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

- GPCC does not claim or possess copyrights → no active re-distribution of station related (original) data by GPCC
- GPCC provides gridded data products that cannot be traced back to the original station data due to GPCC's choice of interpolation scheme
- So far the strict data policy has helped GPCC 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, GPCC 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

- GPCC 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
- GPCC provides same data also in netCDF-format
- GPCC 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 GPCC Products

First Guess Daily	***First Guess (monthly)***
GPCC First Guess Daily Product with gridded precipitation data sets for Day/Month/Year at 1.0 ° **[more]**	GPCC First Guess Product with gridded precipitation data sets for Month/Year at 1.0 ° **[more]**
Monitoring Product	***Full Data Reanalysis Version 6 (dec. 2011)***
GPCC Monitoring Product with gridded precipitation data sets for Month/Year at 1.0 ° resp. 2.5 ° **[more]**	GPCC Full Data Reanalysis (V.6 1901-2010) with gridded precipitation data sets at 0.5 °, 1.0 ° and 2.5 ° **[more]**
GPCC Drought Index Product	
GPCC Drought Index Product (GPCC_DI) at 1.0° Globally Gridded Drought Index with averaging periods 1,3,6,9,12,24,48 months **[more]**	
Precipitation Climatology	***VASClimo Dataset***
GPCC 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 ° **[more]**	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 ° **[more]**
Visualizer	***GPCC at DWD***
Access to the GPCC Visualizer, with witch you can create maps in your own coordinates and parameters **[more]**	Detailed information about GPCC (in high performance cases temporarily not available) **[more]**

**The Global Precipitation Climatology Centre (GPCC) 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 GPCC.**

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
Menu / AREA / Userdefined	GLOBAL (-180°/+180°) LON_min -180. LON_max +180. LAT_min -90. LAT_max +90. ZOOM-Window	COLOR	COLOR
		PROJECTION	LAT/LON

START VISUALISATION

Download GPCC data | GPCC Product Info | Customer Feedback

Data storage – key point for quality control

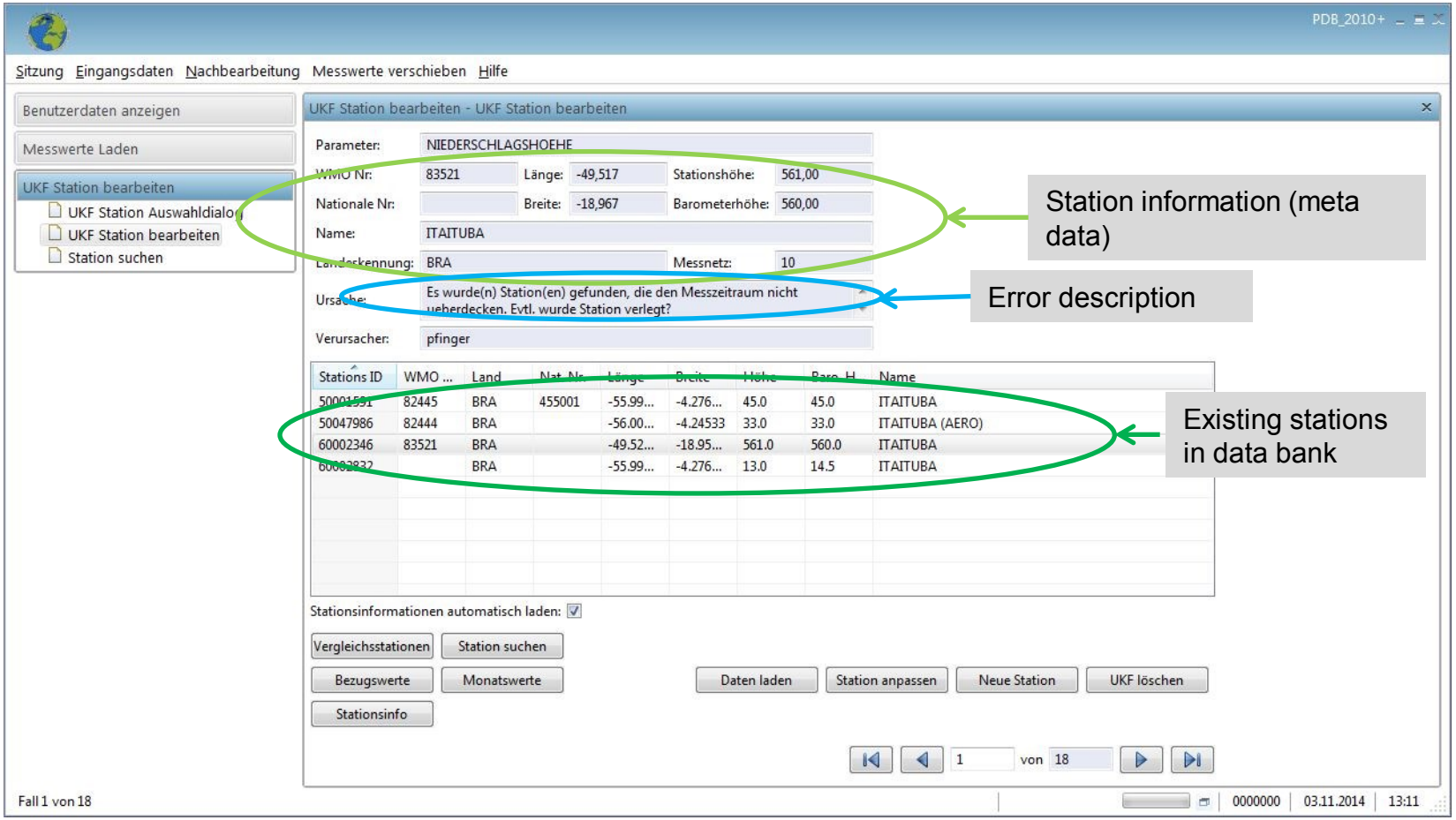
- GPCC stores data in a relational data bank system
- Data are stored separately according to source
  - possibility to cross-check the data to find errors (QC)
- Data bank provides a tracking of changes during QC (questionable value confirmed, corrected or deleted)

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)

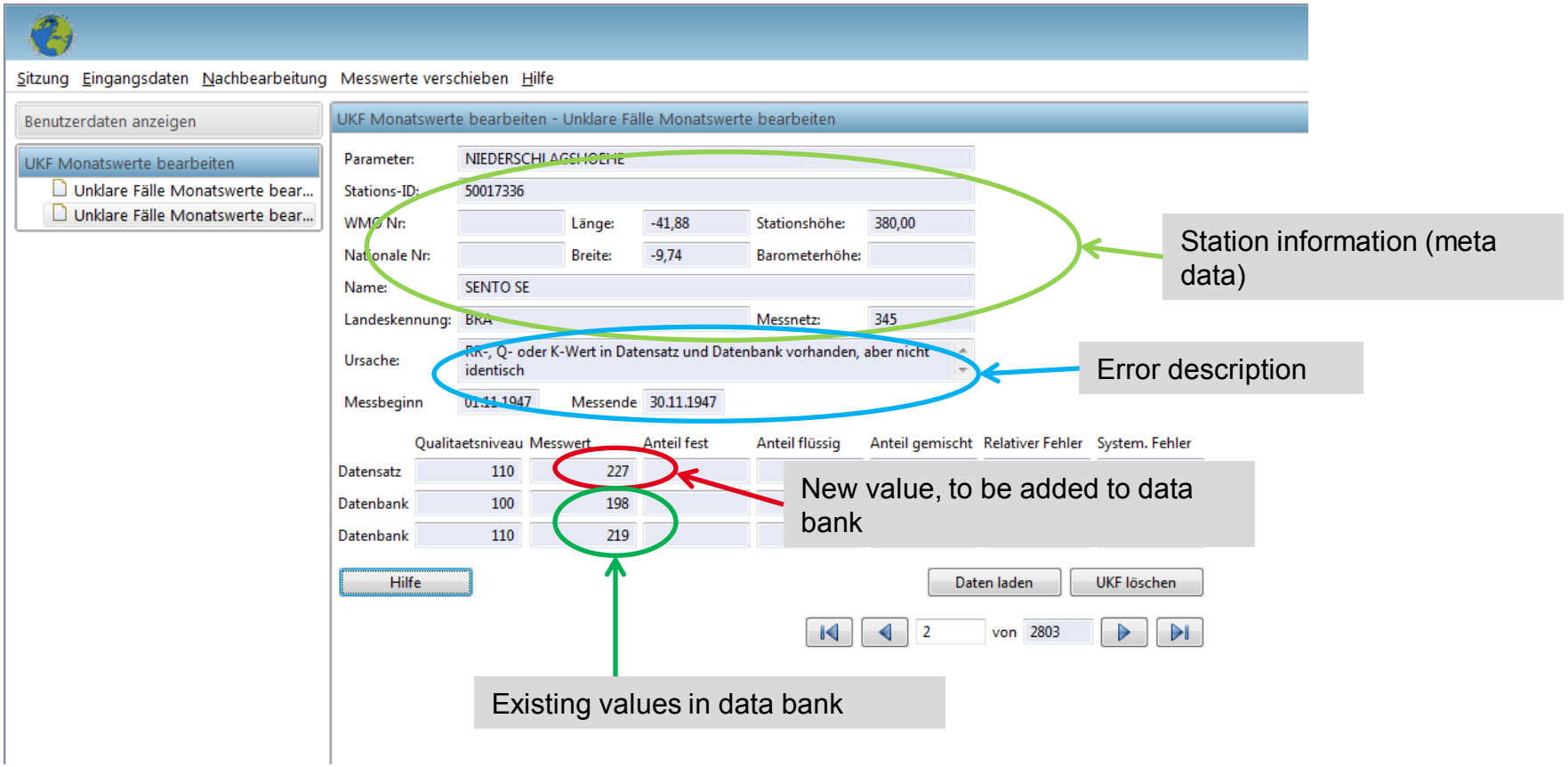
Useful tools

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



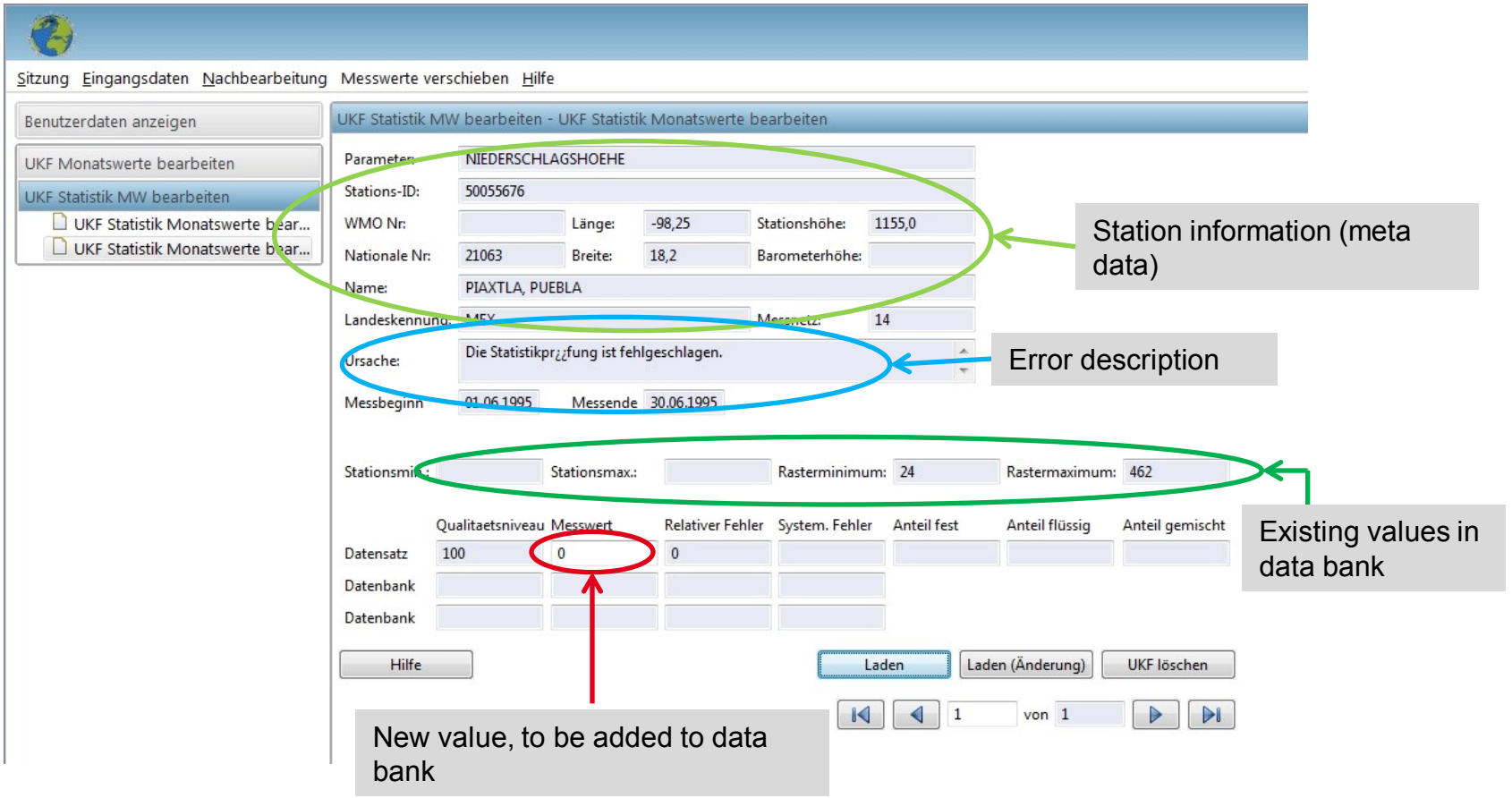
Useful tools

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



Useful tools

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

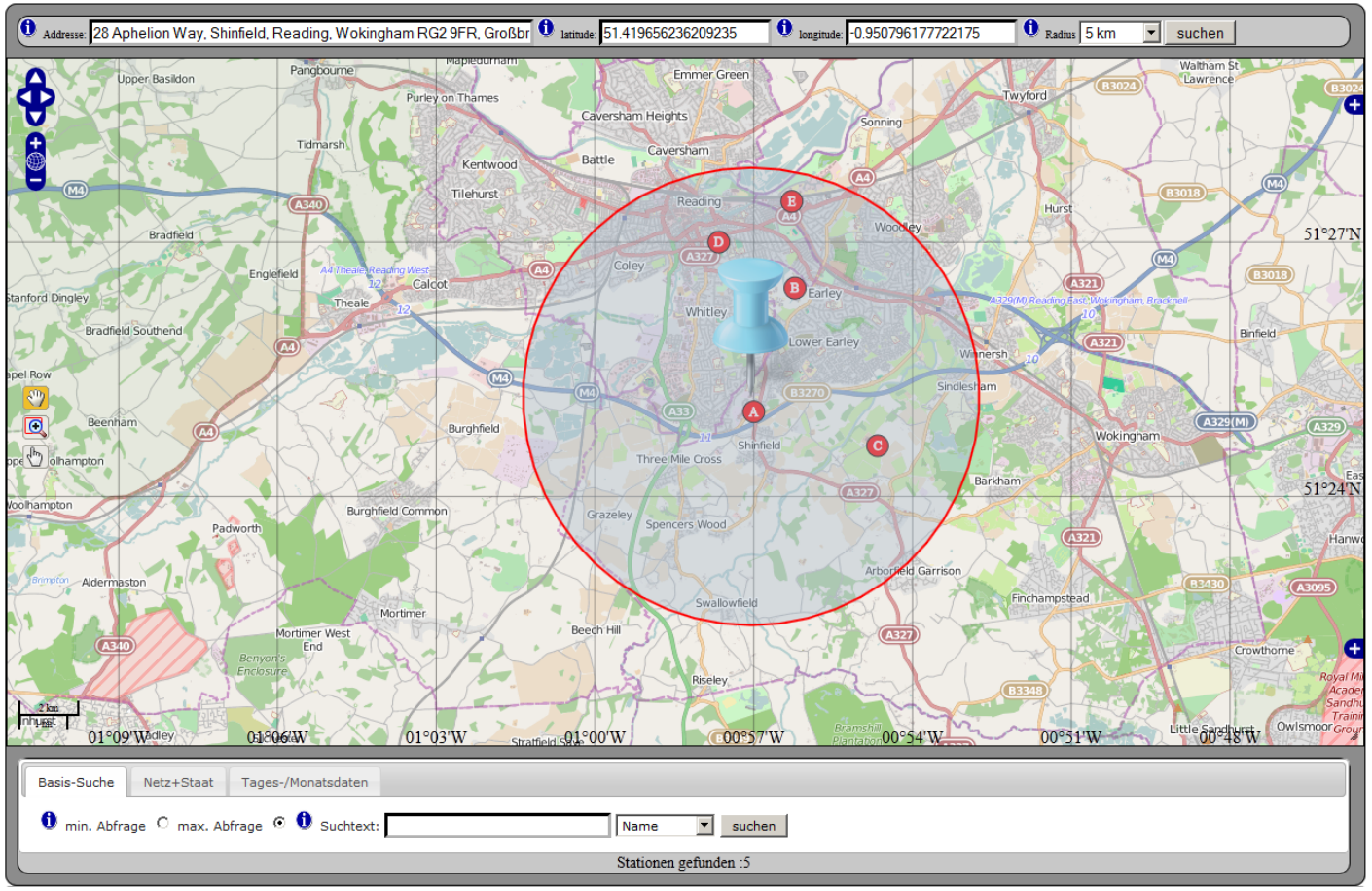


Useful tools

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

Useful tools

➔ Visualization tool for station data → searching stations



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:

10 Einträge anzeigen — Suchen

#	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:

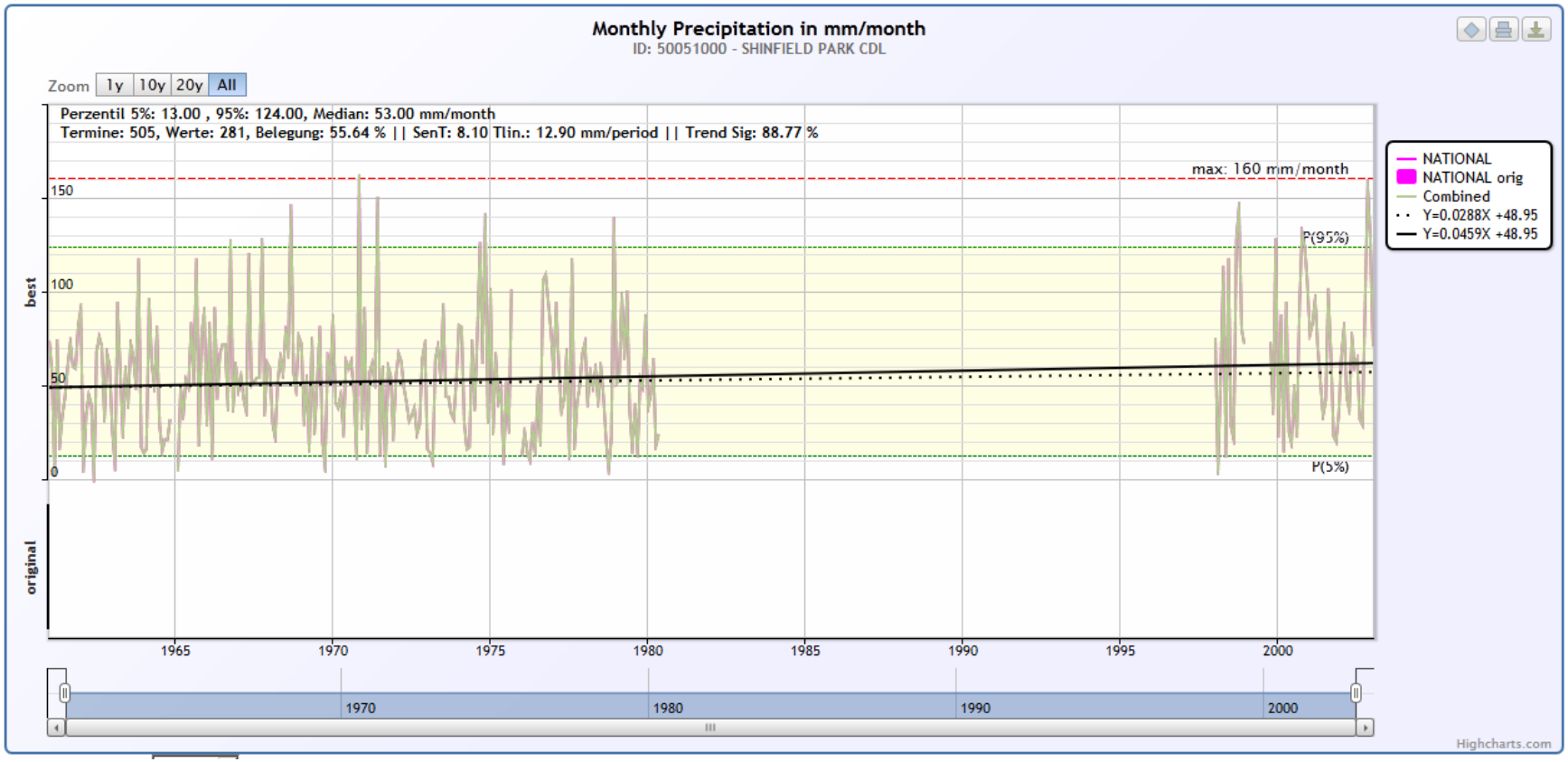
10 Einträge anzeigen — Suchen

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