

Experience from the Global Precipitation Climatology Centre (GPCC) in serving global in-situ historical precipitation data

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Outline

- Background of GPCC
- GPCC's data policy
- Data access for users
- Data storage – key point for quality control
- Useful tools
- Snow data at GPCC – a contribution to ACSYS
- Suggestions from GPCC
- (Data acquisition at GPCC)



Background and agenda of GPCC

- Global collection and analysis of in-situ data of land-surface precipitation
- Established in early 1989 at Deutscher Wetterdienst (DWD) on request of WMO WCRP. 25 year anniversary indicates GPCC's long term experience on the job
- Current staffing, 9 individuals: 1 head, 3 permanent scientists , 1 project scientist, 1 programmer, 3 support staff
- Contributing to GEWEX (Global Energy and Water Exchanges Project) and GCOS (Global Climate Observing System)
- Many users world wide, analyses used in IPCC-AR5
- Data sources: SYNOP, CLIMAT, SYNOP from CPC, ECA&D, CRU, FAO, GHCN, national meteorological services, regional data collections

GPCCs data policy

- GPCCC does not claim or possess copyrights → no active re-distribution of station related (original) data by GPCCC
- GPCCC provides gridded data products that cannot be traced back to the original station data due to GPCCC's choice of interpolation scheme
- So far the strict data policy has helped GPCCC to get more data than other data centers that also claim the copyright to allow for open data access
- As long as a universalization of open data access has not been reached, GPCCC supports the co-existence of non-open and open data centers (like CRU or GHCN) to complement each other and to provide best transparency, quality and coverage in the suite of in-situ data products offered to the community



Data access for users




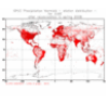
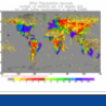
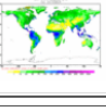
- GPCP provides gridded data sets with different spatial resolutions on a regular latitude-longitude-grid
- Files are published on a dedicated ftp-server
- No registration necessary
- Website with description and citation for each data set, including link to files on ftp-server
- ASCII file header includes short description of file content
- GPCP provides same data also in netCDF-format
- GPCP provides simple uncertainty estimates like number of stations per grid cell
- Operates 'Visualizer' as visualizing tool for quick looks
- Data sets referenced with DOIs for an easy citation and long term utilization
- Peer-reviewed data set description



Data access for users

- Website with description and citation for each data set, including link to files on ftp-server

Visualize and Download GPCP Products

	<p>First Guess Daily</p> <p>GPCP First Guess Daily Product with gridded precipitation data sets for Day/Month/Year at 1.0 °</p> <p style="text-align: right;">[more]</p>	<p>First Guess (monthly)</p> <p>GPCP First Guess Product with gridded precipitation data sets for Month/Year at 1.0 °</p> <p style="text-align: right;">[more]</p>
	<p>Monitoring Product</p> <p>GPCP Monitoring Product with gridded precipitation data sets for Month/Year at 1.0 ° resp. 2.5 °</p> <p style="text-align: right;">[more]</p>	<p>Full Data Reanalysis Version 6 (dec. 2011)</p> <p>GPCP Full Data Reanalysis (V.6 1901-2010) with gridded precipitation data sets at 0.5 °, 1.0 ° and 2.5 °</p> <p style="text-align: right;">[more]</p>
	<p>GPCP Drought Index Product</p> <p>GPCP Drought Index Product (GPCP_DI) at 1.0° Globally Gridded Drought Index with averaging periods 1,3,6,9,12,24,48 months</p> <p style="text-align: right;">[more]</p>	
	<p>Precipitation Climatology</p> <p>GPCP precipitation normals (Version 2011) with gridded precipitation data sets for calendar months and the annual total at 0.25 °, 0.5 °, 1.0 ° and 2.5 °</p> <p style="text-align: right;">[more]</p>	<p>VASCLIMO Dataset</p> <p>VASCLIMO 50-year Precipitation Data Set (Version 1.1 1951-2000) with gridded precipitation data sets for Month/Year at 0.5 °, 1.0 °, 2.5 °</p> <p style="text-align: right;">[more]</p>
	<p>Visualizer</p> <p>Access to the GPCP Visualizer, with which you can create maps in your own coordinates and parameters</p> <p style="text-align: right;">[more]</p>	<p>GPCP at DWD</p> <p>Detailed information about GPCP (in high performance cases temporarily not available)</p> <p style="text-align: right;">[more]</p>

The Global Precipitation Climatology Centre (GPCP) is a specialized Centre supporting climate monitoring and research. It is operated by DWD under the auspices of WMO. Product users are kindly asked to refer to GPCP.

Data access for users

→ ASCII file header includes short description of file content

```

25 : rows to skip
GPCC Monitoring Product Version 4, since dec. 2011
(GAUGE ANOMALY-ANALYSIS SPHEREMAP + GPCC normals v2011)
=====
Grid : 1.0 degree
Area : LON -180.00 to 180.00 LAT 90.00 to -90.00
Month: 02 2014
=====
Note : column 3-7 are available only for Jan. 2007 and later
=====
column 1      : precipitation totals in mm/month
column 2      : number of gauges per grid
column 3      : proportion of solid precip in %
column 4      : proportion of liquid precip in %
column 5      : absolute systematic gauge error in mm/month
column 6      : relative systematic gauge error in %
column 7      : systematic gauge error correction factor (multiplier 1 - 3)
=====
if precipitation totals > 1.0 mm/month:
relativ systematic gauge error is limited to 200 %
systematic gauge error correction factor is limited to 3
if precipitation totals <= 1.0 mm/month:
relativ systematic gauge error is limited to 0 %
systematic gauge error correction factor is limited to 1
=====
-99999.99      0.00 -99999.99 -99999.99 -99999.99 -99999.99 -99999.99
-99999.99      0.00 -99999.99 -99999.99 -99999.99 -99999.99 -99999.99
-99999.99      0.00 -99999.99 -99999.99 -99999.99 -99999.99 -99999.99

```



Data access for users

→ Operates 'Visualizer' as visualizing tool for quick looks

GPCC VISUALIZER

DATASET	GPCC Landsurface Monitoring Product 1.0*	COASTLINES	LOWRES
PRODUCT	PRECIPITATION (mm/month)	OUTPUT	ASCII
PERIOD	JULY	GIF-SCALE	1.4
YEAR	2014 (for winter 86/87 eg. select 1987)	SHOW AS	GRID
<input checked="" type="radio"/> Menu	GLOBAL (-180°/+180°) LON_min: -180. LON_max: +180. LAT_min: -90. LAT_max: +90. ZOOM-Window	COLOR	COLOR
<input type="radio"/> Userdefined		PROJECTION	LAT/LON
START VISUALISATION			
Download GPCC data	GPCC Product Info	Customer Feedback	



Data storage – key point for quality control

- GPCC stores data in a relational data bank system
- Data are stored separately according to source
 - possibility to cross-check the data to find errors (QC)
- Data bank provides a tracking of changes during QC (questionable value confirmed, corrected or deleted)

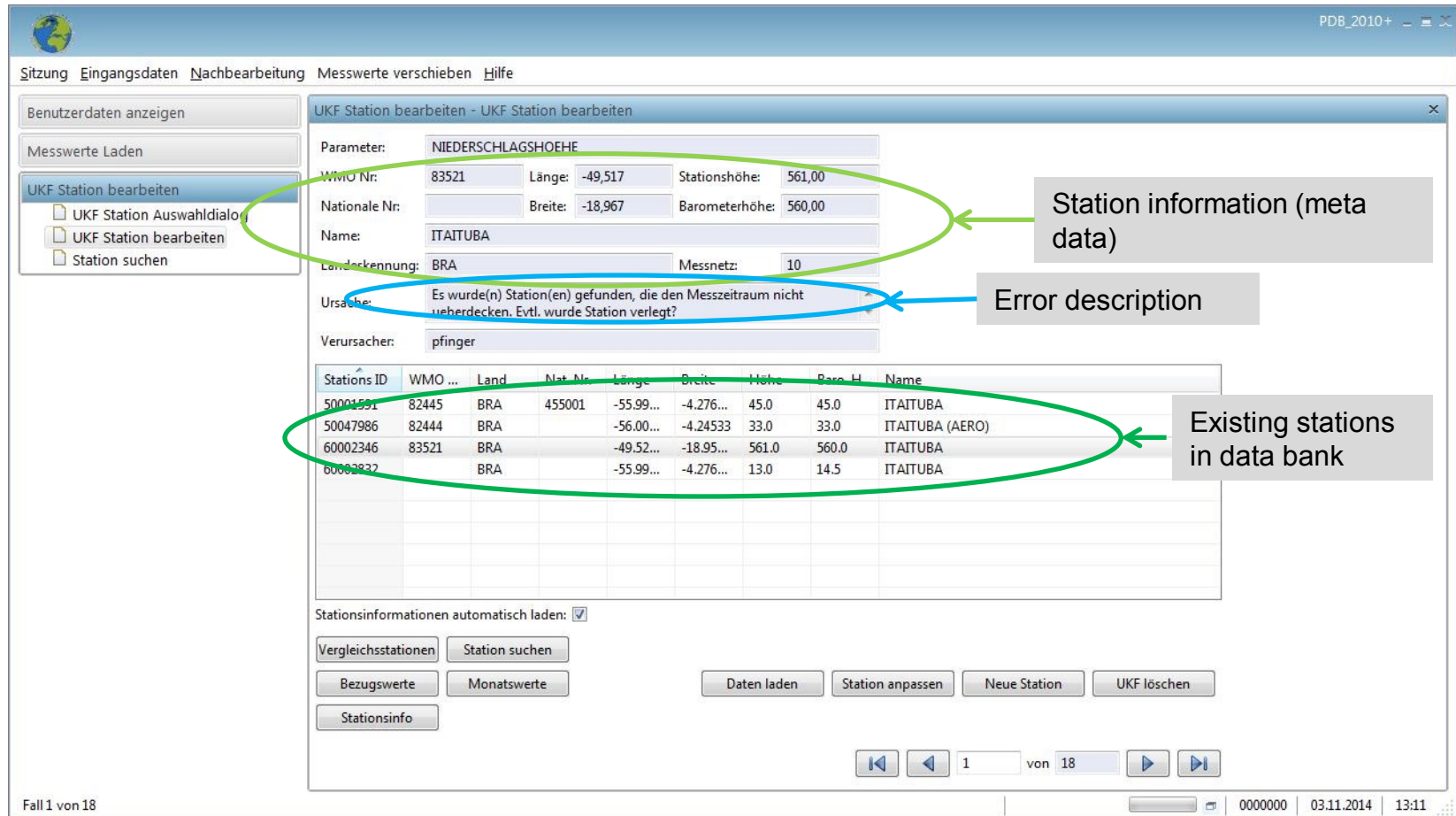
Useful tools

- Loading data including
 - meta data checks (find existing station and add data, create new station or ask what to do, if station in neighborhood or similar name found)
 - statistical checks (1% and 99% percentile; statistics previously calculated for station and grid cell)
 - compare values with an existing one (differences below 5 mm/month are ignored)
 - possibility to edit/correct wrong data (unclear cases stations, unclear cases statistics, unclear cases values)



Useful tools

➔ Example of GPCC's loading tool and unclear station meta data



The screenshot shows the 'UKF Station bearbeiten' window. The main form contains the following data:

- Parameter: NIEDERSCHLAGSHOEHE
- WMO Nr.: 83521, Länge: -49,517, Stationshöhe: 561,00
- Nationale Nr.: , Breite: -18,967, Barometerhöhe: 560,00
- Name: ITAITUBA
- Landkennung: BRA, Messnetz: 10
- Ursache: Es wurde(n) Station(en) gefunden, die den Messzeitraum nicht ueberdecken. Evtl. wurde Station verlegt?
- Verursacher: pfinger

Below the form is a table of existing stations in the data bank:

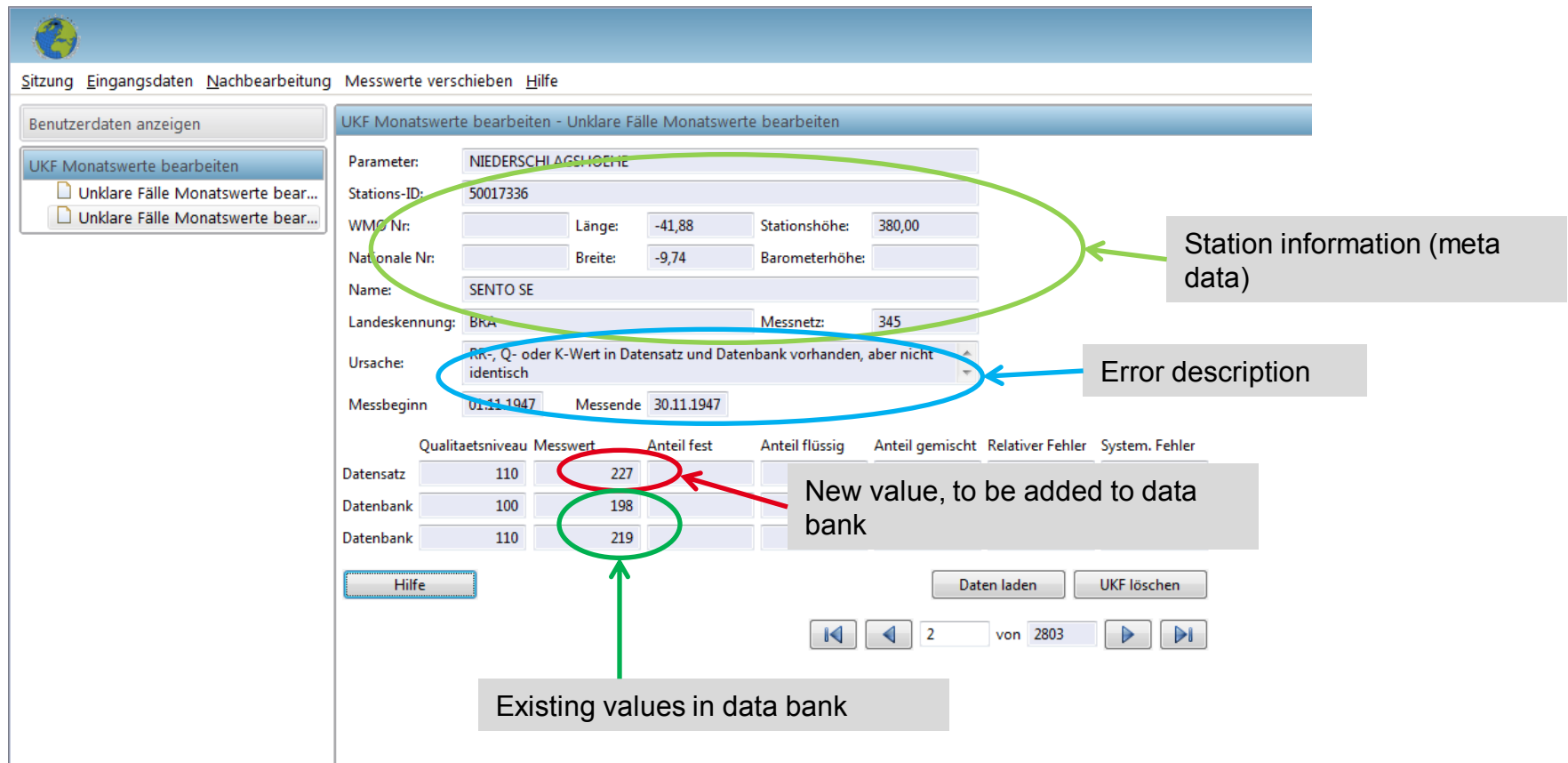
Stations ID	WMO ...	Land	Nat. Nr.	Länge	Breite	Höhe	Baro. H.	Name
50001551	82445	BRA	455001	-55.99...	-4.276...	45.0	45.0	ITAITUBA
50047986	82444	BRA		-56.00...	-4.24533	33.0	33.0	ITAITUBA (AERO)
60002346	83521	BRA		-49.52...	-18.95...	561.0	560.0	ITAITUBA
60003832		BRA		-55.99...	-4.276...	13.0	14.5	ITAITUBA

Annotations in the image:

- A green oval highlights the 'UKF Station bearbeiten' menu item and the main form fields.
- A blue oval highlights the 'Ursache' field with the error description.
- A green oval highlights the table of existing stations.
- Arrows point from text boxes to these elements: 'Station information (meta data)' points to the form fields; 'Error description' points to the 'Ursache' field; 'Existing stations in data bank' points to the table.

Useful tools

➔ Example of GPCC's loading tool and different existing value



Station information (meta data)

Error description

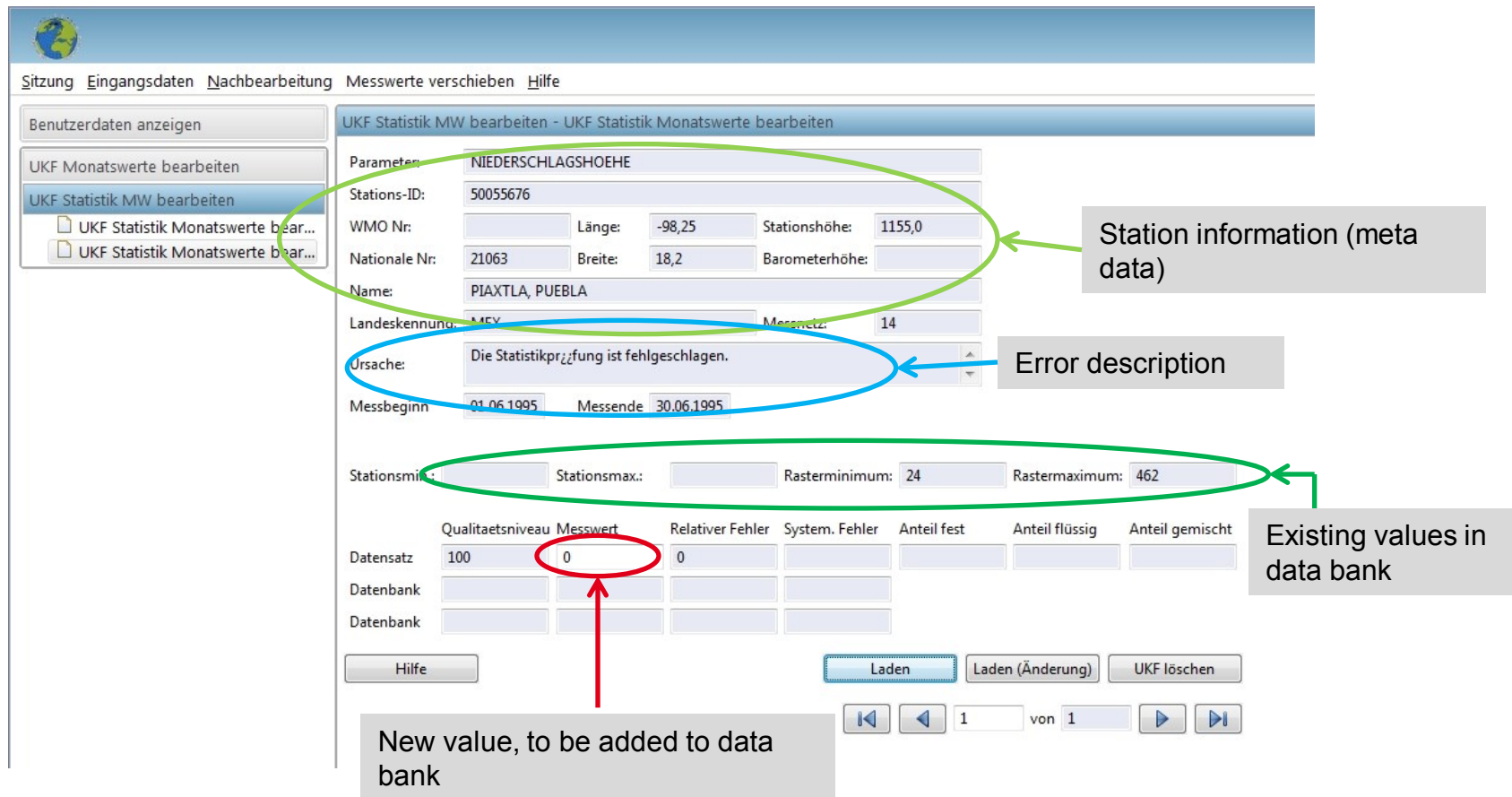
New value, to be added to data bank

Existing values in data bank

	Qualitaetsniveau	Messwert	Anteil fest	Anteil flüssig	Anteil gemischt	Relativer Fehler	System. Fehler
Datensatz	110		227				
Datenbank	100		198				
Datenbank	110		219				

Useful tools

➔ Example of GPCC's loading tool and statistical test failed



The screenshot shows the 'UKF Statistik MW bearbeiten' interface. The main form contains the following data:

- Parameter: NIEDERSCHLAGSHOEHE
- Stations-ID: 50055676
- WMO Nr.: [empty] Länge: -98,25 Stationshöhe: 1155,0
- Nationale Nr.: 21063 Breite: 18,2 Barometerhöhe: [empty]
- Name: PIAXTLA, PUEBLA
- Landeskennung: MEX Messwert: 14
- Ursache: Die Statistikprüfung ist fehlgeschlagen.
- Messbeginn: 01.06.1995 Messende: 30.06.1995
- Stationsmin.: [empty] Stationsmax.: [empty] Rasterminimum: 24 Rastermaximum: 462

Annotations on the screenshot:

- Station information (meta data):** A green oval highlights the top section of the form (Parameter, Stations-ID, WMO Nr., etc.).
- Error description:** A blue oval highlights the 'Ursache' field.
- Existing values in data bank:** A green oval highlights the 'Stationsmin.', 'Stationsmax.', 'Rasterminimum', and 'Rastermaximum' fields.
- New value, to be added to data bank:** A red oval highlights the 'Messwert' field, which contains the value '0'. A red arrow points to this field from a text box below.

At the bottom of the form, there are buttons for 'Laden', 'Laden (Änderung)', and 'UKF löschen', along with a pagination control showing '1 von 1'.

Useful tools

- Visualization tool for station data
 - shows data from several sources
 - possibility to switch sources on/off
 - shows combined series according to prioritization scheme
 - searches for neighboring stations



Useful tools

➔ Visualization tool for station data ➔ searching stations

Address: 28 Aphelion Way, Shinfield, Reading, Wokingham RG2 9FR, Großbr | Latitude: 51.419656236209235 | Longitude: -0.950796177722175 | Radius: 5 km | suchen

Stationen gefunden :5



Useful tools

➔ Visualization tool for station data → list of stations

10 Einträge anzeigen									Suchen
#	Marker	StationID	Name	Monatsdaten	Tagesdaten	Staat	Alpha3Code	Bundesland	Entfernung
1	A	50051000	SHINFIELD PARK CDL	1961.01.XX <> 2003.01.XX	no data	Großbritannien und Nordirland	GBR	---	0.33332274294016173
2	B	50018920	READING (WHITEKNIGHTS)	1961.01.XX <> 2013.05.XX	no data	Großbritannien und Nordirland	GBR	---	2.5587909950310297
3	C	50095509	ARBORFIELD. NAT INST RES DAIRYING	1980.05.XX <> 1992.02.XX	no data	Großbritannien und Nordirland	GBR	---	2.9613652704024584
4	D	50095294	READING UNIVERSITY	1961.01.XX <> 1967.12.XX	no data	Großbritannien und Nordirland	GBR	---	3.4474151902805796
5	E	50095216	READING. SEED TRIAL GROUNDS	1961.01.XX <> 1968.09.XX	no data	Großbritannien und Nordirland	GBR	---	4.354908786583885
#	Marker	StationID	Name	Monatsdaten	Tagesdaten	Staat	Alpha3Code	Bundesland	Entfernung

1 bis 5 von 5 Einträgen

Useful tools

➔ Visualization tool for station data → data sources for selected station

Geographie:

#	StationID	Von Datum	Bis Datum	geo. Breite	geo. Laenge	Hoehe	BaroHoehe	DigiHoehe
1	50051000	1111.11.11		51.4167	-0.95	77		67

1 bis 1 von 1 Einträgen

[gehe zum Anfang](#)

Messnetze, Daten(von-bis), Kennungen:

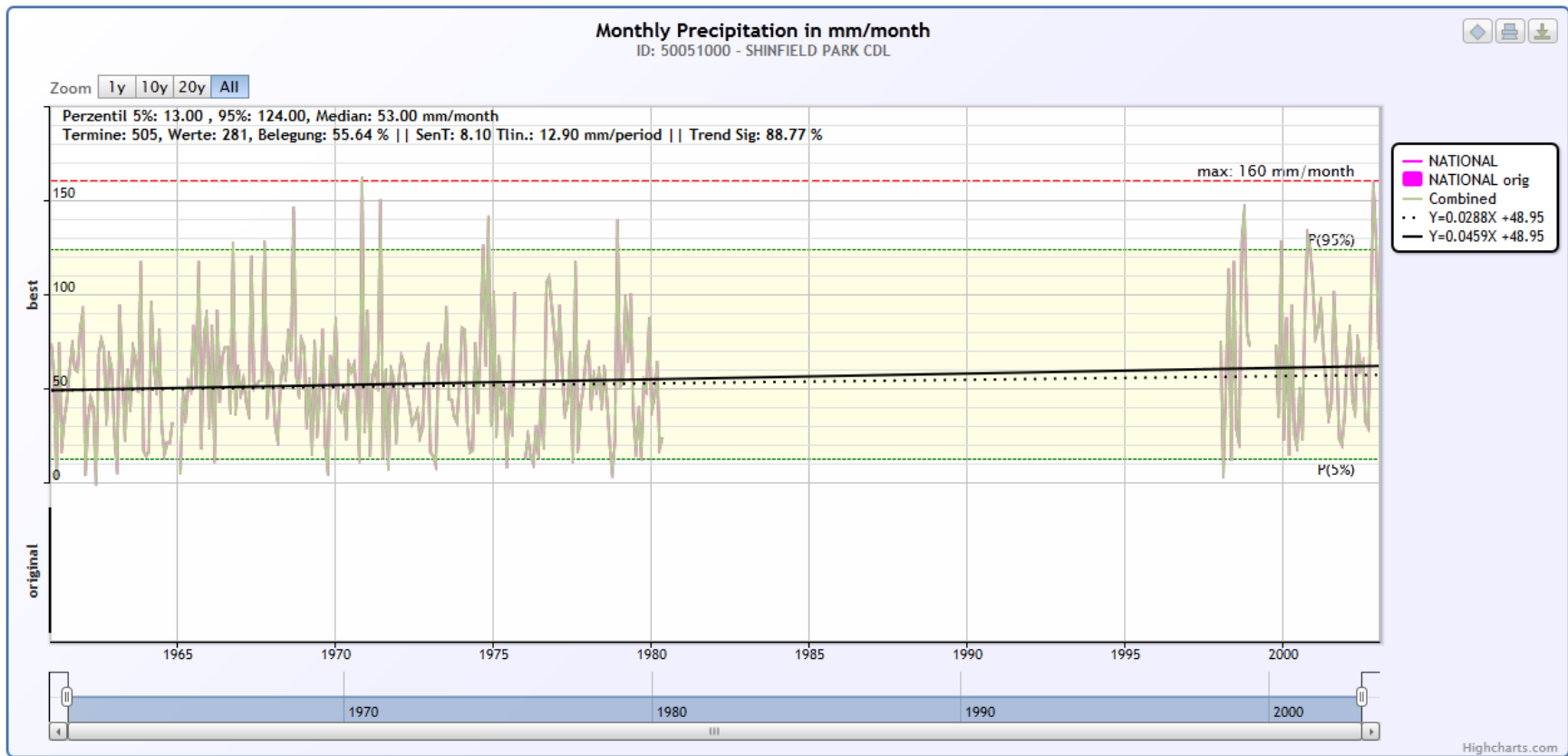
StationID	Monatwerte (RR)	Tageswerte (RR)	KennungsTyp	Kennung	von
WZN_NATIONAL (monatlicher Niederschlag aus Daten einer nationalen Quelle mit Bezug auf ein Land (z.B. vom hydrometeorologischen Dienst eines Landes) (WZN))					
50051000	1961.01.XX <> 2003.01.XX				
50051000			WZN_ID	52962	1111.11.11
50051000			NAT_NUMMER	270304	1111.11.11

1 bis 3 von 3 Einträgen



Useful tools

→ Visualization tool for station data → data series



Useful tools

- Additional tools to edit station meta information and data
 - possibility to correct errors, which were found during other activities (like loading other data, statistical test with existing series, ...)
 - could be part of the loading tool



Arctic Climate System Study – with contribution of GPCC

- Main objective of ACSYS:
 - studies concerning the freshwater input into the Arctic ocean
 - climatic change studies of the hydrological regime of the Arctic basin
 - investigation of the role of the snow-albedo feedback in the functioning of the land-ocean-atmosphere system
- Observational data selected for:
 - precipitation
 - snow water equivalent
 - snow depth
 - new snowfall
 - temperature
 - wind velocity
- Data stored at contributing institutes and services



Recommendations from GPCC

- Store data in a relational data bank system
- Store data in source specific slots to allow intercomparison
- Data model should include tracking of modifications during QC
- Develop tools for loading data into data bank which compare meta data and existing data
- Statistical tests during data loading
- Keep download as easy as possible (ftp-server)
- Use common or self describing data formats like ASCII or netCDF
- Provide DOI for data set
- Keep copyright as strict as possible (station data provision is essential for this project)



Data Acquisition at GPCC

- Find data collections in web
- Personal contact to data set creators via GEWEX, AOPC, GHP, meetings and conferences
- Acquisition letters with WMO support again and again
- Presentation of GPCC products and needed data at bilateral meetings of national meteorological and hydrological services at DWD
- Colleagues from DWD ask for data at project meetings, where GPCC is not involved (e.g. SASCAL)
- Colleagues from DWD have open ears and eyes to find new data sets, also from not national services (e.g. federal hydrological services in Germany)
- Training in data-QC and collaboration in development aid
- GTS-data (SYNOP and CLIMAT)
- Add support letter from WMO, also recommendatory letter from ECMWF

