

# World Radiation Monitoring Center

and some other activities at the  
Alfred-Wegener-Institut



## Main WRMC Objectives:

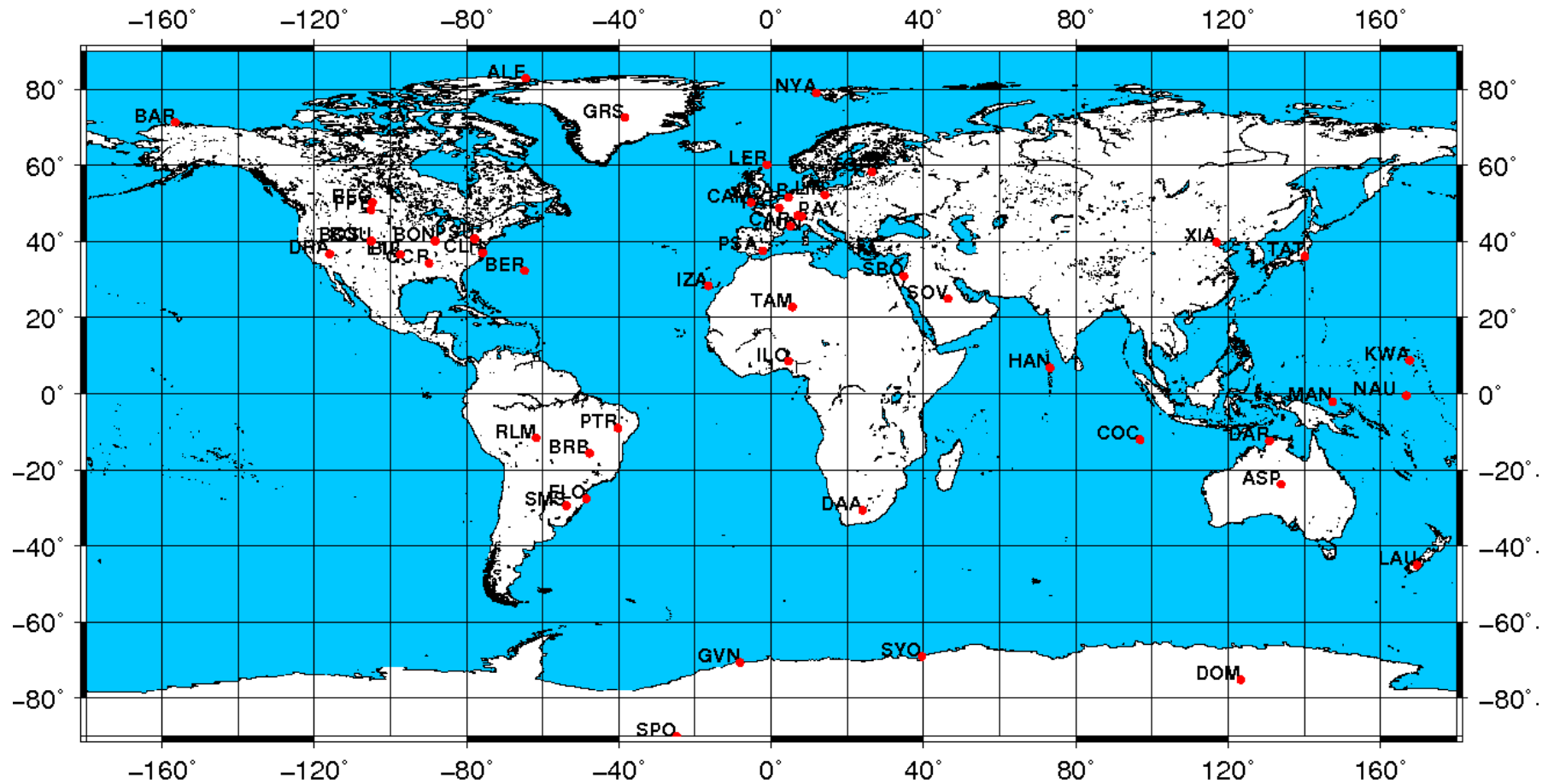
Archiving uniform and consistent **measurements** throughout the **Baseline Surface Radiation Network** (BSRN) to:

1. **monitor** the surface short-wave and long-wave radiative components and their **changes** with the best methods currently available,
2. provide data for the **validation of satellite**-based estimates of the surface radiative fluxes and
3. produce high quality observational data for **comparison to climate models**.

## **Brief WRMC-BSRN History:**

1. 1988: The WMO proposed the establishment of the BSRN.
2. 1992: The BSRN started with 5 sites and the WRMC at ETH Zurich under the direction of Prof. Atsumu Ohmura.
3. 2004: BSRN officially became a contributor to the Global Climate Observing System (GCOS).
4. 2008 July: After 15 years of nearly continuous operation at ETH Zurich, the archive moved to Alfred-Wegener-Institut (AWI) in Bremerhaven, Germany under the direction of Dr. Gert König-Langlo.

## Present State of the WRMC: 47 stations providing data



## Present State of the WRMC: Datasets

The typical average interval for radiation data is 1 minute:

- |   |               |
|---|---------------|
| 1. LR 0100: (Global, Diffuse, Direct, Long-wave down)     | 47 stations   |
| 2. LR 0200: (Long-wave spectral down)                     | 0 stations    |
| 3. LR 0300: (Reflex, Long-wave up)                        | 9 stations    |
| 4. LR 0500: (UV)  | 12 stations   |
| 5. LR 1000: (Synops)                                      | 8 stations    |
| 6. LR 1100: (Upper air soundings)                         | 25 stations   |
| 7. LR 1200: (Total ozone)                                 | 8 stations    |
| 8. LR 1300: (Aerosol optical depths) (under construction) | (14) stations |
| 9. LR 1300: (Ceilometer data)                             | 3 stations    |
| 10. LR 30x0: (Radiation measurements from tower)          | 11 stations   |

## Homepage

1. The web-address is:  
<http://www.bsrn.awi.de>.
2. Access to  
<ftp://ftp.bsrn.awi.de/>
3. Link-tables which offer easy access to any dataset using the PANGAEA.

BSRN - World Radiation Monitoring Center | Index von ftp://ftp.bsrn.awi.de/ - Mozilla Firefox

Baseline Surface Radiation Network - Status - Mozilla Firefox

http://www.pangaea.de/PHP/BSRN\_Status.php?q=LR0100

Baseline Surface Radiation Network

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

Station	Short name	Station manager currently in charge	pre BSRN	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	All
Alice Springs	ASP	Bruce Forgan (B.Forgan@bom.gov.au)					12	12	12	12	12	12	11	12	12	12	12	12	12				X
Barrow	BAR	Ellsworth Dutton (Ellsworth.G.Dutton@noaa.gov)		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	6		X
Bermuda	BER	Ellsworth Dutton (Ellsworth.G.Dutton@noaa.gov)		12	12	12	12	12	12	12	12	12	12	12	10	12	12	12	12	12	6		X
Billings	BIL	Charles Long (chuck.long@pnl.gov)			4	12	12	12	12	12	12	12	11	12	12	12	12	12	12	12	6		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	Ellsworth Dutton (Ellsworth.G.Dutton@noaa.gov)		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	6		X
Brasilia	BRB	Enio Bueno Pereira (eniobp@cptec.inpe.br)															8	10					X
Cabauw	CAB	Wouter Knap (knap@knmi.nl)															11	12	12	12	12		X
Camborne	CAM	Patrick Fishwick (patrick.fishwick@metoffice.com)											12	12	12	12	12	12	4				X
Carpentras	CAR	Jean-Philippe Morel (jean-philippe.morel@meteo.fr)						4	12	12	12	12	12	12	12	12	12	12	12	12	12	1	X
Chesapeake Light	CLH	Fred M. Denn (Frederick.M.Denn@nasa.gov)										8	12	11	12	12	12	12	12	12	12	1	X
Cocos Island	COC	Bruce Forgan (B.Forgan@bom.gov.au)														3	10	8	12	12			X
De Aar	DAA	Danie Esterhuysen (danie@weathersa.co.za)										7	6	12	11	12	1						X
Darwin	DAR	Charles Long (chuck.long@pnl.gov)												10	12	12	12	12	12				X
Desert Rock	DRA	John Augustine (John.A.Augustine@noaa.gov)							10	12	12	12	12	12	12	12	12	12	12	12	6		X
Concordia Station	DOM	Vito Vitale (v.vitale@isac.cnr.it)																12	12	12	4		X
S. Great Plains	E13	Charles Long (chuck.long@pnl.gov)				12	7	12	12	12	12	12	12	12	12	12	12	12	12	12	5		X
Florianopolis	FLO	Sergio Colle (colle@emc.ufsc.br)				6	12	12	10	12	12	9	12	12	12	12	12						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
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
Neumayer Station	GVN	Gert König-Langlo (Gert.Koenig-Langlo@awi.de)	120	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



# What is PANGAEA?

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## PANGAEA: Winner 2008

AWI and the Center for Marine Environmental Sciences (MARUM) received the 21st Century Achievement **Award of the Computerworld Honors Program in the category Environment**, which is one of the most prestigious awards in information technology.

The award has been granted in response to PANGAEA's implementation and successful operation of a unique information system for archiving, publishing and processing of Earth system data.



THE COMPUTERWORLD  
HONORS PROGRAM



## Present State of the WRMC: 5743 station-months available

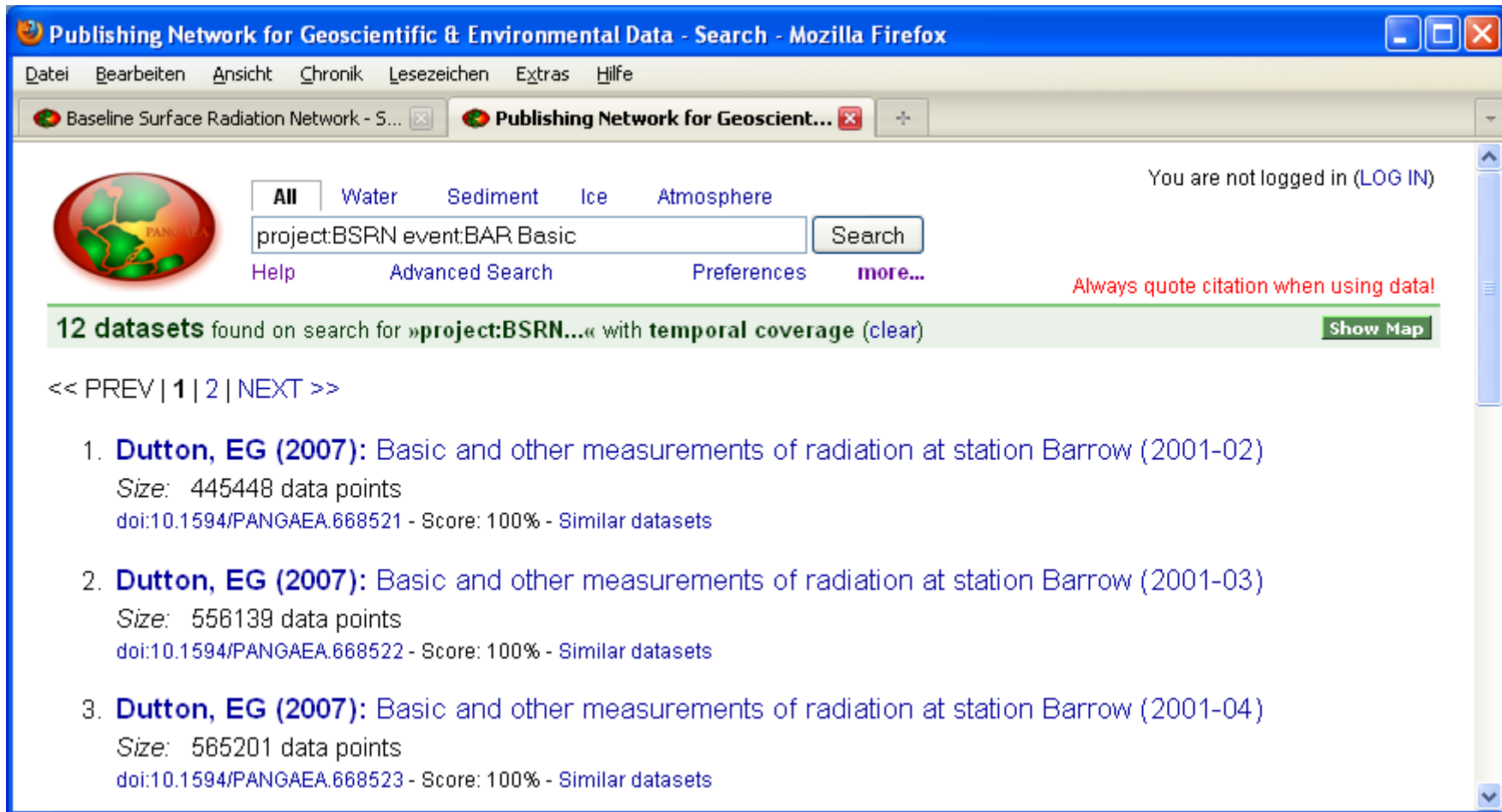
Station	Short name	Station manager currently in charge	pre BSRN	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	All
Alice Springs	ASP	Bruce Forgan (B.Forgan@bom.gov.au)					12	12	12	12	12	12	11	12	12	12	12	12	12				X
Barrow	BAR	Ellsworth Dutton (Ellsworth.G.Dutton@noaa.gov)		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	6		X
Bermuda	BER	Ellsworth Dutton (Ellsworth.G.Dutton@noaa.gov)		12	12	12	12	12	12	12	12	12	12	12	10	12	12	12	12	12	6		X
Billings	BIL	Charles Long (chuck.long@pnl.gov)			4	12	12	12	12	12	12	12	11	12	12	12	12	12	12	12	6		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	Ellsworth Dutton (Ellsworth.G.Dutton@noaa.gov)		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	6		X
Brasilia	BRB	Enio Bueno Pereira																8	10				X

\*\*\*\*\*

Tamanrasset	TAM	Mohamed Mimouni (m_mimouni_dz@yahoo.fr)										10	12	12	12	12	12	12	12	12	12		X
Tateno	TAT	Nozomu Ohkawara (ohkawara@met.kishou.go.jp)						11	12	12	12	12	12	11	11	12	12	12	12	12	12		X
Toravere	TOR	Ain Kallis (kallis@aai.ee)									12	12	12	12	12	12	12	12	12	12	12	1	X
Xianghe	XIA	Xiangao Xia (xiangaoxia2000@yahoo.com)															12	12	12	8			X
Historical station	Eismitte		1																				X
	<b>All</b>			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			<b>pre BSRN</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>All</b>



## What offers PANGAEA?



The screenshot shows a Mozilla Firefox browser window displaying the PANGAEA search results for the query "project:BSRN event:BAR Basic". The browser title is "Publishing Network for Geoscientific & Environmental Data - Search - Mozilla Firefox". The search results show 12 datasets found, with the first three listed below.

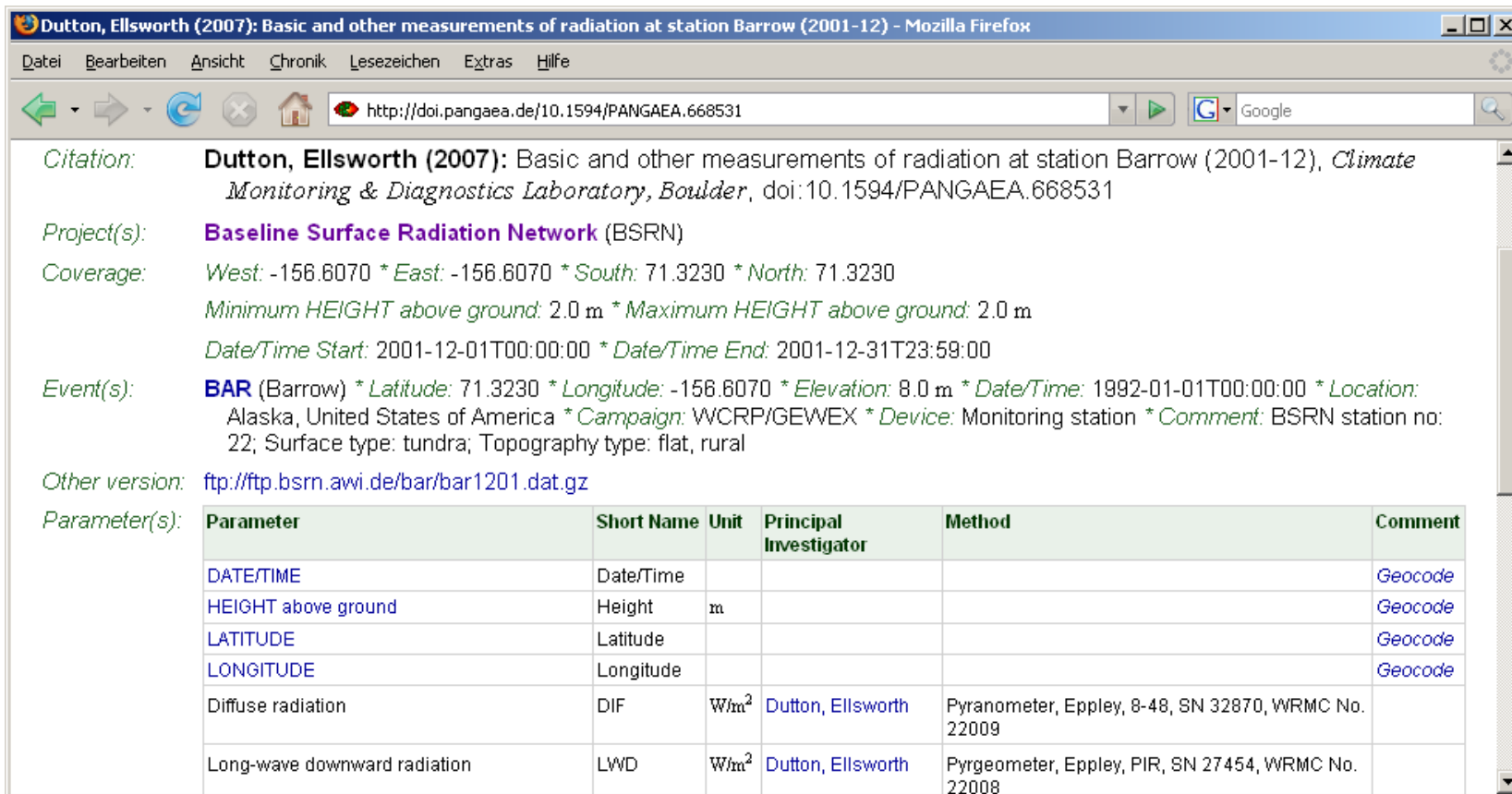
**12 datasets** found on search for »project:BSRN...« with **temporal coverage** (clear) [Show Map](#)

<< PREV | 1 | 2 | NEXT >>

1. **Dutton, EG (2007):** Basic and other measurements of radiation at station Barrow (2001-02)  
Size: 445448 data points  
doi:10.1594/PANGAEA.668521 - Score: 100% - Similar datasets
2. **Dutton, EG (2007):** Basic and other measurements of radiation at station Barrow (2001-03)  
Size: 556139 data points  
doi:10.1594/PANGAEA.668522 - Score: 100% - Similar datasets
3. **Dutton, EG (2007):** Basic and other measurements of radiation at station Barrow (2001-04)  
Size: 565201 data points  
doi:10.1594/PANGAEA.668523 - Score: 100% - Similar datasets

## What offers PANGAEA?

PANGAEA presents well defined metadata for any dataset (no login)



**Citation:** Dutton, Ellsworth (2007): Basic and other measurements of radiation at station Barrow (2001-12), *Climate Monitoring & Diagnostics Laboratory, Boulder*, doi:10.1594/PANGAEA.668531

**Project(s):** Baseline Surface Radiation Network (BSRN)

**Coverage:** West: -156.6070 \* East: -156.6070 \* South: 71.3230 \* North: 71.3230  
Minimum HEIGHT above ground: 2.0 m \* Maximum HEIGHT above ground: 2.0 m  
Date/Time Start: 2001-12-01T00:00:00 \* Date/Time End: 2001-12-31T23:59:00

**Event(s):** BAR (Barrow) \* Latitude: 71.3230 \* Longitude: -156.6070 \* Elevation: 8.0 m \* Date/Time: 1992-01-01T00:00:00 \* Location: Alaska, United States of America \* Campaign: WCRP/GEWEX \* Device: Monitoring station \* Comment: BSRN station no: 22; Surface type: tundra; Topography type: flat, rural

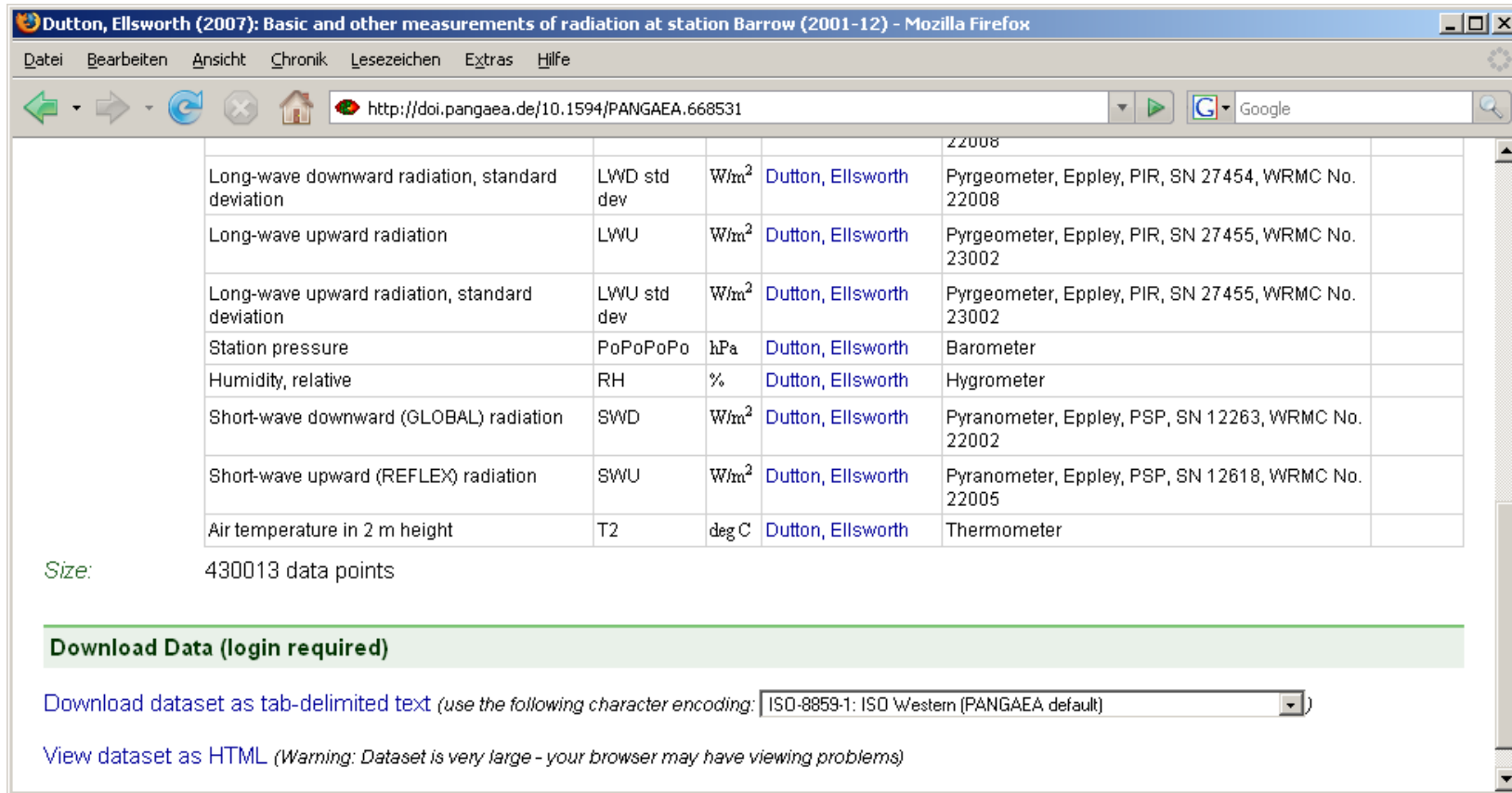
**Other version:** <ftp://ftp.bsrn.awi.de/bar/bar1201.dat.gz>

**Parameter(s):**

Parameter	Short Name	Unit	Principal Investigator	Method	Comment
DATE/TIME	Date/Time				<a href="#">Geocode</a>
HEIGHT above ground	Height	m			<a href="#">Geocode</a>
LATITUDE	Latitude				<a href="#">Geocode</a>
LONGITUDE	Longitude				<a href="#">Geocode</a>
Diffuse radiation	DIF	W/m <sup>2</sup>	Dutton, Ellsworth	Pyranometer, Eppley, 8-48, SN 32870, WRMC No. 22009	
Long-wave downward radiation	LWD	W/m <sup>2</sup>	Dutton, Ellsworth	Pyrgeometer, Eppley, PIR, SN 27454, WRMC No. 22008	

## What offers PANGAEA?

PANGAEA presents well defined metadata for any dataset (no login)



Long-wave downward radiation, standard deviation	LWD std dev	W/m <sup>2</sup>	<a href="#">Dutton, Ellsworth</a>	22008 Pyrometer, Eppley, PIR, SN 27454, WRMC No. 22008
Long-wave upward radiation	LWU	W/m <sup>2</sup>	<a href="#">Dutton, Ellsworth</a>	Pyrometer, Eppley, PIR, SN 27455, WRMC No. 23002
Long-wave upward radiation, standard deviation	LWU std dev	W/m <sup>2</sup>	<a href="#">Dutton, Ellsworth</a>	Pyrometer, Eppley, PIR, SN 27455, WRMC No. 23002
Station pressure	PoPoPoPo	hPa	<a href="#">Dutton, Ellsworth</a>	Barometer
Humidity, relative	RH	%	<a href="#">Dutton, Ellsworth</a>	Hygrometer
Short-wave downward (GLOBAL) radiation	SWD	W/m <sup>2</sup>	<a href="#">Dutton, Ellsworth</a>	Pyranometer, Eppley, PSP, SN 12263, WRMC No. 22002
Short-wave upward (REFLEX) radiation	SWU	W/m <sup>2</sup>	<a href="#">Dutton, Ellsworth</a>	Pyranometer, Eppley, PSP, SN 12618, WRMC No. 22005
Air temperature in 2 m height	T2	deg C	<a href="#">Dutton, Ellsworth</a>	Thermometer

Size: 430013 data points

**Download Data (login required)**

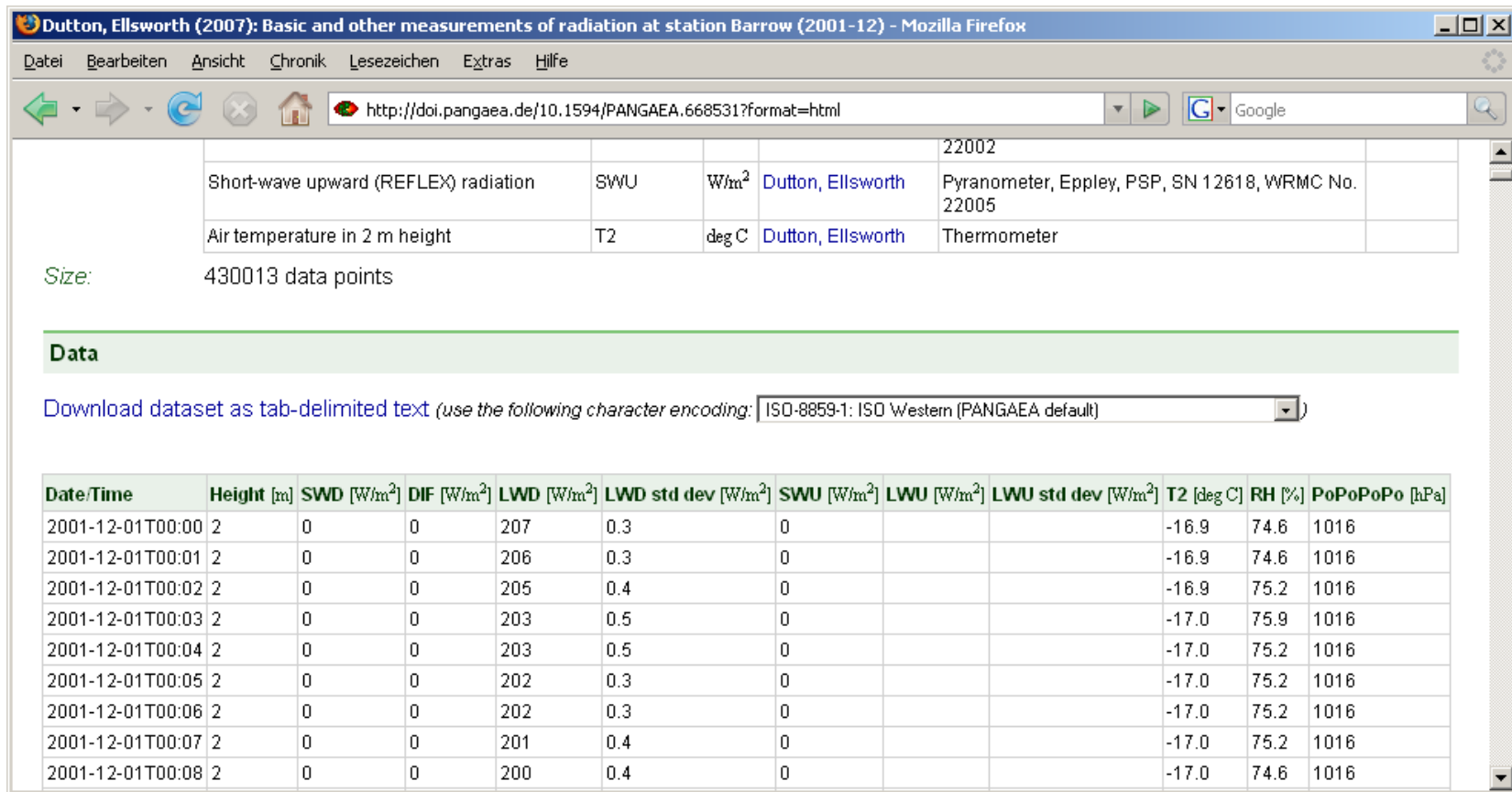
[Download dataset as tab-delimited text](#) (use the following character encoding: )

[View dataset as HTML](#) (Warning: Dataset is very large - your browser may have viewing problems)



# What offers PANGAEA?

PANGAEA presents the data itself in different formats (ftp, text, html)



Dutton, Ellsworth (2007): Basic and other measurements of radiation at station Barrow (2001-12) - Mozilla Firefox

http://doi.pangaea.de/10.1594/PANGAEA.668531?format=html

Short-wave upward (REFLEX) radiation	SWU	W/m <sup>2</sup>	Dutton, Ellsworth	22002	Pyranometer, Eppley, PSP, SN 12618, WRMC No. 22005
Air temperature in 2 m height	T2	deg.C	Dutton, Ellsworth		Thermometer

Size: 430013 data points

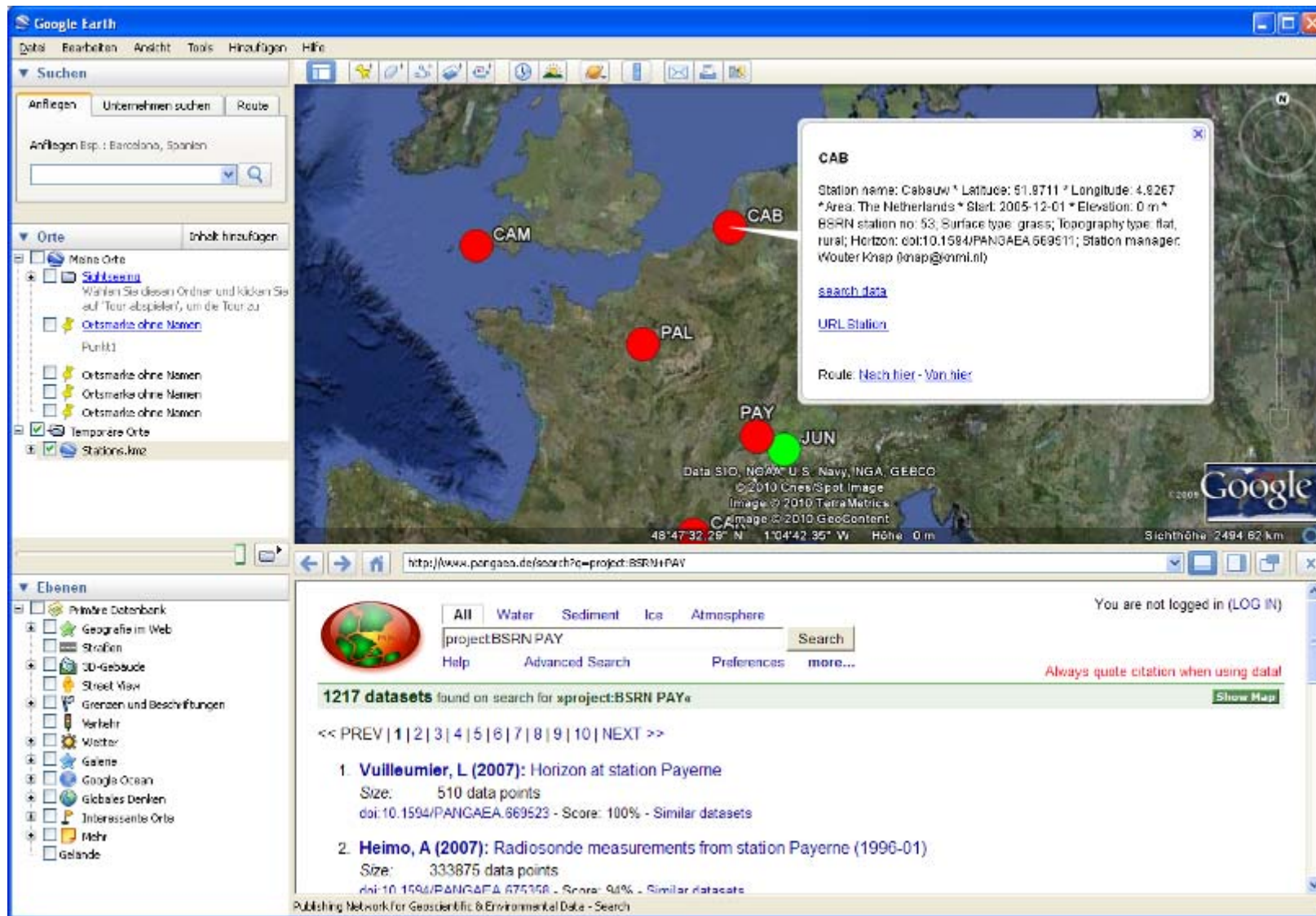
**Data**

Download dataset as tab-delimited text (use the following character encoding: ISO-8859-1: ISO Western (PANGAEA default))

Date/Time	Height [m]	SWD [W/m <sup>2</sup> ]	DIF [W/m <sup>2</sup> ]	LWD [W/m <sup>2</sup> ]	LWD std dev [W/m <sup>2</sup> ]	SWU [W/m <sup>2</sup> ]	LWU [W/m <sup>2</sup> ]	LWU std dev [W/m <sup>2</sup> ]	T2 [deg C]	RH [%]	PoPoPoPo [hPa]
2001-12-01T00:00	2	0	0	207	0.3	0			-16.9	74.6	1016
2001-12-01T00:01	2	0	0	206	0.3	0			-16.9	74.6	1016
2001-12-01T00:02	2	0	0	205	0.4	0			-16.9	75.2	1016
2001-12-01T00:03	2	0	0	203	0.5	0			-17.0	75.9	1016
2001-12-01T00:04	2	0	0	203	0.5	0			-17.0	75.2	1016
2001-12-01T00:05	2	0	0	202	0.3	0			-17.0	75.2	1016
2001-12-01T00:06	2	0	0	202	0.3	0			-17.0	75.2	1016
2001-12-01T00:07	2	0	0	201	0.4	0			-17.0	75.2	1016
2001-12-01T00:08	2	0	0	200	0.4	0			-17.0	74.6	1016

## Google Earth Overlay





The screenshot shows a Google Earth window with several BSRN stations marked: CAM, CAB, PAL, PAY, and JUN. A pop-up window for station CAB provides the following details:

**CAB**  
 Station name: Cabauw \* Latitude: 51.8711 \* Longitude: 4.9267  
 \*Area: The Netherlands \* Start: 2005-12-01 \* Elevation: 0 m \*  
 BSRN station no: 53; Surface type: grass; Topography type: flat, rural; Horizon: doi:10.1594/PANGAEA.569511; Station manager: Wouter Knip (knip@inm.nl)

Below the map, a search interface for project:BSRN PAY is shown, displaying 1217 datasets. The top two results are:

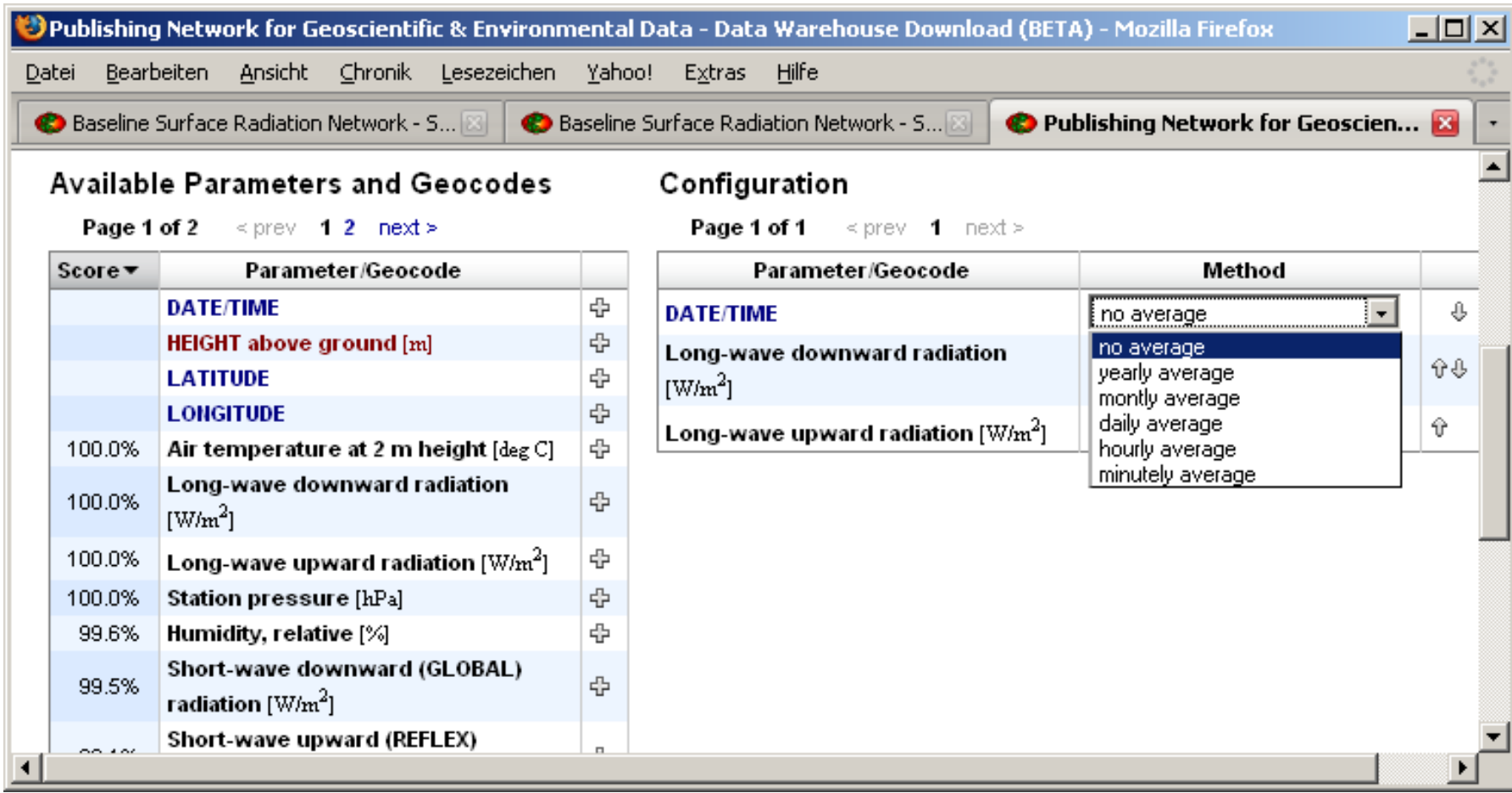
- Vuilleumier, L (2007):** Horizon at station Payerne  
 Size: 510 data points  
 doi:10.1594/PANGAEA.669523 - Score: 100% - Similar datasets
- Heimo, A (2007):** Radiosonde measurements from station Payerne (1996-01)  
 Size: 333875 data points  
 doi:10.1594/PANGAEA.675158 - Score: 96% - Similar datasets





## What offers PANGAEA?

PANGAEA Data Warehouse offers averaging of long time series



The screenshot shows a web browser window titled "Publishing Network for Geoscientific & Environmental Data - Data Warehouse Download (BETA) - Mozilla Firefox". The interface is divided into two main sections: "Available Parameters and Geocodes" and "Configuration".

**Available Parameters and Geocodes** (Page 1 of 2):

Score	Parameter/Geocode	
	DATE/TIME	+
	HEIGHT above ground [m]	+
	LATITUDE	+
	LONGITUDE	+
100.0%	Air temperature at 2 m height [deg C]	+
100.0%	Long-wave downward radiation [W/m <sup>2</sup> ]	+
100.0%	Long-wave upward radiation [W/m <sup>2</sup> ]	+
100.0%	Station pressure [hPa]	+
99.6%	Humidity, relative [%]	+
99.5%	Short-wave downward (GLOBAL) radiation [W/m <sup>2</sup> ]	+
99.4%	Short-wave upward (REFLEX)	+

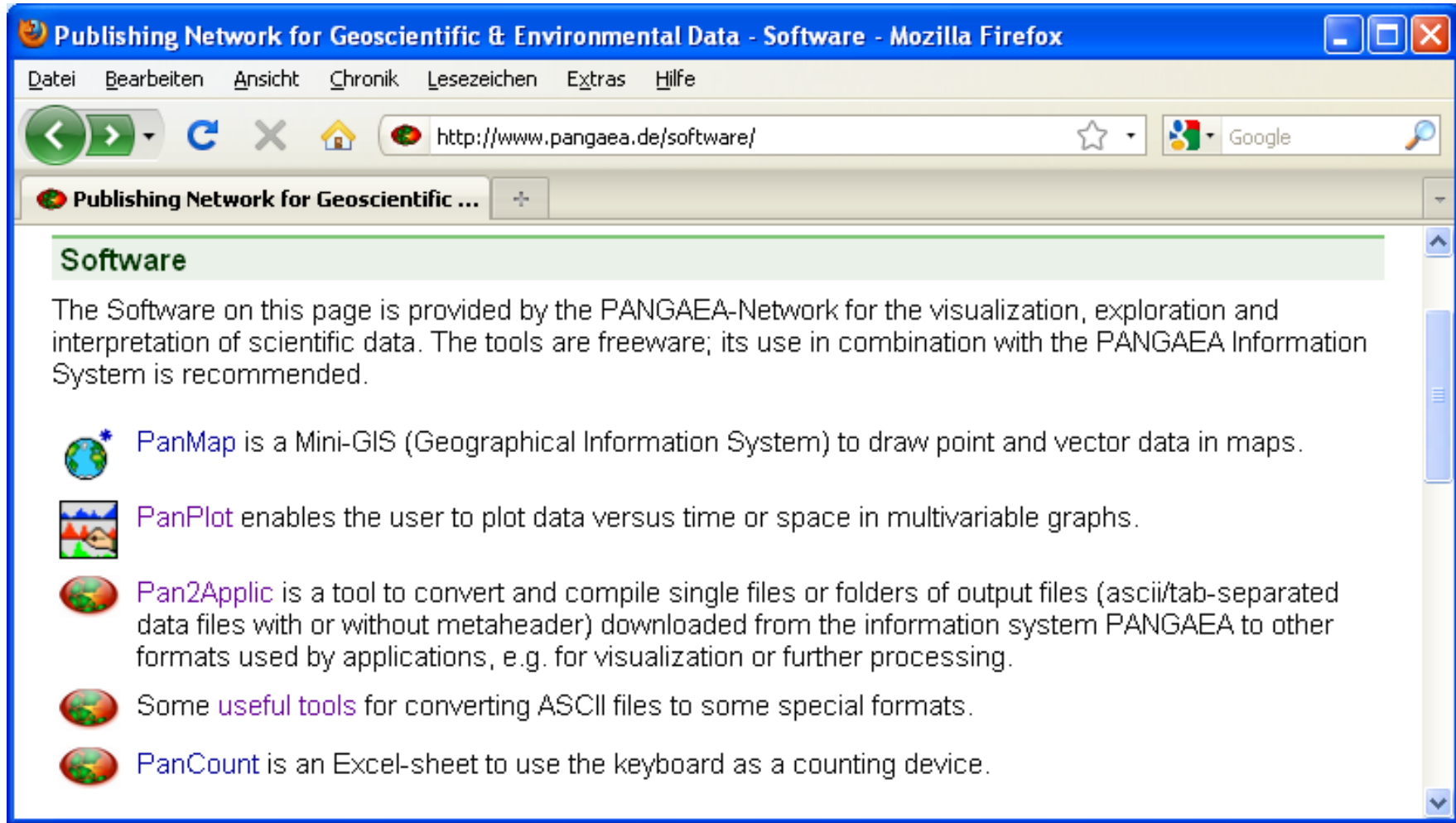
**Configuration** (Page 1 of 1):

Parameter/Geocode	Method	
DATE/TIME	no average	↓
Long-wave downward radiation [W/m <sup>2</sup> ]	no average	↑↓
Long-wave upward radiation [W/m <sup>2</sup> ]	yearly average	↑↓
	monthly average	↑↓
	daily average	↑↓
	hourly average	↑↓
	minutely average	↑



## What offers PANGAEA?

## Software








**Publishing Network for Geoscientific & Environmental Data - Software - Mozilla Firefox**

Datei Bearbeiten Ansicht Chronik Lesezeichen Extras Hilfe

http://www.pangaea.de/software/

**Software**

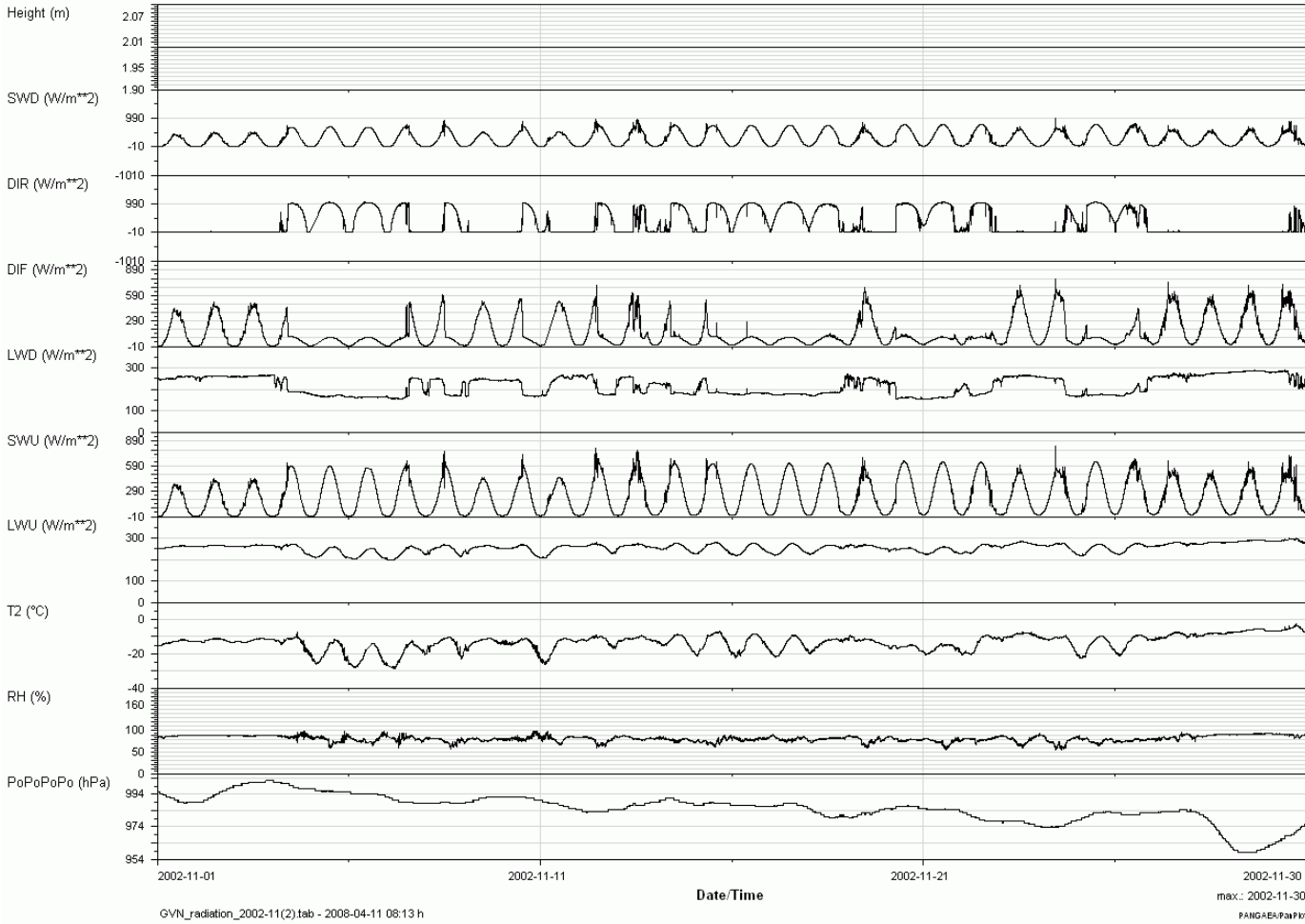
The Software on this page is provided by the PANGAEA-Network for the visualization, exploration and interpretation of scientific data. The tools are freeware; its use in combination with the PANGAEA Information System is recommended.

-  **PanMap** is a Mini-GIS (Geographical Information System) to draw point and vector data in maps.
-  **PanPlot** enables the user to plot data versus time or space in multivariable graphs.
-  **Pan2Applic** is a tool to convert and compile single files or folders of output files (ascii/tab-separated data files with or without metaheader) downloaded from the information system PANGAEA to other formats used by applications, e.g. for visualization or further processing.
-  Some **useful tools** for converting ASCII files to some special formats.
-  **PanCount** is an Excel-sheet to use the keyboard as a counting device.

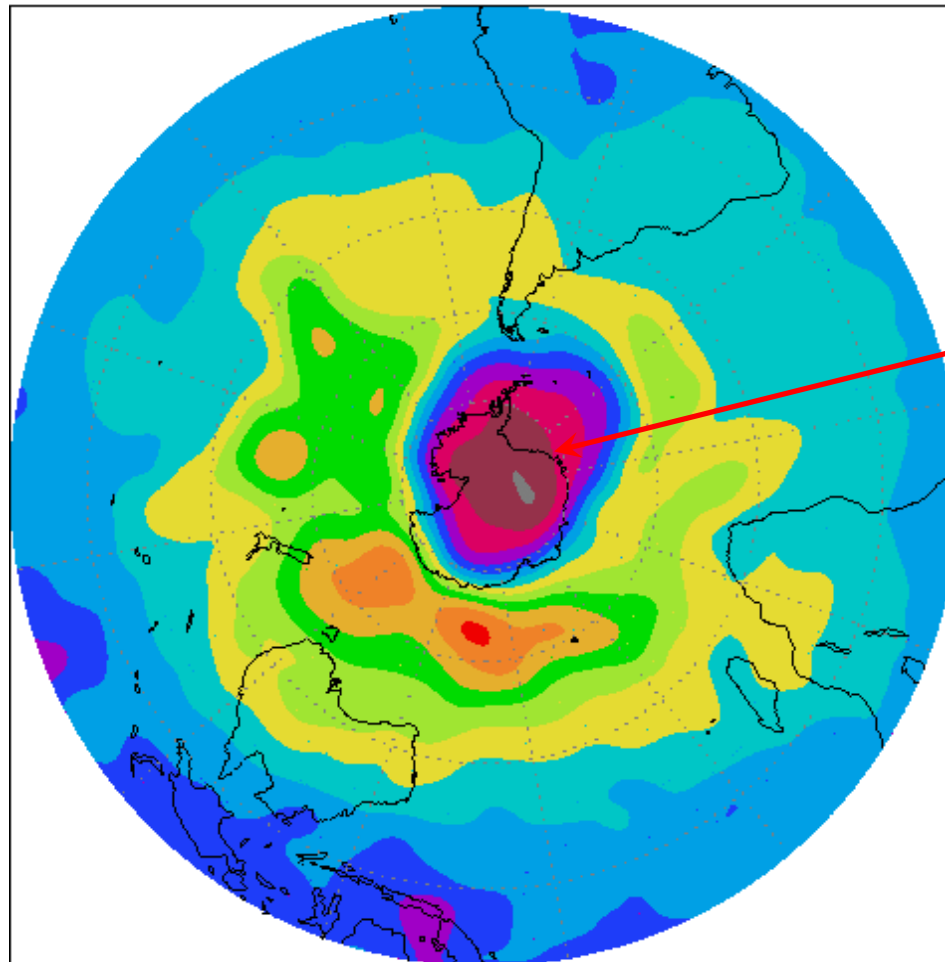


# What offers PANGAEA?

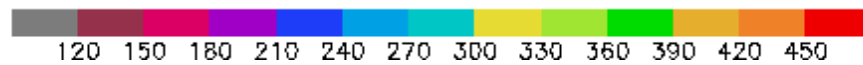
## Quicklook with PanPlot



# Neumayer Station

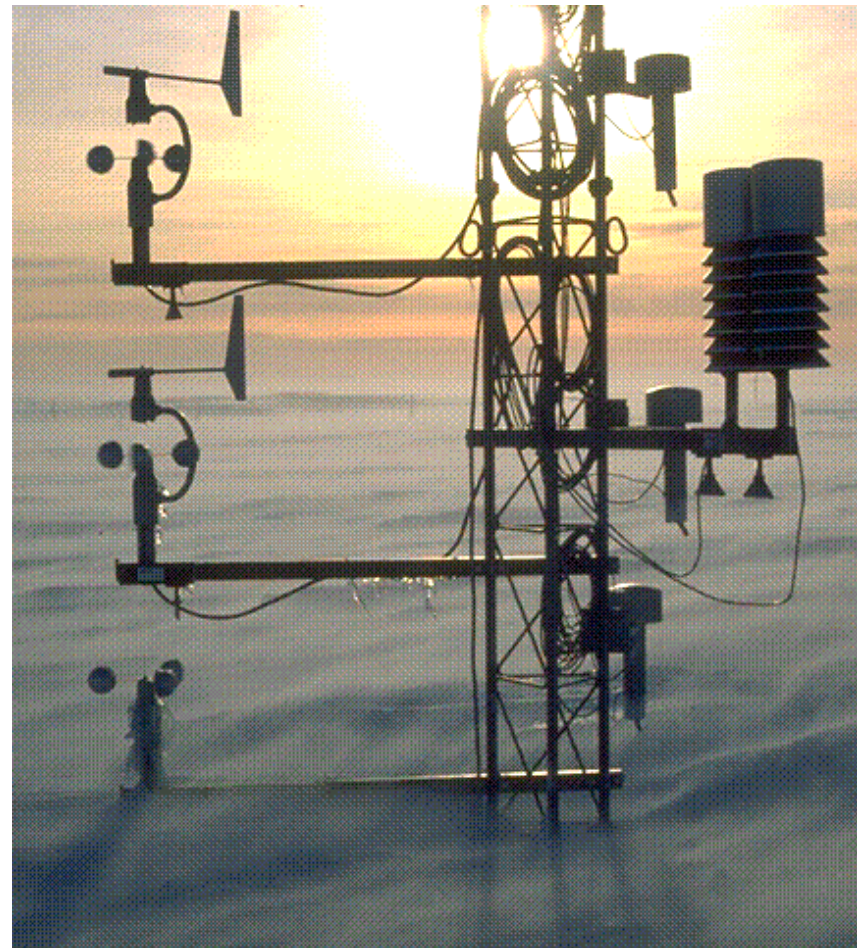


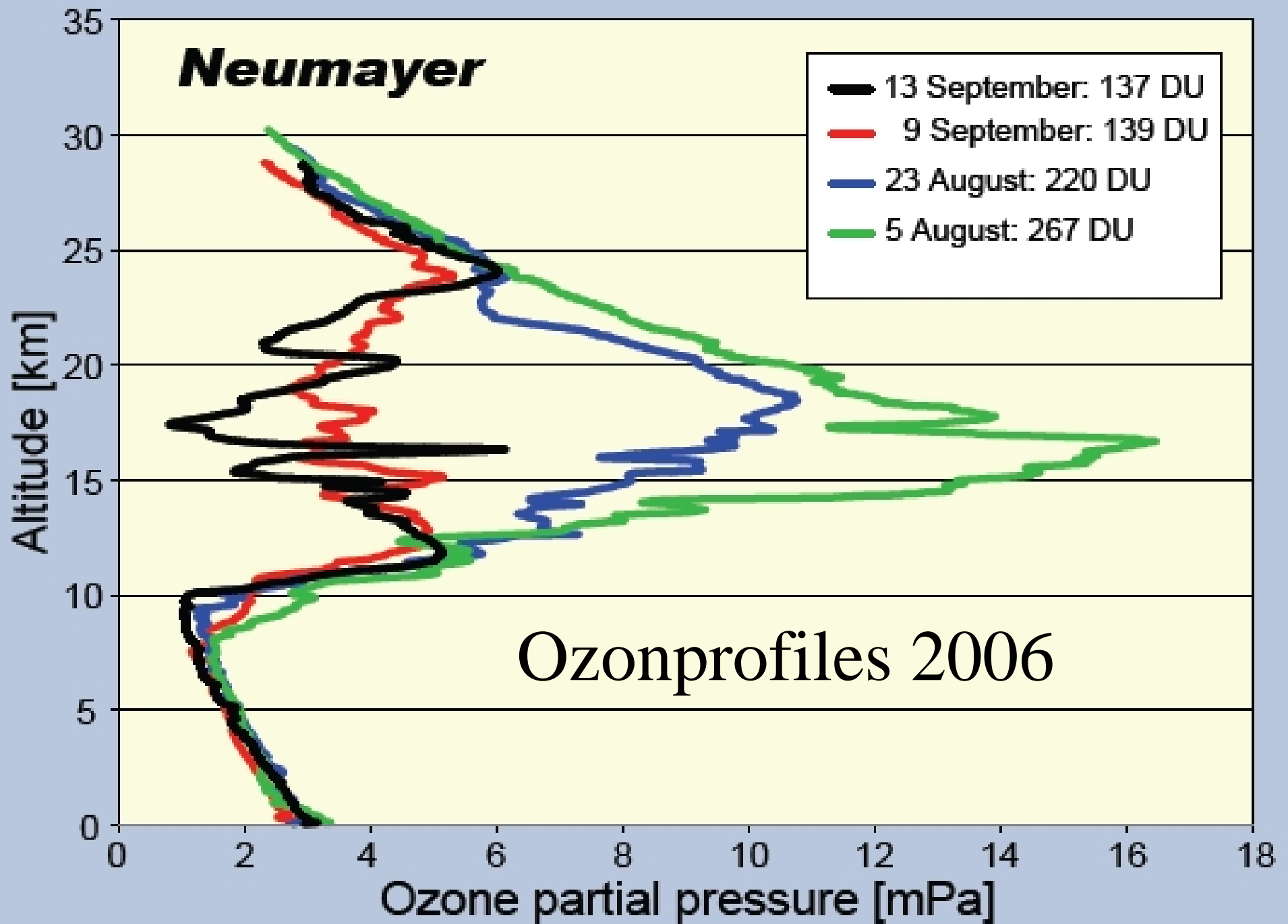
**Neumayer**



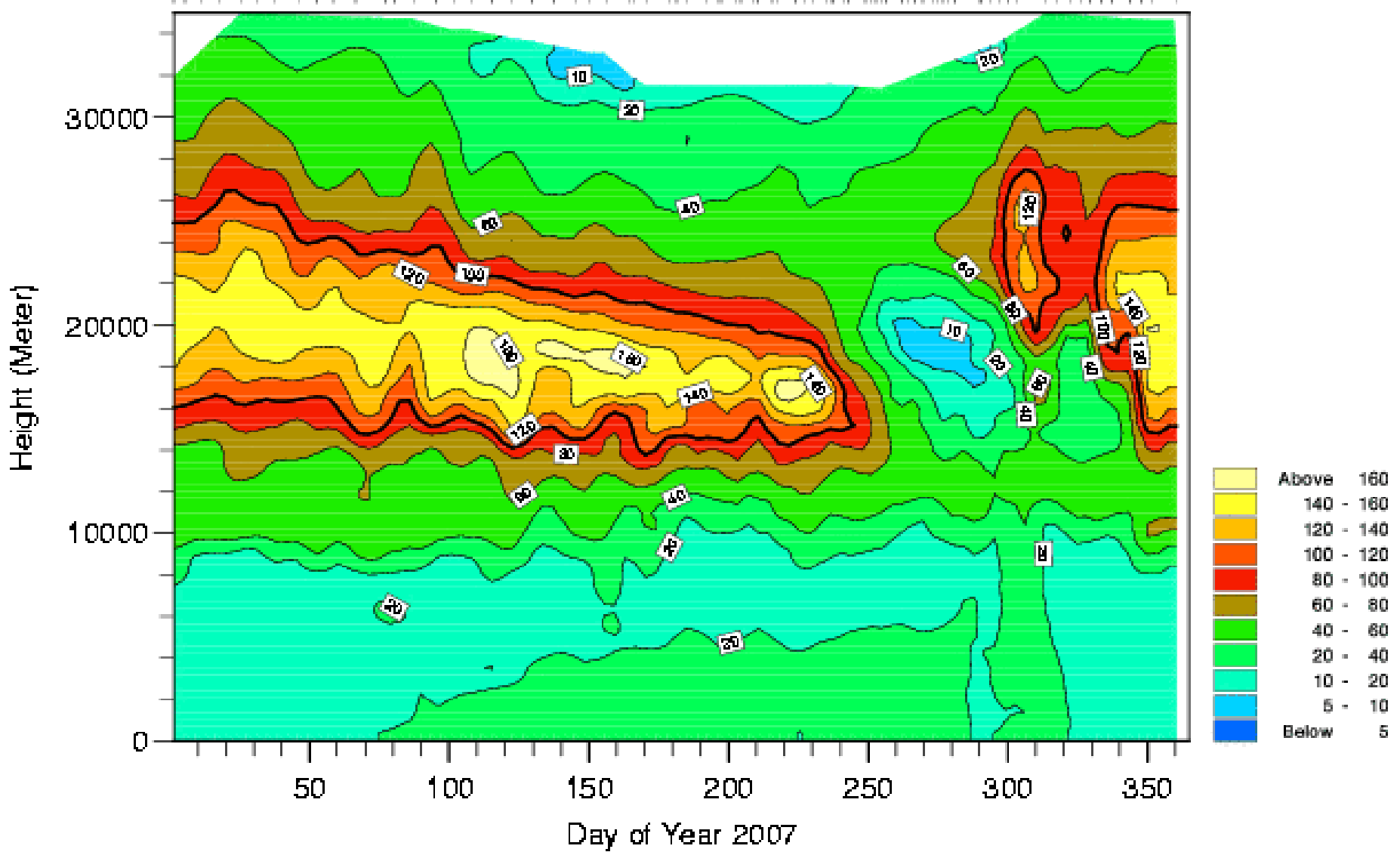
Dobson Units

1. **Global Telecommunication System (GTS)**
2. **Baseline Surface Radiation Network (BSRN)**
3. **Network for the Detection of Atmospheric Composition Change (NDACC)**
4. **Global Atmospheric Watch (GAW)**
5. **World Ozone and Ultraviolet Radiation Data Centre (WOUDC)**





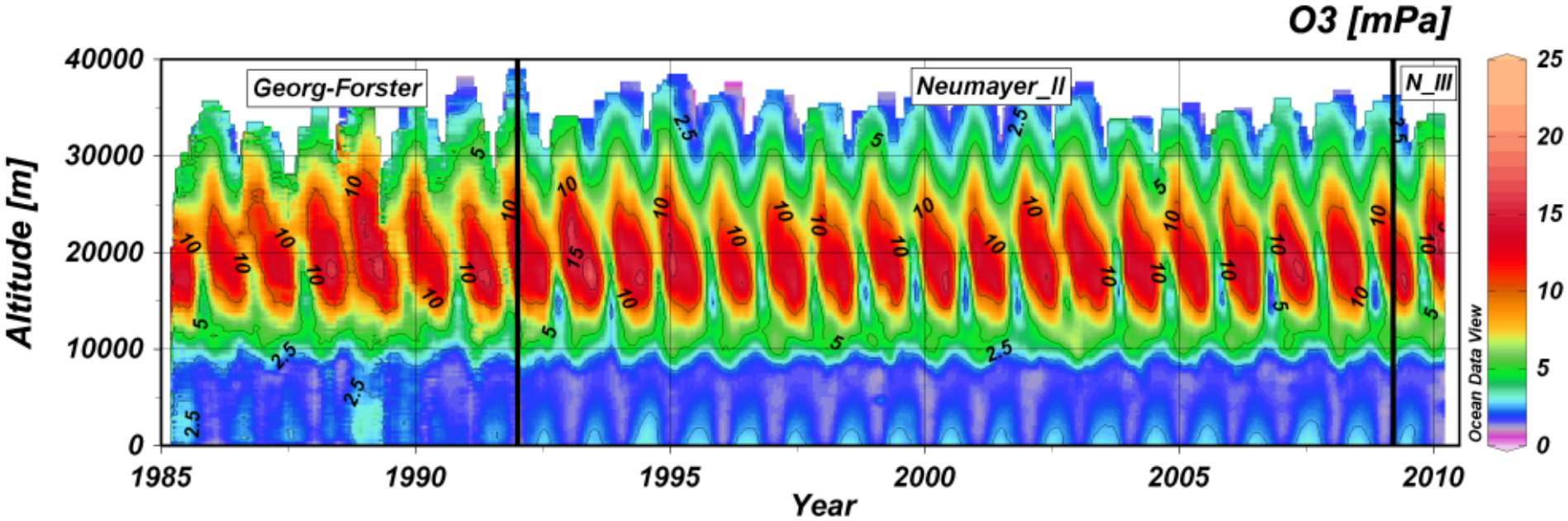
Neumayer Radiosonde Station 70° 39' South, 8° 15' West  
Ozone Partial Pressure (nanobar)





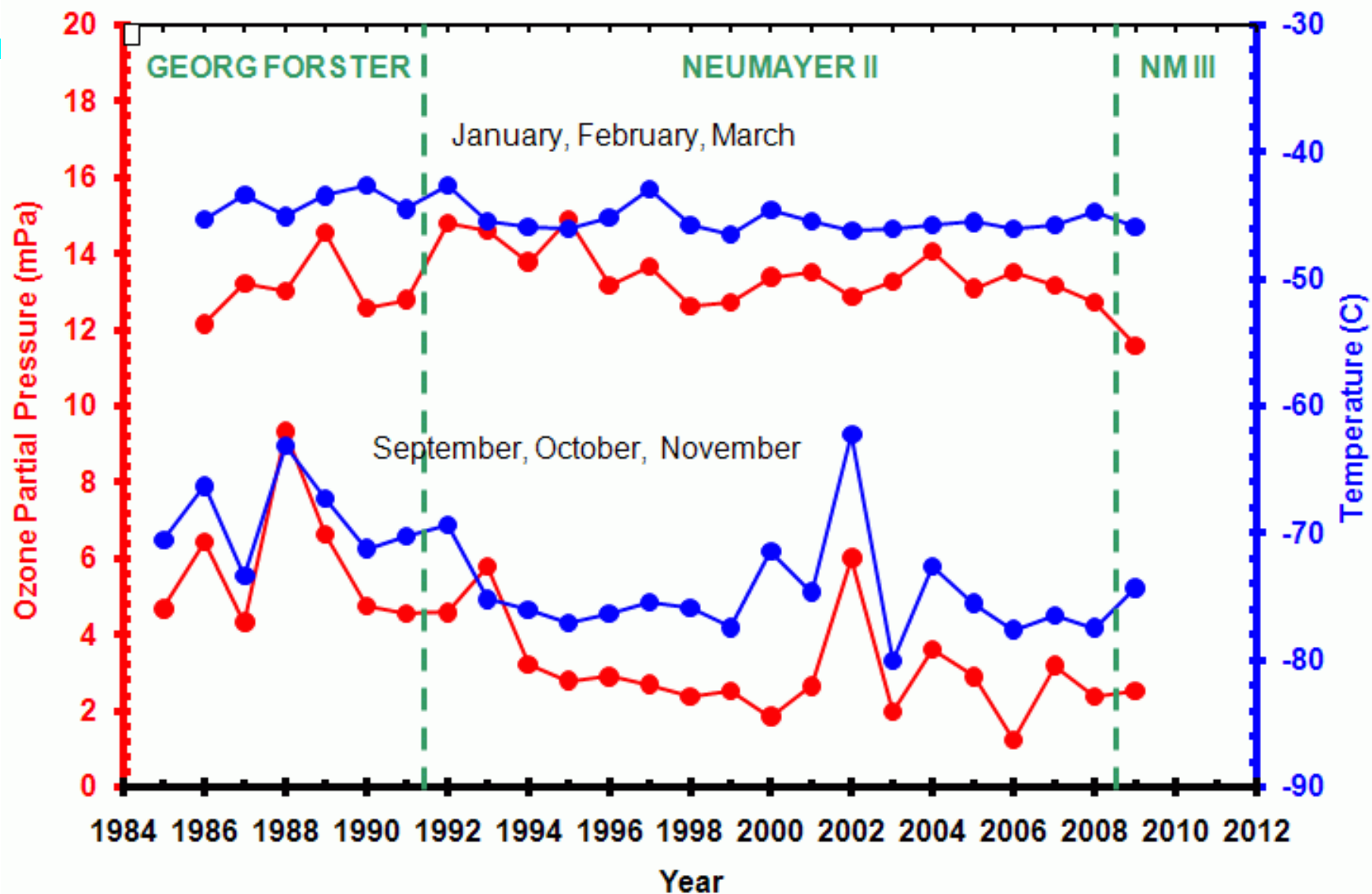
# What offers PANGAEA?

Ocean Data View example:





# Timeseries of Seasonal Averaged Stratospheric Parameters (at 70hPa)

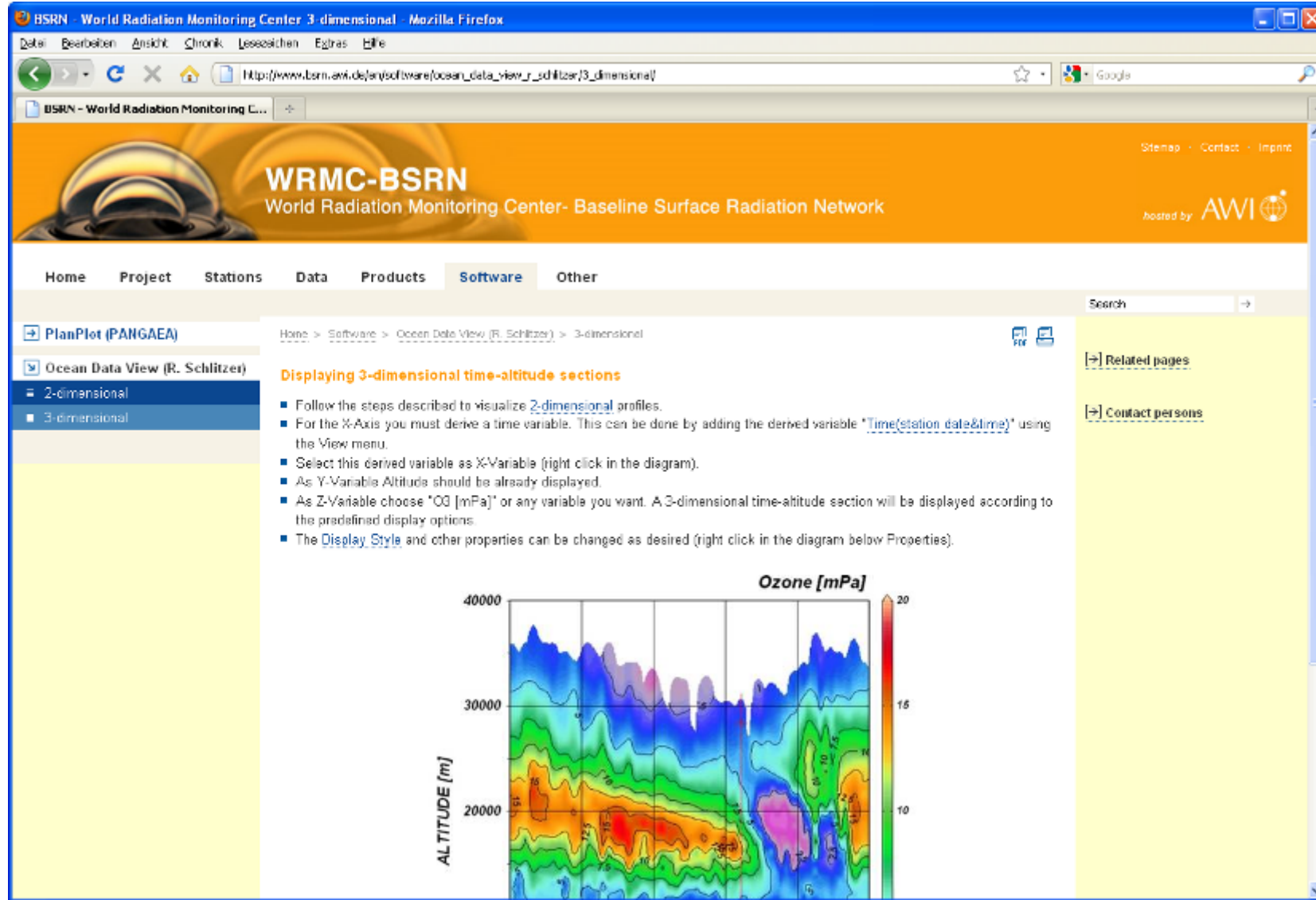


Gert König-Langlo, ET-WDC Meeting 2010

# WRMC-BSRN

World Radiation Monitoring Center- Baseline Surface Radiation Network

hosted by AWI 




BSRN - World Radiation Monitoring Center 3-dimensional - Mozilla Firefox

http://www.bsrn.awi.de/en/software/ocean\_data\_view\_r\_schlitzer/3\_dimensional/

BSRN - World Radiation Monitoring C...

WRMC-BSRN  
World Radiation Monitoring Center- Baseline Surface Radiation Network

hosted by AWI 

Home Project Stations Data Products **Software** Other

Search

Home > Software > Ocean Data View (R. Schlitzer) > 3-dimensional

**Displaying 3-dimensional time-altitude sections**

- Follow the steps described to visualize [2-dimensional](#) profiles.
- For the X-Axis you must derive a time variable. This can be done by adding the derived variable `*Time(station_date&time)*` using the View menu.
- Select this derived variable as X-Variable (right click in the diagram).
- As Y-Variable Altitude should be already displayed.
- As Z-Variable choose "O3 [mPa]" or any variable you want. A 3-dimensional time-altitude section will be displayed according to the predefined display options.
- The [Display Style](#) and other properties can be changed as desired (right click in the diagram below Properties).

**Ozone [mPa]**

ALTITUDE [m]

40000  
30000  
20000

20  
15  
10

[+] Related pages

[+] Contact persons

## Interactions between Archives

Pangaea can be harvested from other archives (xml metadata are iso conform )

```
<OAI-PMH xsi:schemaLocation="http://www.openarchives.org/OAI/2.0/ http://www.openarchives.org/OAI/2.0/OAI-PMH.xsd">
<responseDate>2009-09-10T19:05:24Z</responseDate>
<request verb="GetRecord" metadataPrefix="iso19139" identifier="oai:pangaea.de:doi:10.1594/PANGAEA.269656">http://ws.pangaea.de/oai/</request>
-
<GetRecord>
-
<record>
-
<header>
<identifier>oai:pangaea.de:doi:10.1594/PANGAEA.269656</identifier>
<timestamp>2009-07-06T16:19:20Z</timestamp>
<setSpec>geocode1599</setSpec>
<setSpec>geocode1600</setSpec>
<setSpec>geocode1601</setSpec>
<setSpec>project4094</setSpec>
</header>
-
<metadata>
-
```

➔ The WRMC became a candidate for a Data Collection or Production Centre (DCPC) within the WMO Information System (WIS)