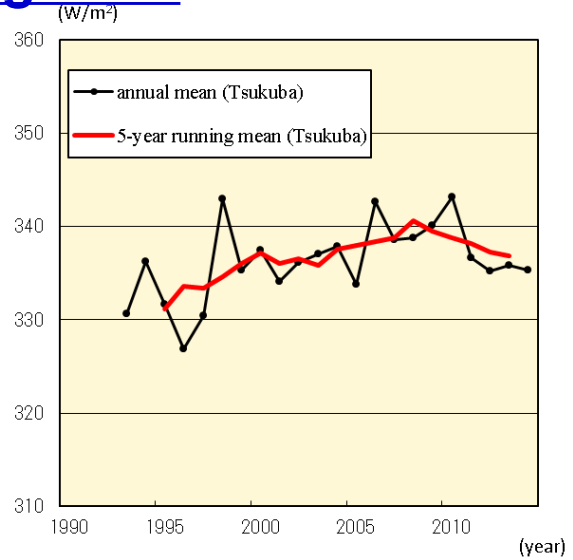
2) Long-term variation of surface radiation

Shortwave

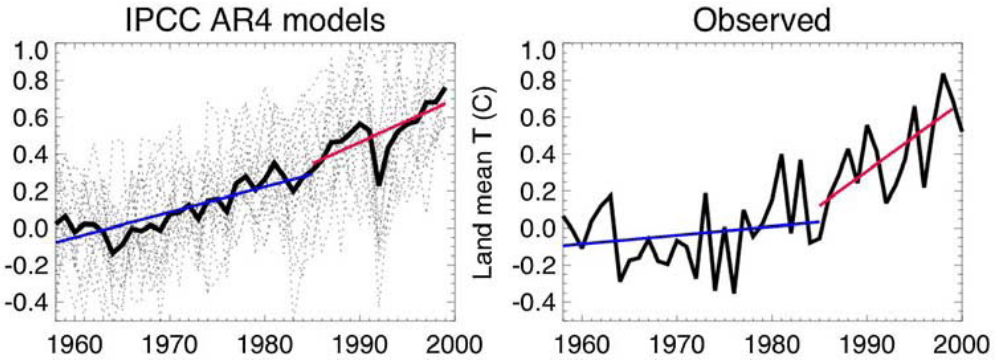


Long-term variations of global solar radiation （average of 5 Japanese BSRN stations）

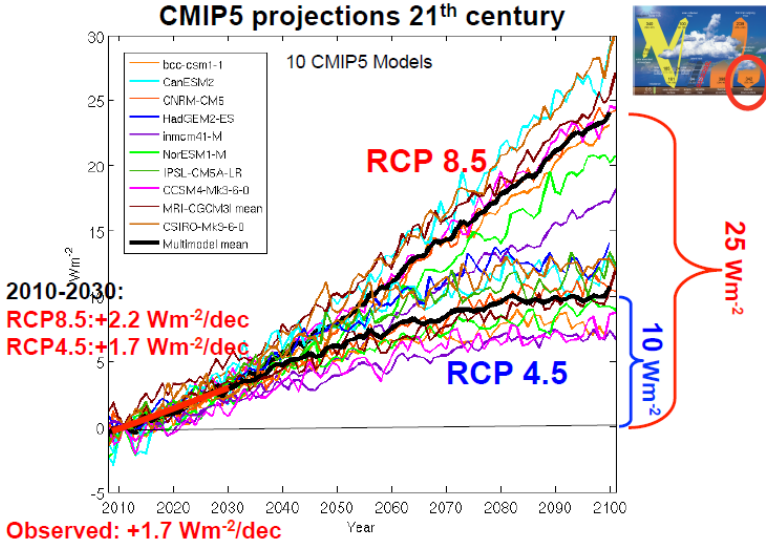
Longwave



Long-term variations of downward longwave radiation （BSRN Tateno station）



Deviation of surf. air temp. from 20th century average (Land) (Wild, 2009)

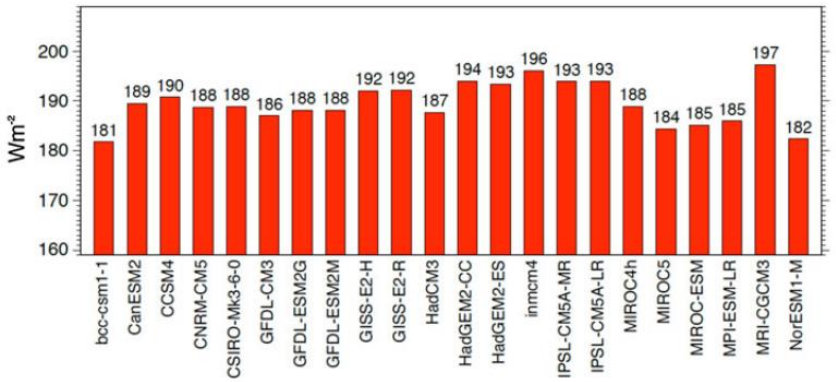


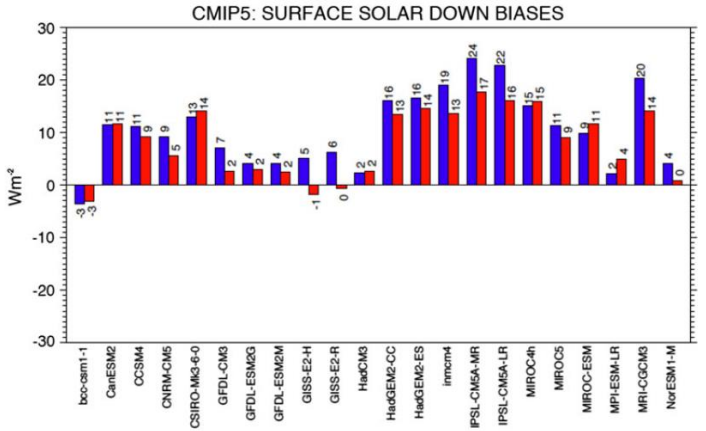
CMIP5 projections 21st century (Wild et al. 2014)

Validation of climate models

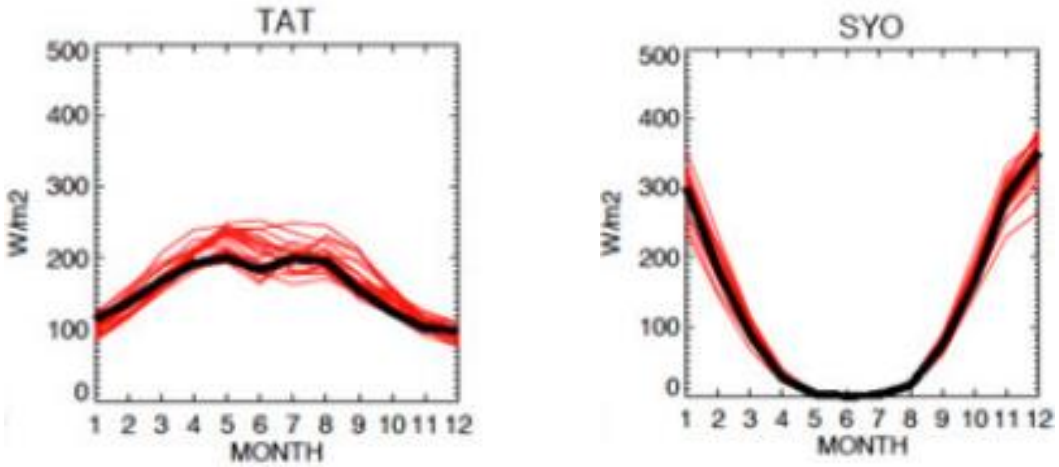
1) Downward Shortwave

Almost all climate models overestimate global solar radiation.





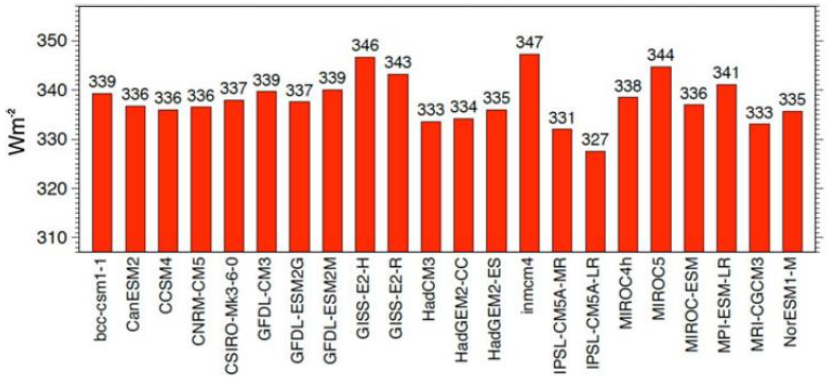
Climate model calculations (left) and comparisons between climate model calculations and observations（right）(Wild et al. 2013）

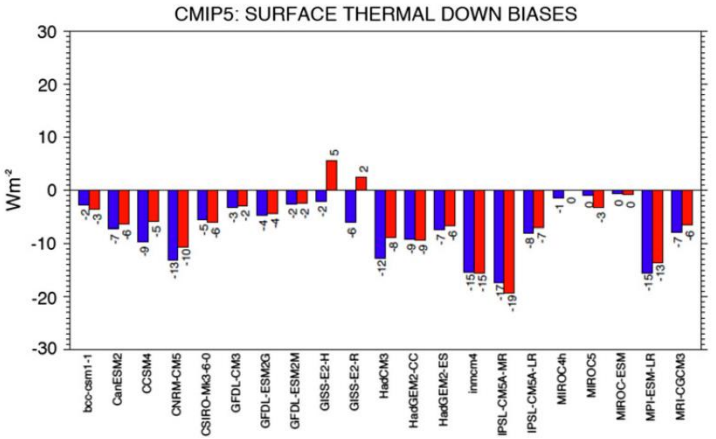


Comparisons between climate model calculations and observations（Wild et al. 2013）

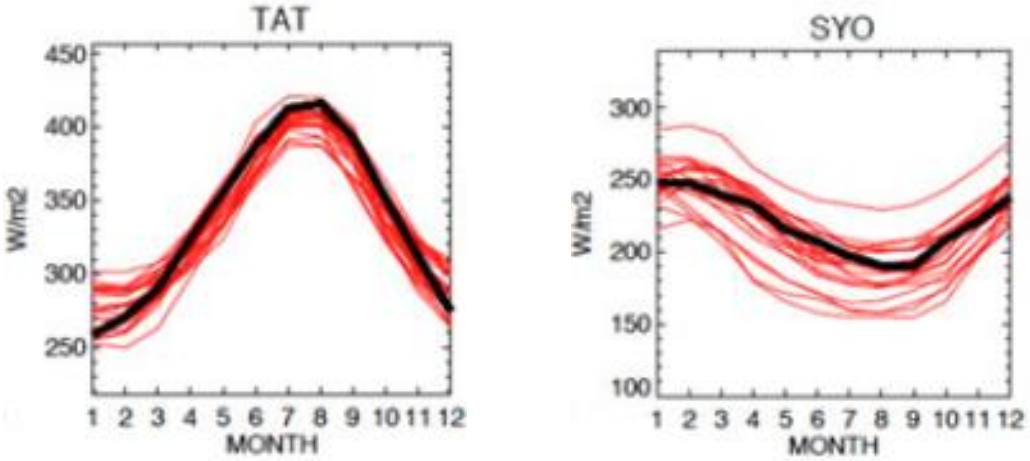
2) Downward Longwave

Almost all climate models underestimate downward longwave radiation.





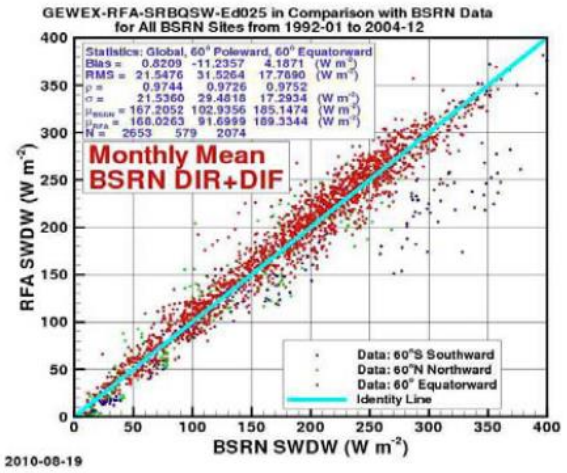
Climate model calculations (left) and comparisons between climate model calculations and observations（right）(Wild et al. 2013）

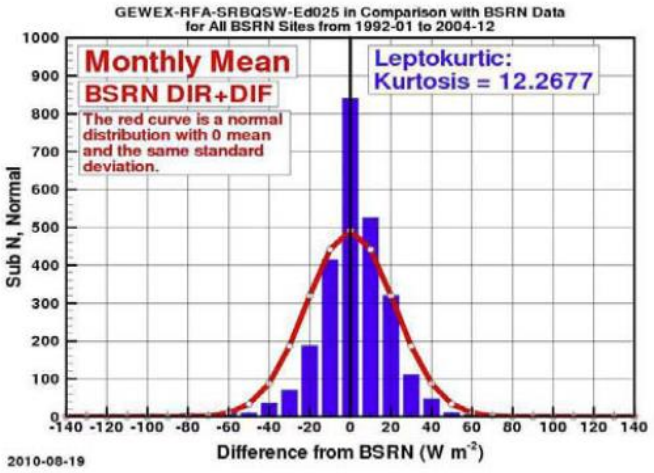


Comparisons between climate model calculations and observations.（Wild et al. 2013）

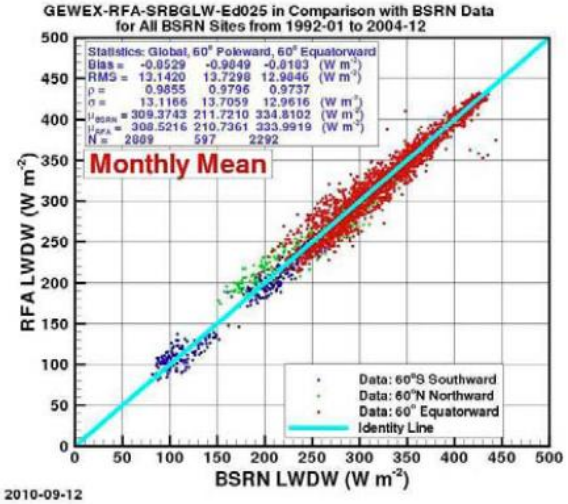
Validation of satellite SRB data sets

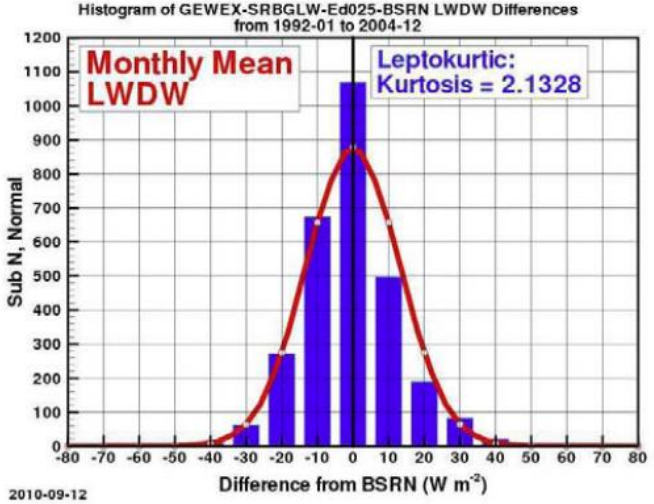
Shortwave





Longwave





Comparisons between satellite SRB data sets and BSRN data (GEWEX 2012)
Shortwave: GEWEX SRBQSW-Ed025, Longwave: GEWEX-SRBGLW

2. Status of surface radiation budget observation reviewed in the GCOS status report

Action for Parties operating BSRN stations in IP-10

Action A14: Ensure continued long-term operation of the BSRN and expand the network

Action: Ensure continued long-term operation of the BSRN and expand the network to obtain globally more representative coverage. Establish formal analysis infrastructure.

Who: Parties' national services and research programmes operating BSRN sites in cooperation with AOPC and the WCRP GEWEX Radiation Panel.

Time-Frame: Ongoing (network operation and extension); by 2012 (analysis infrastructure).

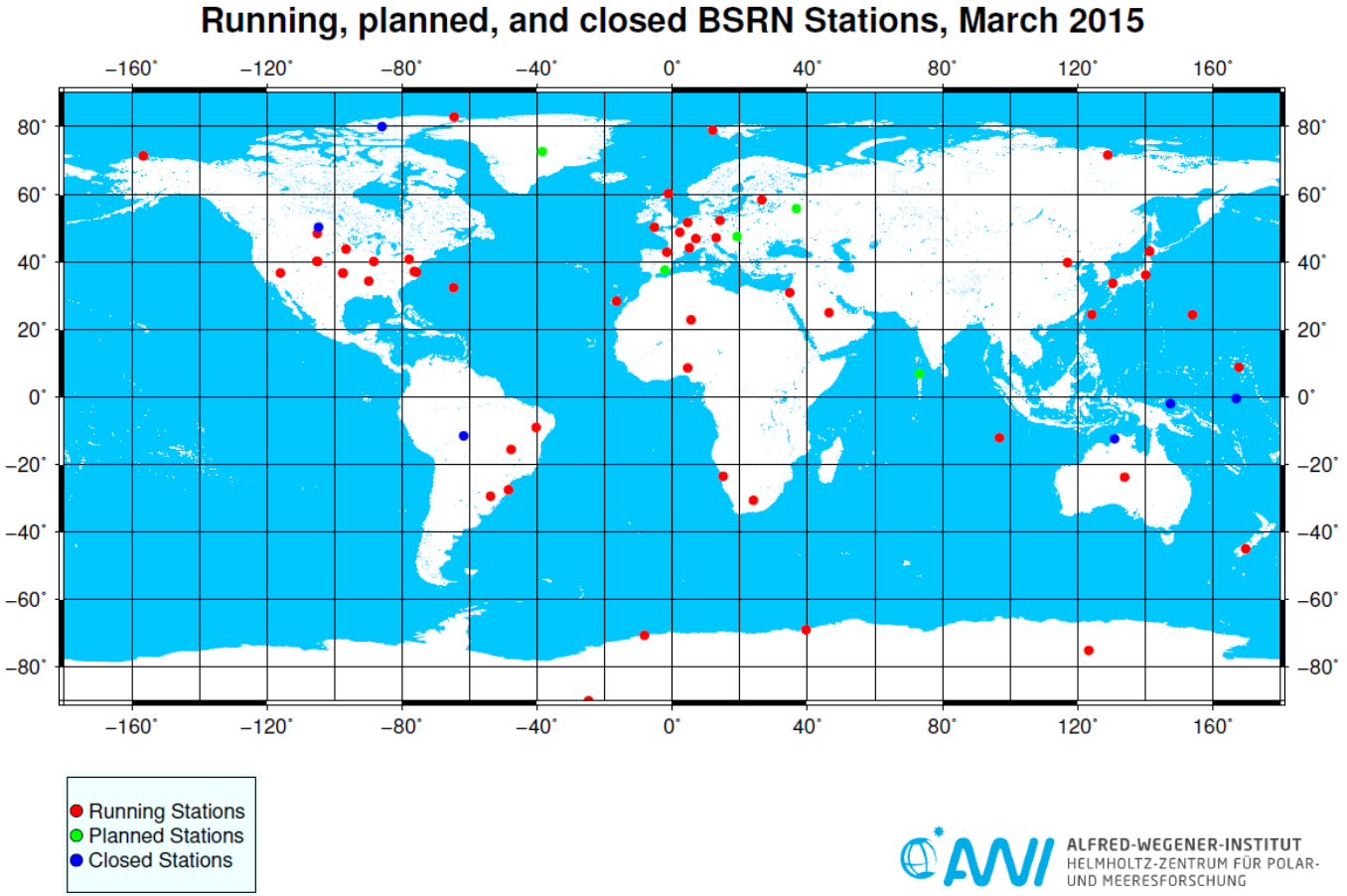
Performance Indicator: The number of BSRN stations regularly submitting data to International Data Centres; analysis infrastructure in place.

Annual Cost Implications: 1-10M US$ (20% in non-Annex-I Parties).

Category C: Moderate progress overall, though progress may be good on some part of the action.

Status of archived data at WRMC in the period of IP-10 (2010-2015)

The total data amounts archived in the WRMC have been growing steadily although data scarce area remain, especially over oceans, eastern Africa and central Asia.



ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

WRMC website operated by AWI (http://bsrn.awi.de/)

Data archive status (as of Sep 2015)

PANGAEA®
Data Publisher for Earth & Environmental Science

Not logged in (log in or sign up)

Baseline Surface Radiation Network

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

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	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	All
Alert	ALE	Christopher Cox (christopher.j.cox@noaa.gov)														5	12	12	12	12	12	12	12	12	2		X
Alice Springs	ASP	Bruce Forgan (B.Forgan@bom.gov.au)					12	12	12	12	12	12	11	12	12	12	12	12	12	12	12	12	12	11	9		X
Barrow	BAR	David Longenecker (David.U.Longenecker@noaa.gov)		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	2					X
Bermuda	BER	David Longenecker (David.U.Longenecker@noaa.gov)		12	12	12	12	12	12	12	12	12	12	12	10	12	12	12	12	12	12	12	12	12	2			X
Billings	BIL	Charles Long (chuck.long@noaa.gov)			4	12	12	12	12	12	12	12	11	12	12	12	12	12	12	12	12	12	12	4				X
Bondville	BON	John Augustine (John.A.Augustine@noaa.gov)					12	12	12	12	12	12	12	12	12	12	12	12	12	12	6							X
Boulder, SURFRAD	BOS	John Augustine (John.A.Augustine@noaa.gov)					5	12	12	12	12	12	12	12	12	12	12	12	12	12	6							X
Boulder	BOU	David Longenecker (David.U.Longenecker@noaa.gov)		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	7	X
Brasilia	BRB	Enio Bueno Pereira (eniobp@cptec.inpe.br)																8	10	4	12	12	12	6	12	12	1	X
Cabauw	CAB	Wouter Knap (knap@knmi.nl)															11	12	12	12	12	12	12	12	12	8	X
Camborne	CAM	Jonathan Tamlyn (jonathan.tamlyn@metoffice.gov.uk)											12	12	12	12	12	12	12	1					12	7	X
Carpentras	CAR	Thierry Duprat (thierry.duprat@meteo.fr)						4	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	6	X
Chesapeake Light	CLH	Fred M. Denn (Frederick.M.Denn@nasa.gov)									8	12	11	12	12	12	12	12	12	12	12	12	12	12	12	8	X
Cener	CNR	Xabier Olano (xolano@cener.com)																			6	12	12	12	7	8	1	X
Cocos Island	COC	Bruce Forgan (B.Forgan@bom.gov.au)														3	10	8	12	12	12	12	9	4	12	3	X
De Aar	DAA	Lucky Ntsangwane (lucky.ntsangwane@weathersa.co.za)										7	6	12	11	12	1										X
Darwin	DAR	Charles Long (chuck.long@noaa.gov)												10	12	12	12	12	12	12	12	12	12	12	10	1	X
Desert Rock	DRA	John Augustine (John.A.Augustine@noaa.gov)								10	12	12	12	12	12	12	12	12	12	6							X
Concordia Station	DOM	Vito Vitale (v.vitale@isac.cnr.it)																12	12	12	2						X
Darwin Met Office	DWN	Bruce Forgan (B.Forgan@bom.gov.au)																		12	12	12	12	12	9	12	3	X
Eureka	EUR	Station closed end of 2011																	4	12	12	12						X
Southern Great Plains	E13	Charles Long (chuck.long@noaa.gov)				12	7	12	12	12	12	12	12	12	12	12	12	12	12	12	11	12	12	4				X
Florianopolis	FLO	Sergio Colle (colle@emc.ufsc.br)				6	12	12	10	12	12	9	12	12	12	12	12								4	12	6	X
Fort Peck	FPE	John Augustine (John.A.Augustine@noaa.gov)					12	12	12	12	12	12	12	12	12	12	12	12	12	12	6							X
Fukuoka	FUA	Masao Omori (rrc-jma@met.kishou.go.jpp)																				9	12	12	12	12	6	X
Goodwin Creek	GCR	John Augustine (John.A.Augustine@noaa.gov)					12	12	12	12	12	12	12	12	12	12	12	12	12	12	6							X
Gobabeb	GOB	Roland Vogt (roland.vogt@unibas.ch)																						8	12	12	7	X
Neumayer Station	GVN	Gert König-Langlo (Gert.Koenig-Langlo@awi.de)	121	9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	1	X
Ilorin	ILO	T O Aro		4	12	8	7	12	12	6	12	12	12	7	12	12	7											X
Ishigakijima	ISH	Masao Omori (rrc-jma@met.kishou.go.jp)																				9	12	12	12	12	6	X
Izana	IZA	Emilio Cuevas-Agulló (ecuevasa@aemet.es)																			10	12	12	12	12	12	8	X
Kwajalein	KWA	David Longenecker (David.U.Longenecker@noaa.gov)		9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12			X
Lauder	LAU	Bruce Forgan (B.Forgan@bom.gov.au)									5	12	12	12	12	12	12	12	12	12	11	12	12	12	12	9		X
Lerwick	LER	Jonathan Tamlyn (jonathan.tamlyn@metoffice.gov.uk)											12	12	12	11	11	12	5						12	8	X
Lindenberg	LIN	Klaus Behrens (Klaus.Behrens@dwd.de)				3	12	12	12	12	12	12	12	12	12	12	12	12	4								X
Langley Research Center	LRC	Fred M. Denn (Frederick.M.Denn@nasa.gov)																								1	8	X
Momote	MAN	Charles Long (chuck.long@noaa.gov)						3	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	10			X
Minamitorishima	MNM	Masao Omori (rrc-jma@met.kishou.go.jp)																				9	12	12	12	12	6	X
Nauru Island	NAU	Charles Long (chuck.long@noaa.gov)								2	12	12	12	12	12	12	12	12	12	12	12	12	12	12	9			X
Ny-Ålesund	NYA	Marion Maturilli (Marion.Maturilli@awi.de)		5	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12		X
Palaiseau	PAL	Martial Haeffelin (martial.haeffelin@lmd.polytechnique.fr)													7	12	12	12	12	12	12	12	12	12	12			X
Payerne	PAY	Laurent Vuilleumier (laurent.vuilleumier@meteoswiss.ch)		3	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	5					X
Rock Springs	PSU	John Augustine (John.A.Augustine@noaa.gov)								7	12	12	12	12	12	12	12	12	12	12	6							X
Petrolina	PTR	Enio Bueno Pereira (eniobp@cptec.inpe.br)																1	7	4	12	12	12	12	12	12	1	X
Regina	REG	Station closed end of 2011					12	12	12	12	11	12	12	12	12	12	12	12	12	12	12	12	12					X
Rolim de Moura	RLM	Enio Bueno Pereira (eniobp@cptec.inpe.br)																	2									X
Sapporo	SAP	Masao Omori (rrc-jma@met.kishou.go.jp)																				9	12	12	12	12	6	X
Sede Boqer	SBO	Nurit Agam (agam@bgu.ac.il)														12	12	12	12	12	12	12	12	9				X
São Martinho da Serra	SMS	Enio Bueno Pereira (eniobp@cptec.inpe.br)																9	12	7	12	12	12	12	12	12	1	X
Sonnblick	SON	Marc Olefs (marc.olefs@zamg.ac.at)																							12	12	5	X
Solar Village	SOV	Naif Al-Abbadi (nabbadi@kacst.edu.sa)								3	12	12	12	12														X
South Pole	SPO	Charles Long (chuck.long@noaa.gov)		12	12	10	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	7	X
Sioux Falls	SXF	John Augustine (John.A.Augustine@noaa.gov)													7	12	12	12	12	12	6							X
Syowa	SYO	Masato Fukuda (antarctic@met.kishou.go.jp)				12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	1		X
Tamanrasset	TAM	Mohamed Mimouni (m_mimouni_dz@yahoo.fr)										10	12	12	12	12	12	12	12	12	12	12	12	12	12	12	6	X
Tateno	TAT	Osamu Ijima (ijima@met.kishou.go.jp)						11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	6	X
Tiksi	TIK	Vasilii Kustov (kustov@aari.ru)																				7	12	12	8			X
Toravere	TOR	Ain Kallis (kallis@aai.ee)									12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	8	X
Xianghe	XIA	Xiangao Xia (xxa@mail.iap.ac.cn)															12	12	12	12	12	12	8	6	9	12	5	X
Historical station	Eismitte		1																									X
	All			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			pre BSRN	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	All

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

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

Download this table as plain text

Contact

Data archive status from WRMC website operated by AWI (http://bsrn.awi.de/)

About 8400 station-month (700 years) in the archive

60 stations providing data

Web of Science®

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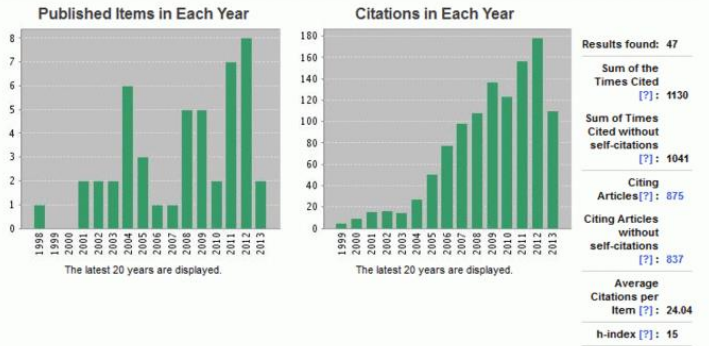
Citation Report Topic=(BSRN)
Timespan=All years. Databases=SCI-EXPANDED, SSCI.

This report reflects citations to source items indexed within Web of Science. Perform a Cited Reference Search to include citations to items not indexed within Web of Science.



Citation to “BSRN” in Web of Science

Citations to BSRN in Web of Science has been strongly increasing with time

3. New GCOS implementation plan related to BSRN

The implementation plan for GCOS including BSRN activity will be updated this year in support of the UNFCCC.

Recommendation for Parties operating BSRN stations in updated GCOS implementation plan

Recommendation: Ensure continued long-term operation of the BSRN and expand the network to obtain globally more representative coverage.

Who: Parties' national services and research programmes operating BSRN sites in cooperation with AOPC and the WCRP GEWEX Radiation Panel.

Time-Frame: Ongoing

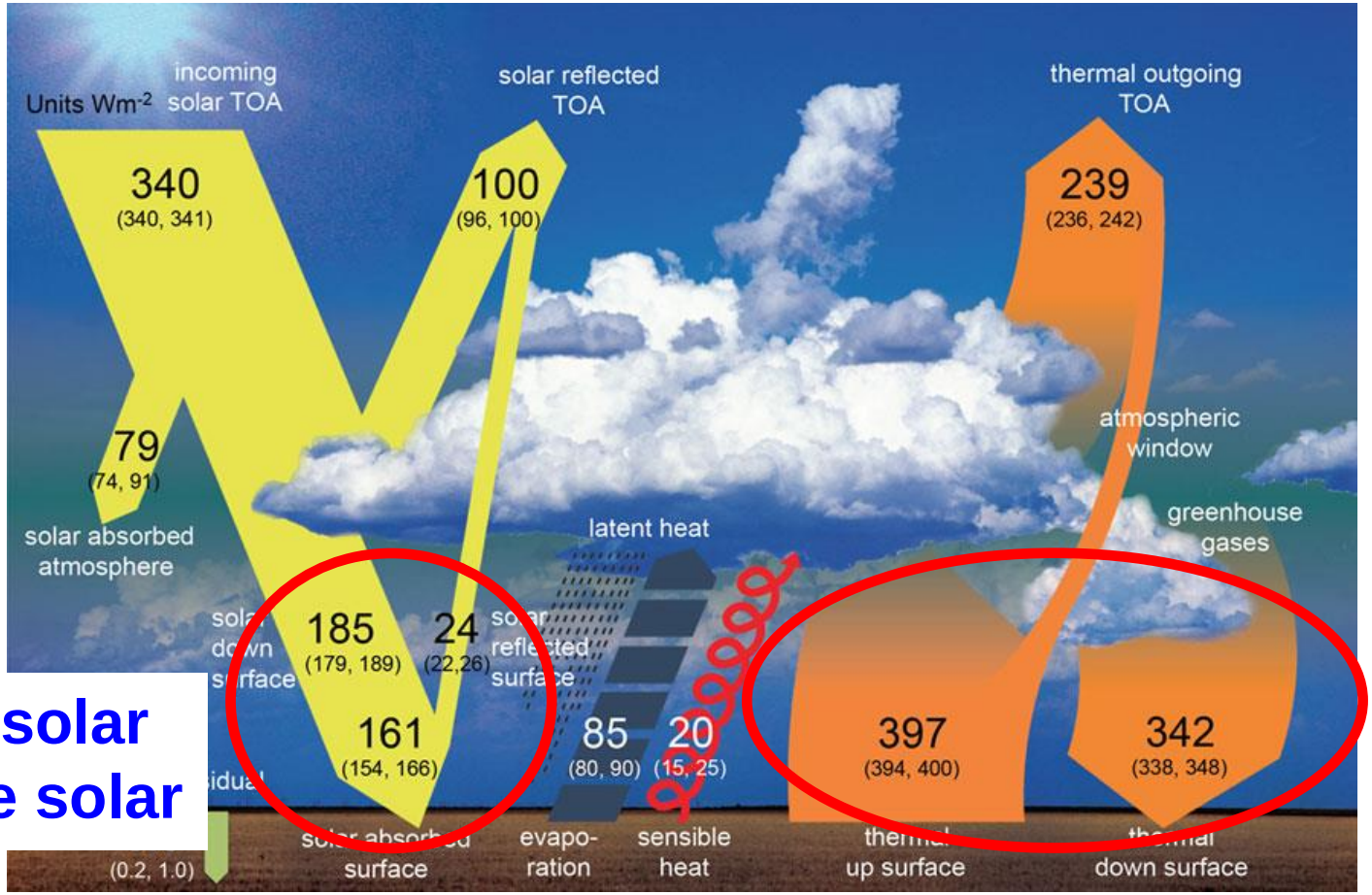
Performance Indicator: The number of BSRN stations regularly submitting valid data to International Data Centres.

Benefits: Continuing baseline surface radiation climate record at BSRN sites.

ECVs related to the energy cycle will be also identified in the new GCOS implementation plan.

Surface energy budget is fundamental variable to understand the energy cycle, completely

Surface



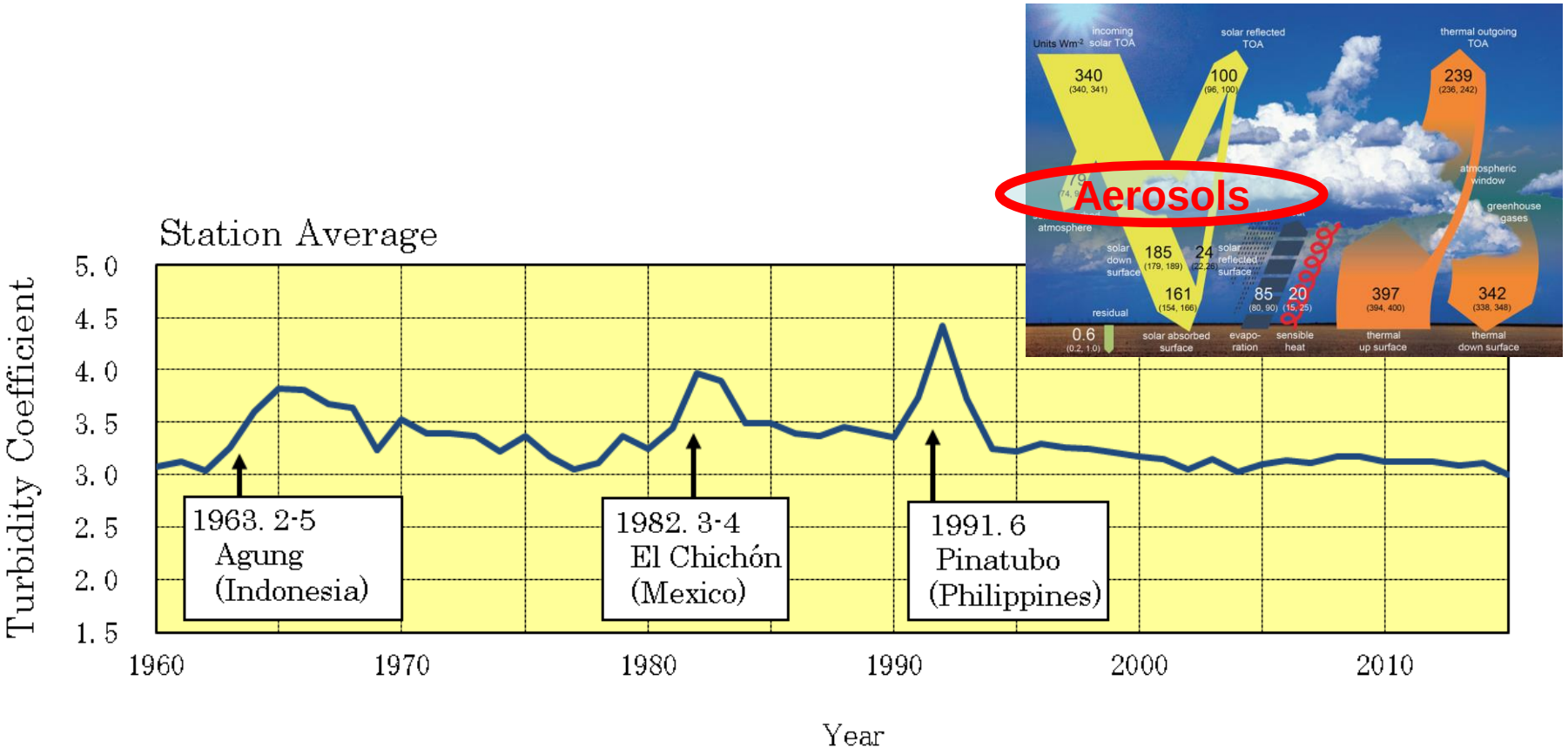
Direct solar
Diffuse solar

Downward shortwave

Downward longwave

Direct solar irradiance

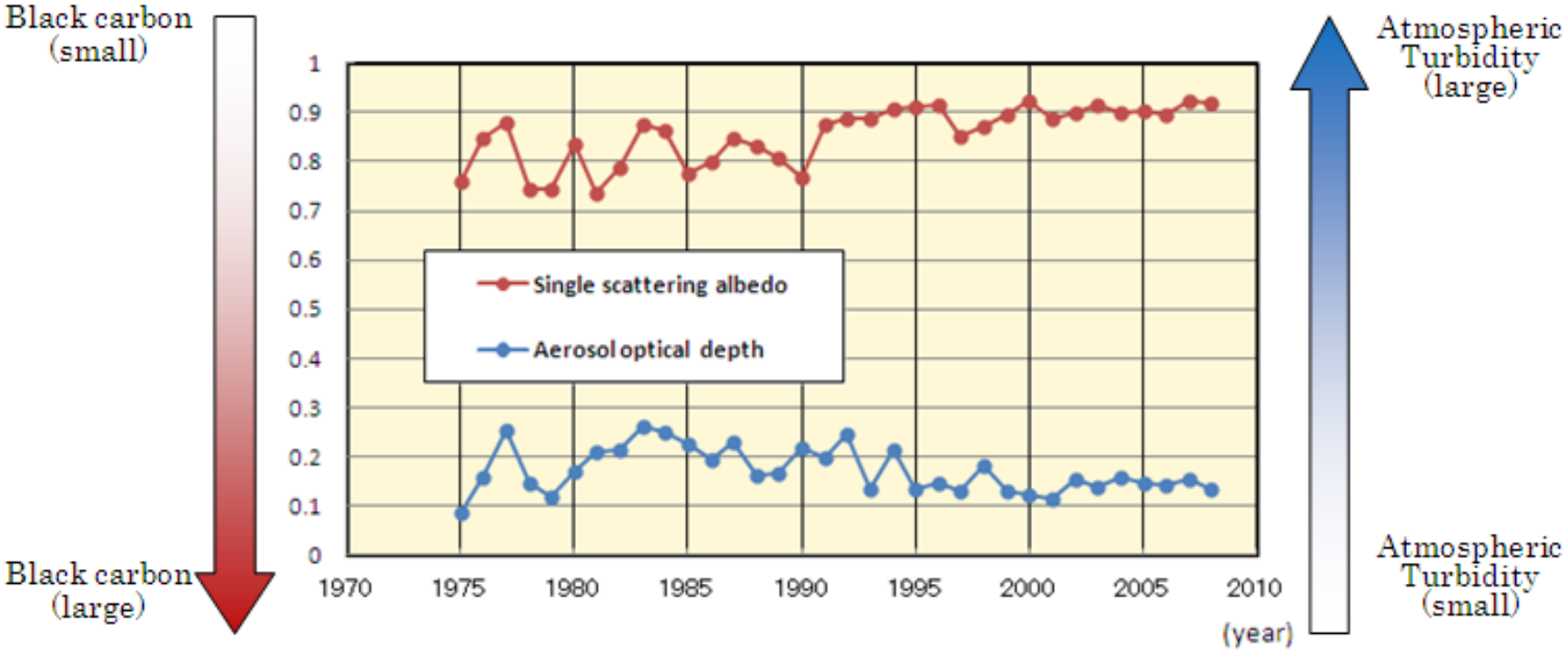
Direct solar irradiance includes information of aerosol concentration in the atmosphere.
The figure shows sudden increase of aerosol concentration in the atmosphere after several years of large volcanic eruptions.



Trend of Long-term Variations of atmospheric turbidity

Diffuse solar irradiance

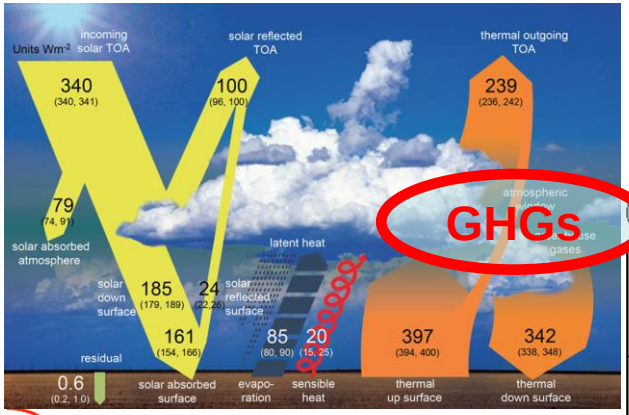
Diffuse solar irradiance includes information of aerosol optical properties.
The figure shows decrease in AOD and increase in SSA due to recent decrease in Black Carbon emissions into the atmosphere.

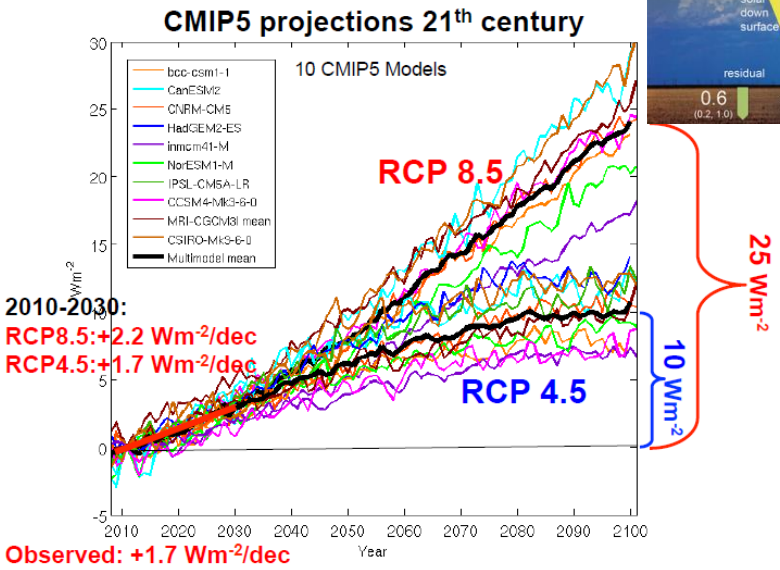


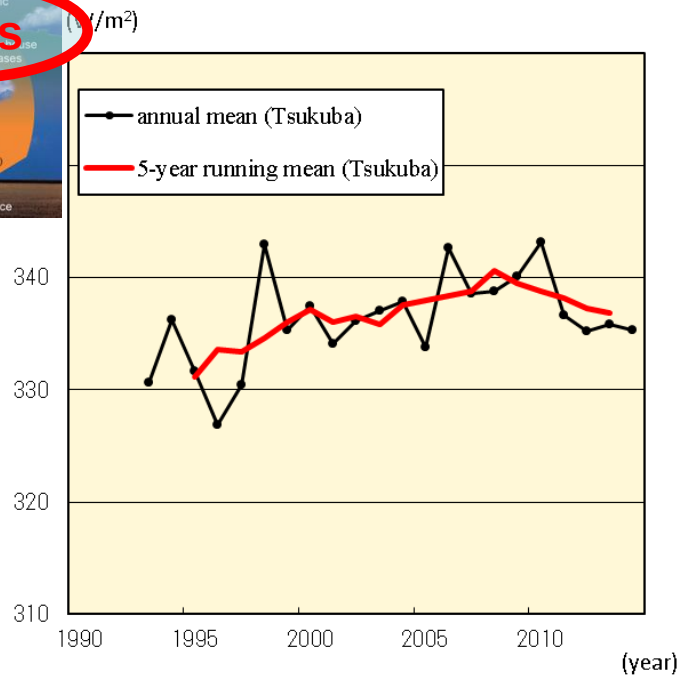
Trend of Long-term Variations in Black Carbon Aerosols

Downward longwave radiation

Downward longwave radiation is very important to monitor GHGs concentration in the atmosphere.







CMIP5 projections 21st century (Wild et al. 2014)

Long-term variations of DL （BSRN Tateno station）

4. Summary

- Surface radiation budget is a fundamental component for climate monitoring.

BSRN is designated as a GCOS global baseline network.

- The data are effectively used for climate research.
- Recent progress of surface radiation budget observation was reported in "Status of the Global Observing System for Climate" in 2015;
  - The total data amount archived at data centres has significantly increased.
  - Data scarce areas also remain in some regions.
- New GCOS implementation plan will be updated this year in support of the UNFCCC;

BSRN is a fundamental network for climate monitoring and required to continue long-term operation and expand the network.

Thank you

for your attention!