The Global Precipitation Climatology Centre (GPCC) supporting GTN-H

Latest Developments and Plans

5th GTN-H Coordination Panel Session
12-13 March 2011, Tokyo, Japan

Dr. Andreas Becker
Deutscher Wetterdienst
Department of Hydrometeorology

The Global Precipitation Climatology Centre (GPCC)

Established by the World Meteorological Organization WMO in the year 1988

- undertaken by Deutscher Wetterdienst **DWD**
- contributes to the Global Climate Observing System **GCOS**
- and the World Climate Research Programme **WCRP**
- thousands of **users world-wide**
- scientific task: **quantitative assessment of global precipitation** and **investigation of the global water cycle**

The functions of the GPCC

- ➔ collection of observed precipitation data world-wide
  - ➔ data processing, quality control, storage
    - ➔ data analysis, production of gridded data fields
      - ➔ distribution of the gridded data fields
        - ➔ contribution to international programs

Institution	Target Application
• GCOS	Global climate monitoring applications
• WCRP/GEWEX	Analyses of hydrometeorol. processes and adjustment of satellite-based observation
• WMO WWW	CLIMAT network monitoring (RBCN/GSN)
• WMO WCP	Annual Report on global climate status
• WMO HWRP	Contribution to GTN-H development
• IPCC	Climate variability and trend analyses
• ECMWF, UKMO	NWF model verification
• GEO	Contribution to GEOSS Implementation
• FAO	Input for drought monitoring applications
• UNESCO IHP	Water resources assessment

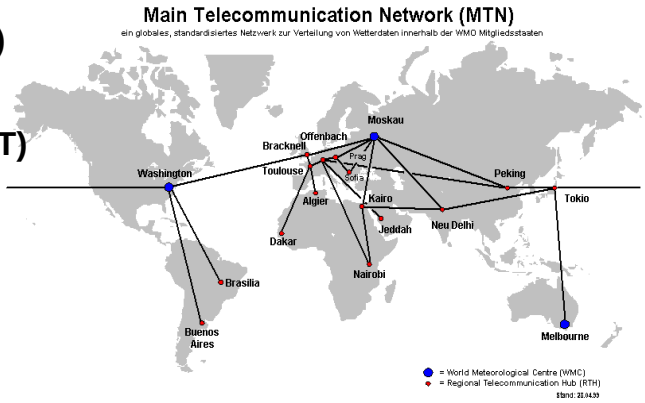
…and many researchers worldwide…

GPCC data sources

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Near real-time regularly exchanged data
via the WMO Global Main Telecommunication Network

- **hourly/daily weather reports (SYNOP)**
  - ➔ **ca. 6,500 stations**
- **monthly climatological totals (CLIMAT)**
  - ➔ **ca. 2,300 stations**
  - ➔ **ca. 8,000 stations**



Non real-time:

Additional data received from ca. 190 countries

plus:
- Historical data collections (CRU, FAO, GHCN)
- International project data (GEWEX and other)

➔ **totally more than 64,000 stations**

GPCC achievements

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

New products

➔ **Global Precipitation Mean Climatology**
- **period 1951-2000**
- **based on about 64,400 stations** — **Done, Dec 2010**

➔ **Full Data Reanalysis Version 5**
- **period 1901-2009**
- **based on all available data** — **Done, Dec 2010**

➔ **Trend analysis for selected data time-series**
- **period 1951-2005**
- **based on complete data time-series** — **Q3 2011**

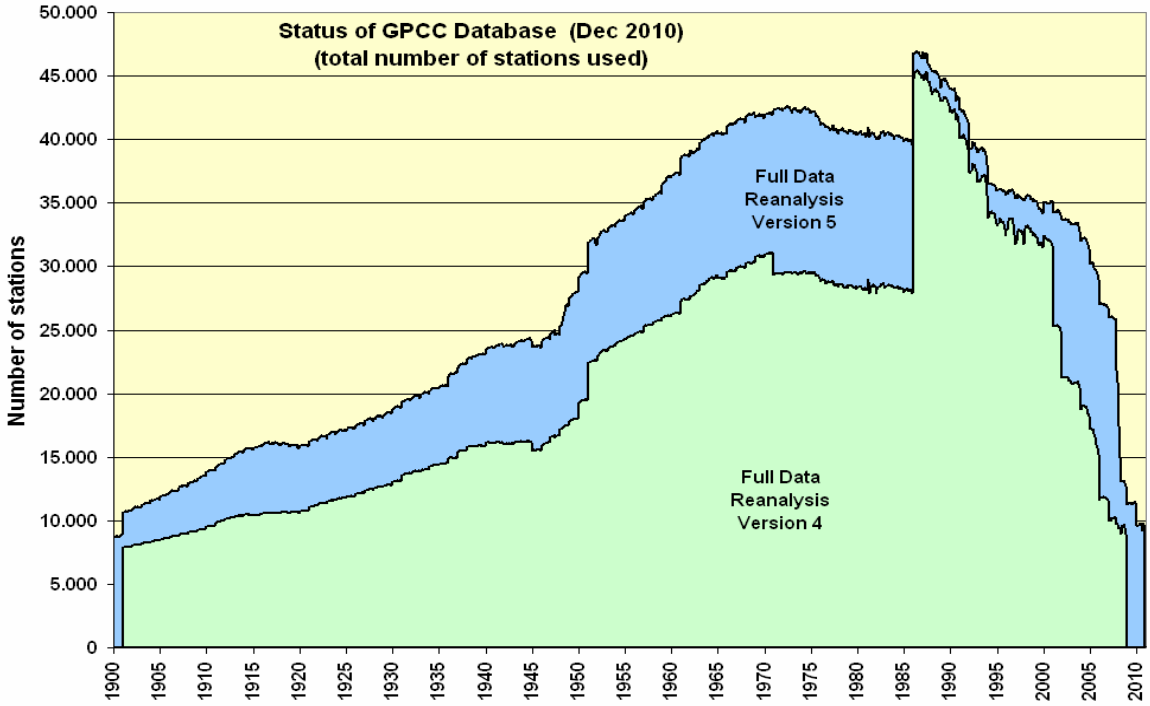
➔ **publication of the methods used and results**

in preparation

GPCC achievements

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

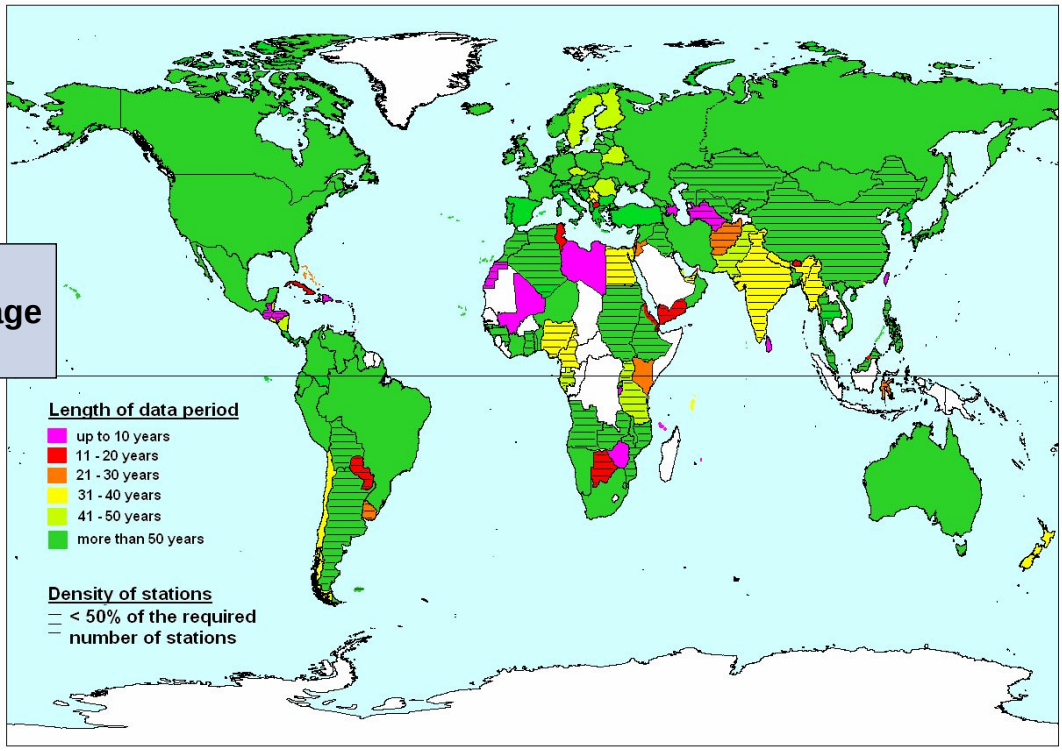
Increased data coverage of Full Data Reanalysis Version 5 vs. Version 4



GPCC achievements

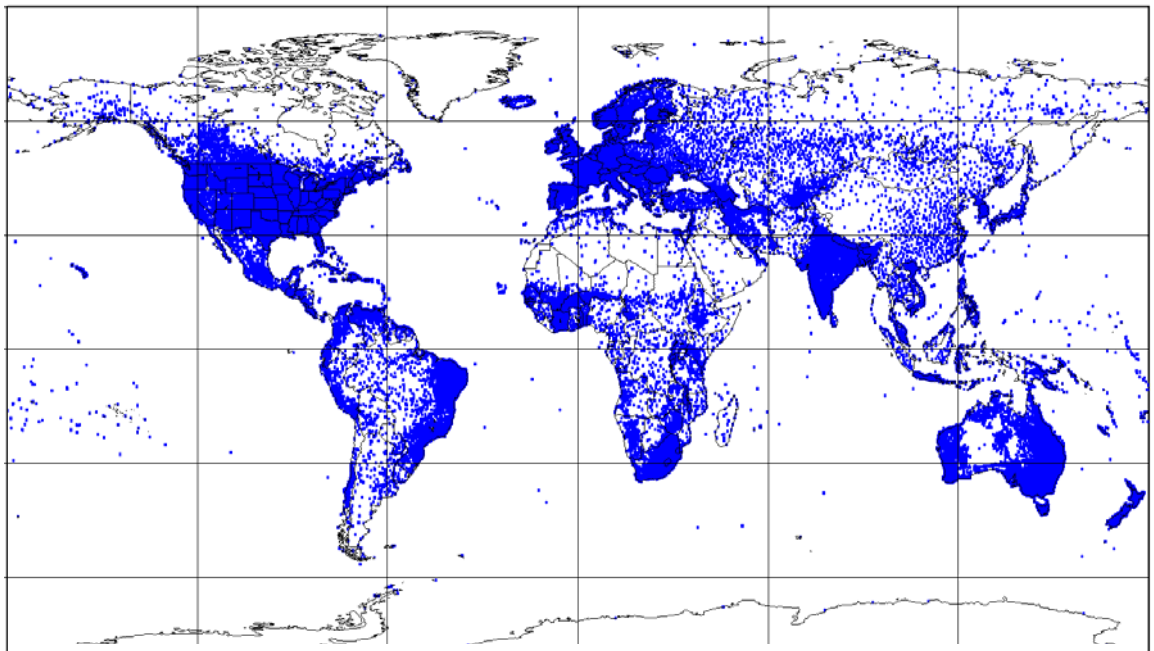
Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Increased data coverage by country



GPCC achievements

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

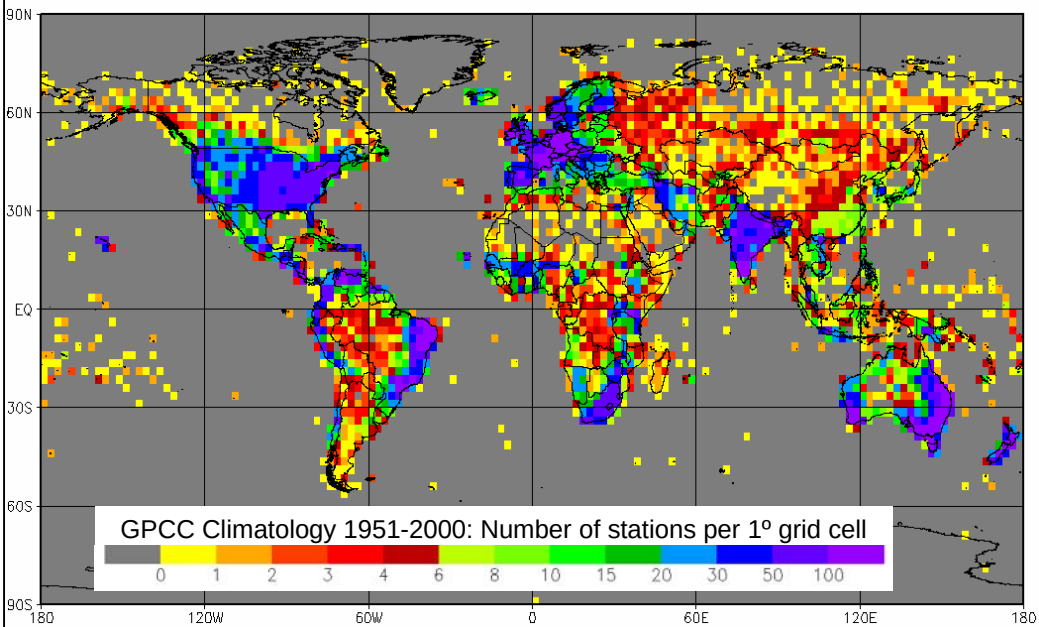


More than 64,400 stations providing normal means – status 2010

Data used as climatologic background for GPCC gridded data sets

GPCC station density

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



Monthly precipitation error < 10%

16 stations per grid, i.e. approximately 40 000 stations required globally

Areas in dark green and blue = Sufficient station density

GPCC Products

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

GPCC near real-time products

Routinely produced gridded data sets

available within:	**application:**	**number of stations:**
5 days	**First Guess Anomalies**	**drought monitoring FAO**	**~ 6,500**
2 months	**Monitoring Product**	**WCRP/GEWEX early reference**	**~ 7,500**

Additional information provided for monitoring product

- **Number of stations per grid box**
- **Sampling error**
- **Stochastic error**
- **Systematic error assessment**

This information is updated every month

GPCC Web site

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Access to GPCC's Precipitation Products

http://gpcc.dwd.de

Email: gpcc@dwd.de

GPCC Use Cases

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

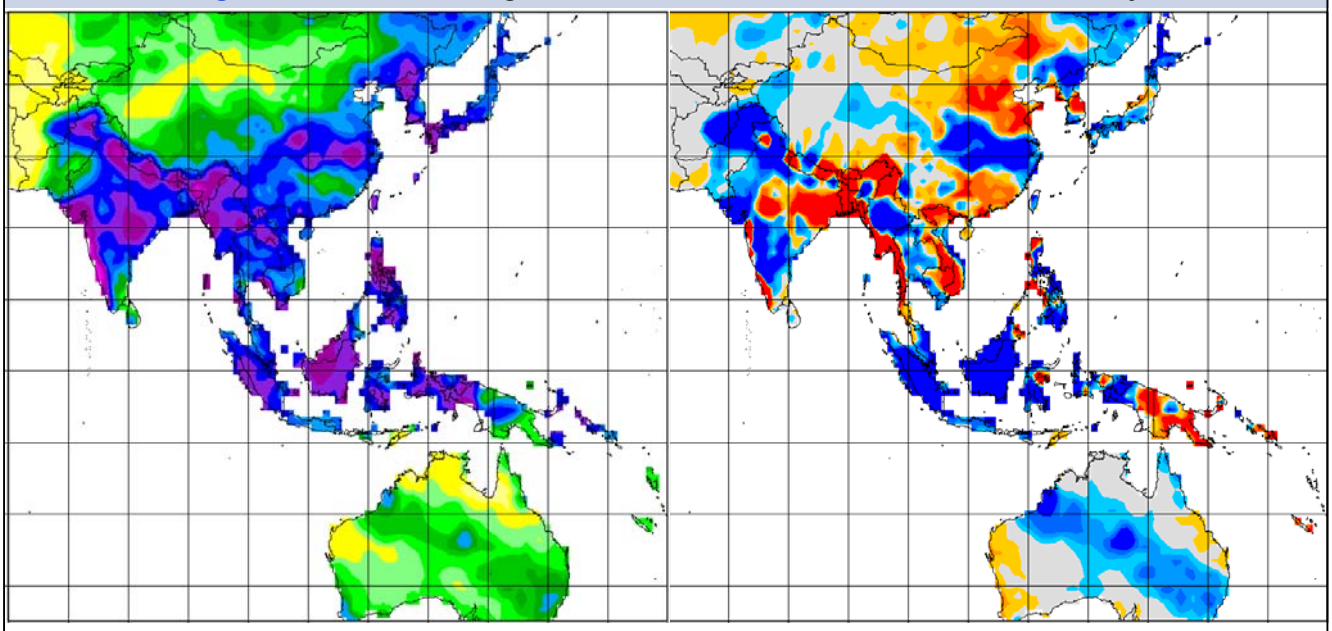
Current GPCC Products are useful for

- Drought monitoring
- Verification of climate and NWP models
- Investigation of the interactions between the global energy and water cycle
- Assessment of global water resources
- Validation/Calibration of remotely sensed precipitation estimations
- Analysis of climate variability and trends

GPCC Products

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Use Case: A QC precipitation monitoring product, e.g. for special event analysis:
La Niña in Pakistan, Indonesia, Australia
➔ **Monitoring Product**, User: e.g. WMO und DWD PR, scientific community



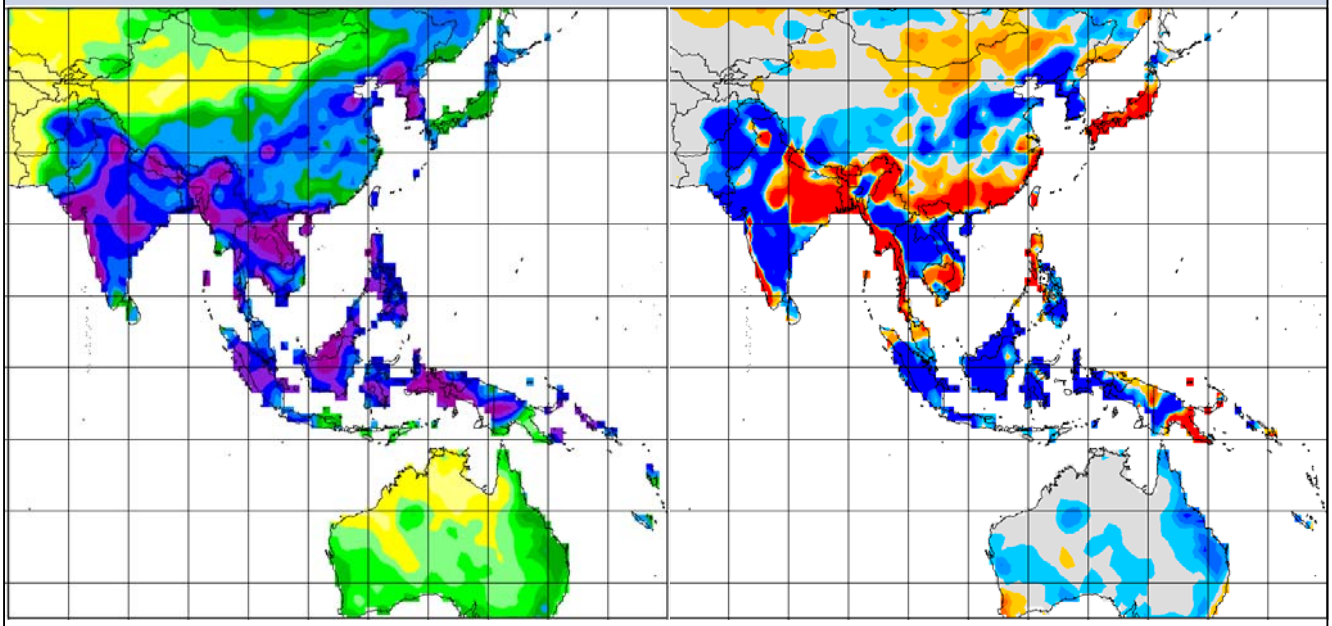
Precipitation total and anomaly July 2010

A. Becker, GPCC Status and Plans, 5th GTN-H Coordination Panel Session, 12-13 March 2011, Tokyo

GPCC Products

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Use Case: A QC precipitation monitoring product, e.g. for special event analysis:
La Niña in Pakistan, Indonesia, Australia
➔ **Monitoring Product**, User: e.g. WMO und DWD PR, scientific community

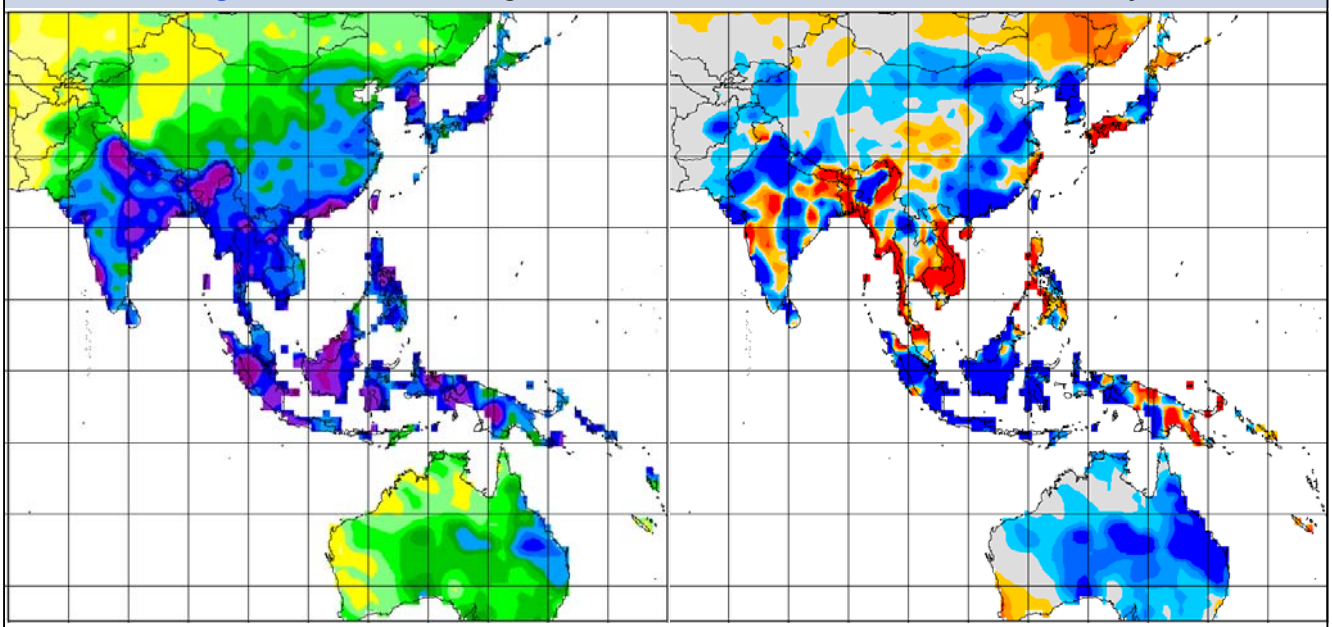


Precipitation total and anomaly August 2010

GPCC Products

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Use Case: A QC precipitation monitoring product, e.g. for special event analysis:
La Niña in Pakistan, Indonesia, Australia
➔ **Monitoring Product**, User: e.g. WMO und DWD PR, scientific community



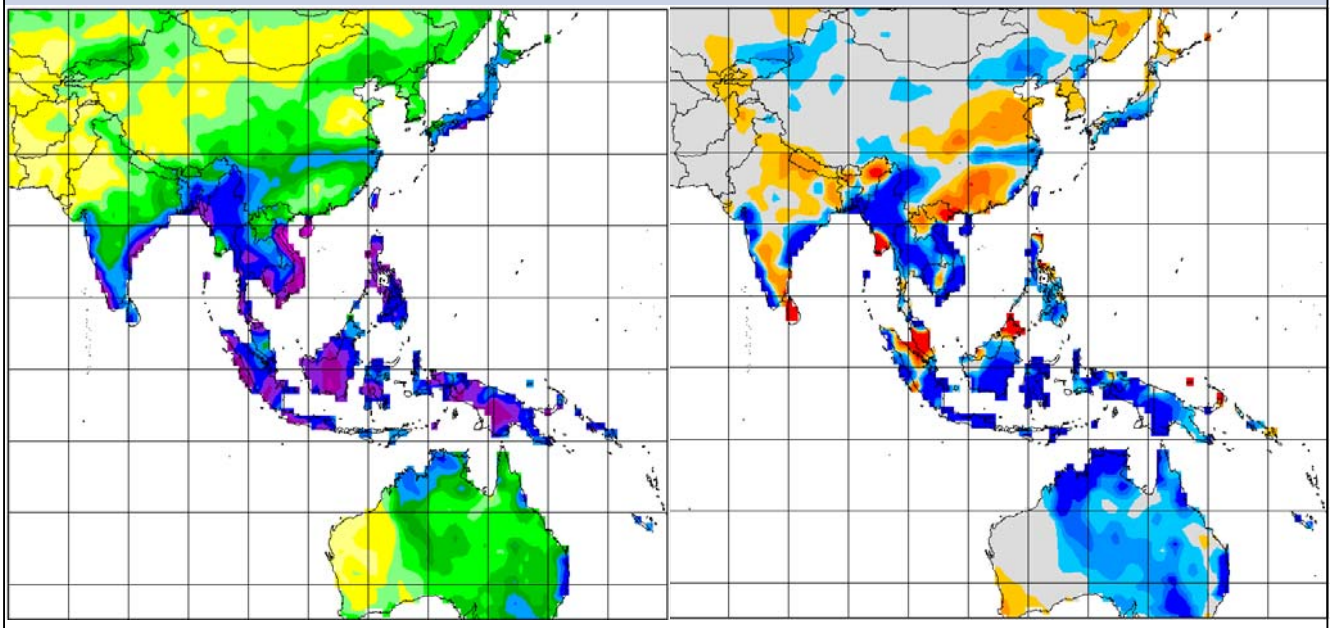
Precipitation total and anomaly September 2010

A. Becker, GPCC Status and Plans, 5th GTN-H Coordination Panel Session, 12-13 March 2011, Tokyo

GPCC Products

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Use Case: A QC precipitation monitoring product, e.g. for special event analysis:
La Niña in Pakistan, Indonesia, Australia
➔ **Monitoring Product**, User: e.g. WMO und DWD PR, scientific community

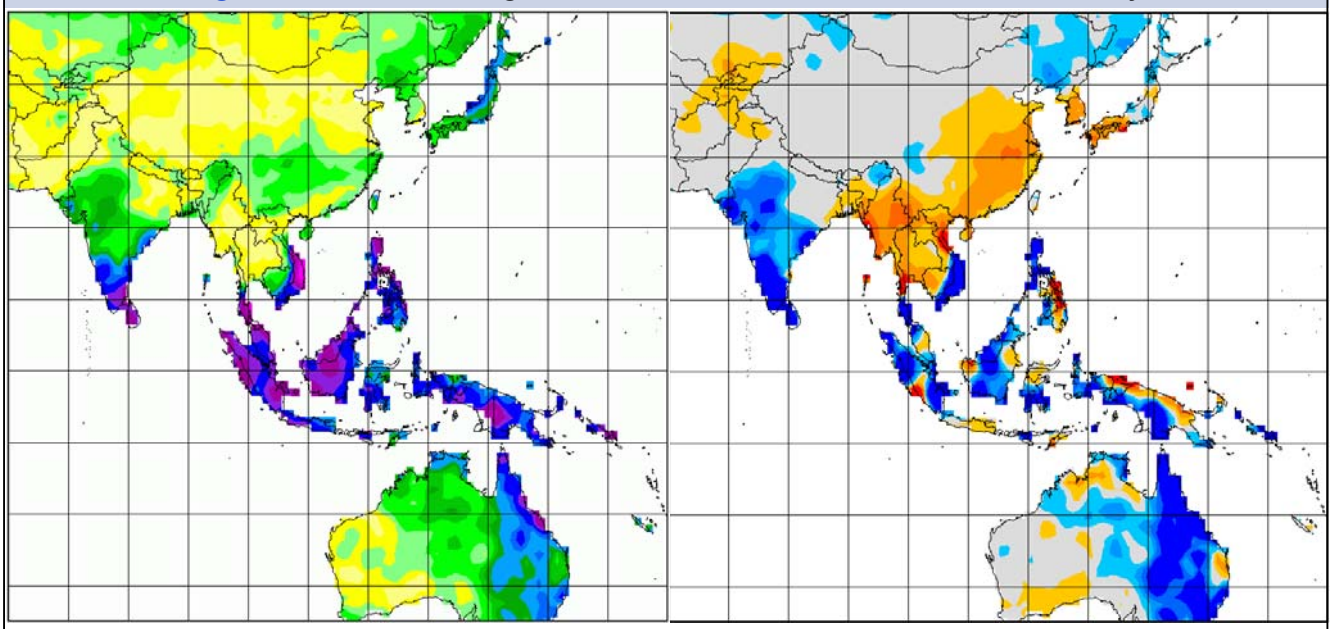


Precipitation total and anomaly October 2010

GPCC Products

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Use Case: A QC precipitation monitoring product, e.g. for special event analysis:
La Niña in Pakistan, Indonesia, Australia
➔ **Monitoring Product**, User: e.g. WMO und DWD PR, scientific community



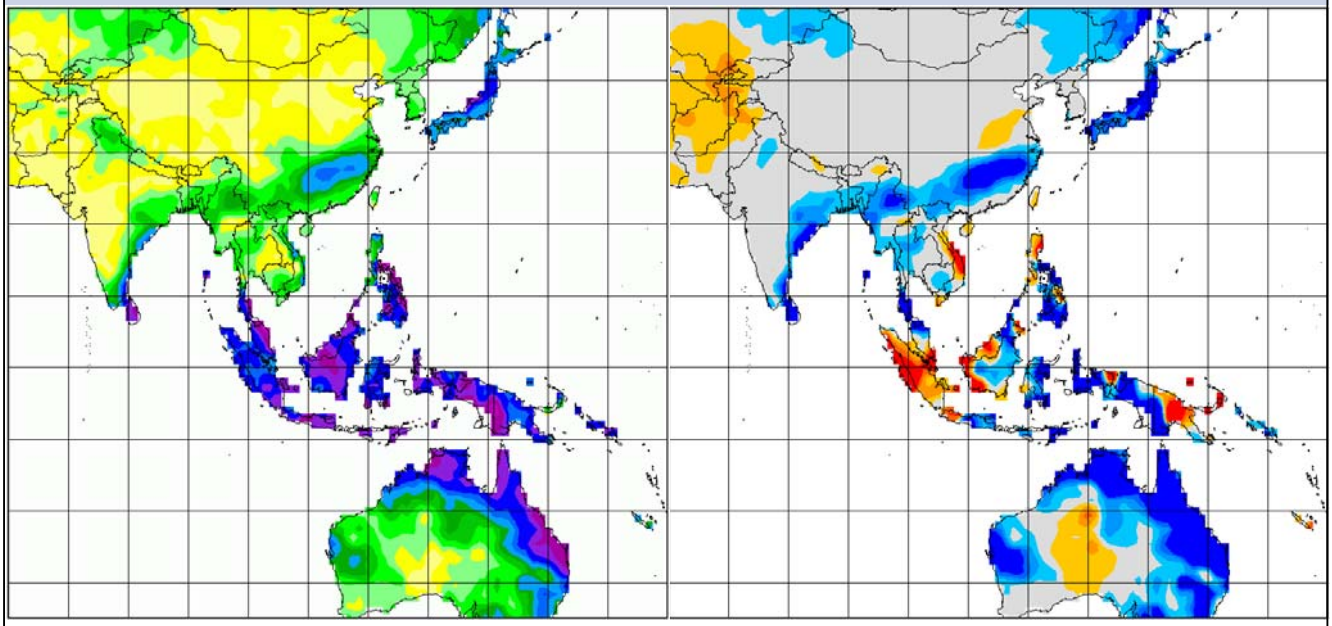
Precipitation total and anomaly November 2010

A. Becker, GPCC Status and Plans, 5th GTN-H Coordination Panel Session, 12-13 March 2011, Tokyo

GPCC Products

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Use Case: A QC precipitation monitoring product, e.g. for special event analysis:
La Niña in Pakistan, Indonesia, Australia
➔ **Monitoring Product**, User: e.g. WMO und DWD PR, scientific community



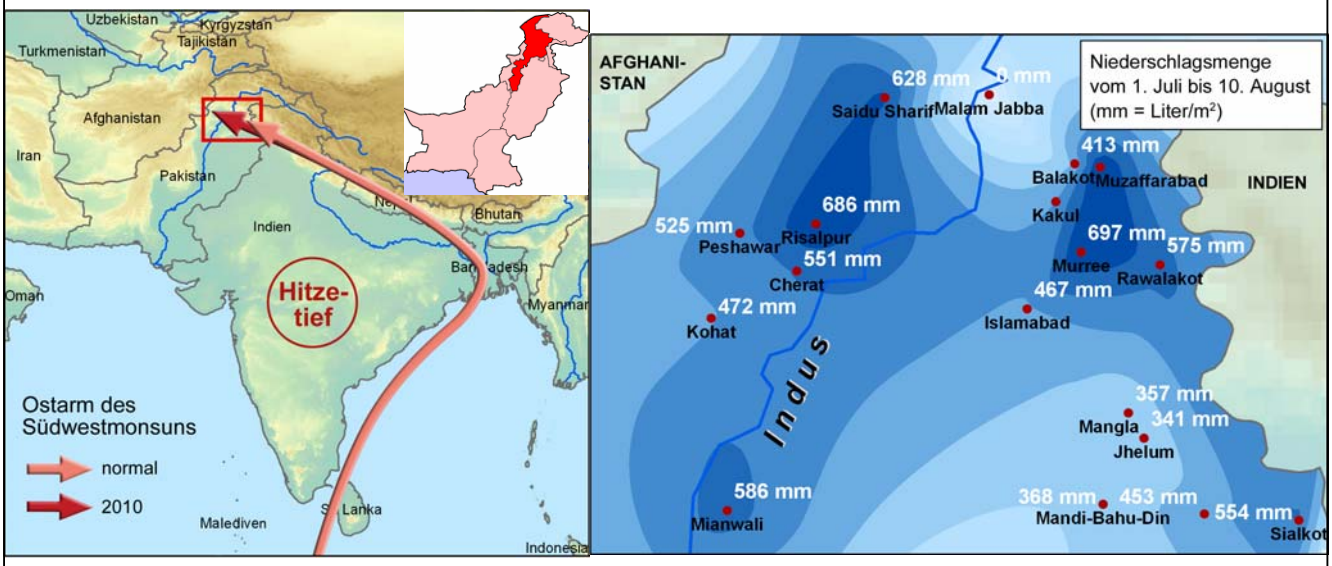
Precipitation total and anomaly December 2010

DWD-KU24

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Precipitation monitoring on special events: La Niña in Pakistan
➔ **GTS data evaluation**, User: DWD public relations

Extreme (rare) precipitation totals in normally arid regions



Precipitation in Pakistan July/August 2010

GPCC Products

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

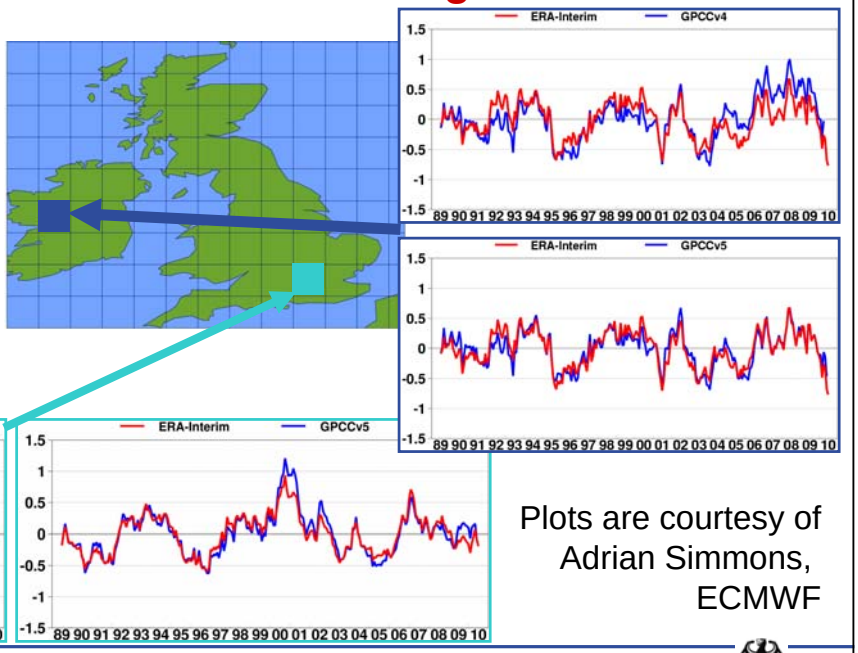
Use Case: Global Re-Analysis at smallest sampling error due to highest data density
➔ **Full Data Reanalysis**, User: Scientific Community, WMO WCRP, etc.

ERA-Interim Anomalies vs. 1989-2009 background

ERA values are interpolated from ~80km model grid to 1° grid of GPCC products

GPCC versions are v4/v5 of Full Data Product supplemented by v2/v3 of Monitoring Product

Plots show 12m running means (mm/day)

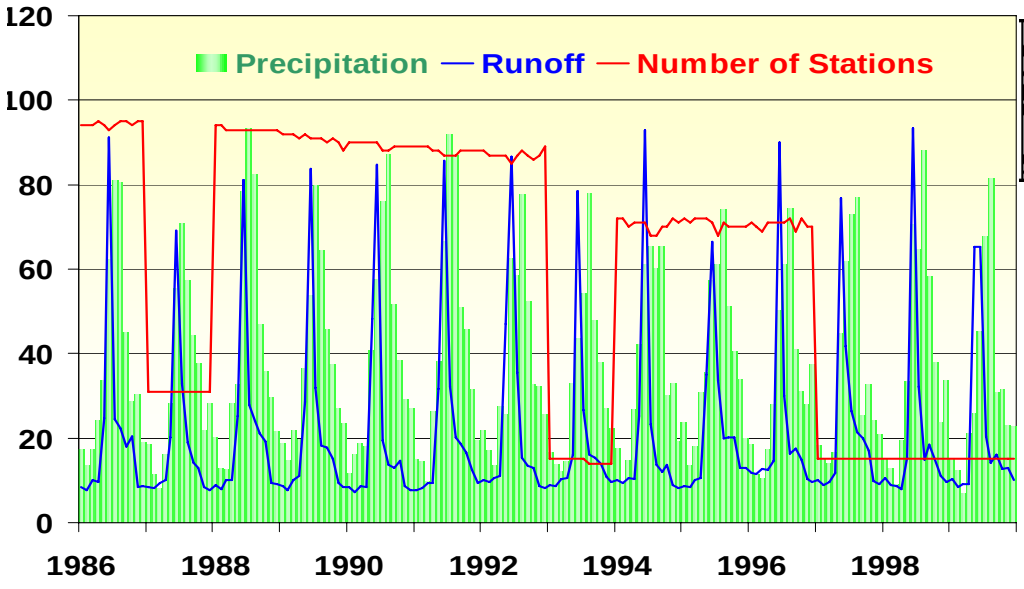


Plots are courtesy of Adrian Simmons, ECMWF

Potential GPCC products

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

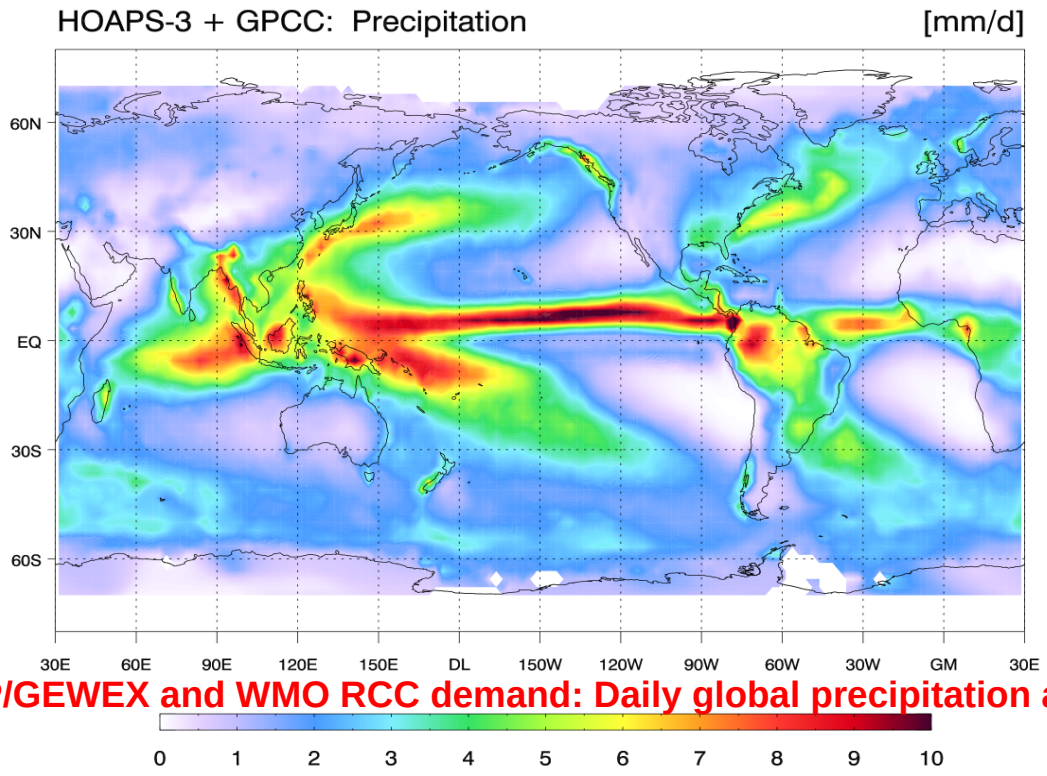
Comparison of precipitation (GPCC) and river run-off (GRDC) variation at Yenisei river in Siberia



Green area indicates the analysis region

Potential GPCC products

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



Courtesy: S. Bakan, MPI-M, Hamburg

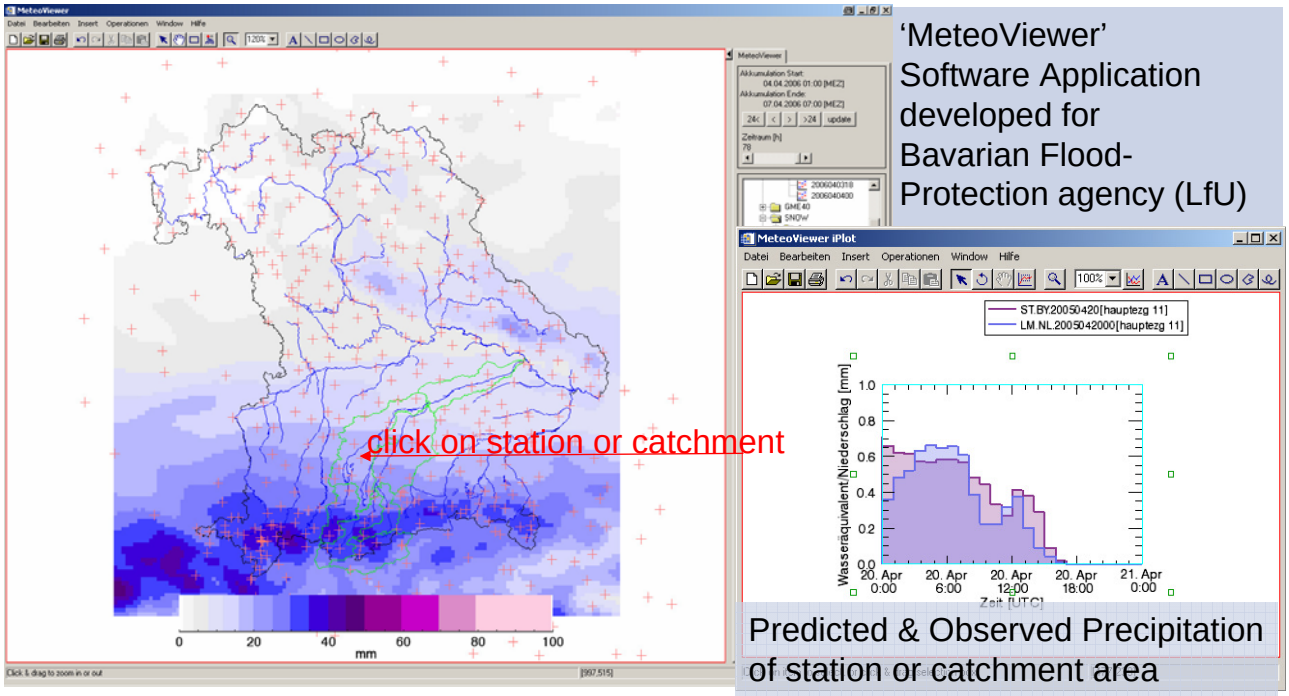
WCRP/GEWEX and WMO RCC demand: Daily global precipitation analyses

A. Be **Example: Combination of HOAPS and GPCC climatology 1994-2004**

Vision 2015-2020?

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Establishment of global secured Web Services feeding user tailored client software



'MeteoViewer' Software Application developed for Bavarian Flood-Protection agency (LfU)

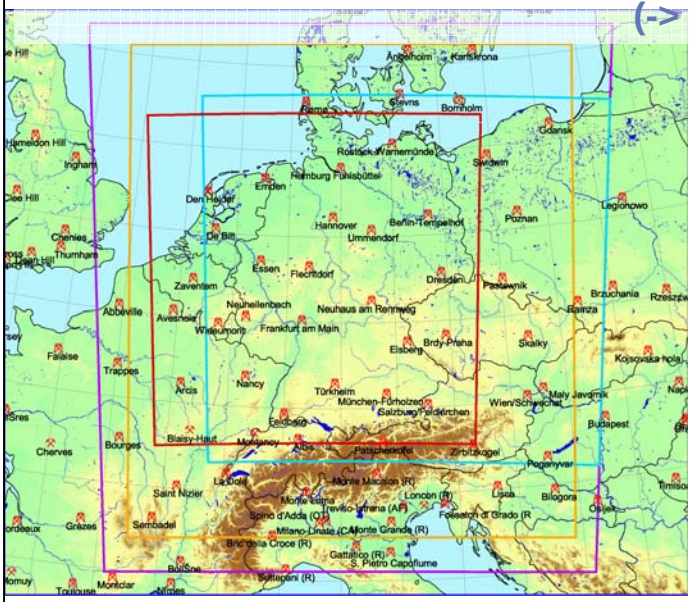
Predicted & Observed Precipitation of station or catchment area

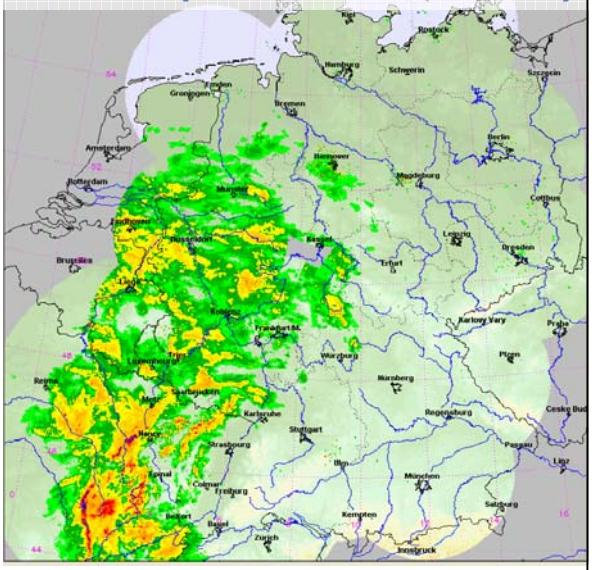
Vision 2015-2020?

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

GCOS/WCRP/IGBP needs: Global hourly precipitation product based on a combination of radar QPE and automatic raingauges

(-> pilot for Europe and North America)



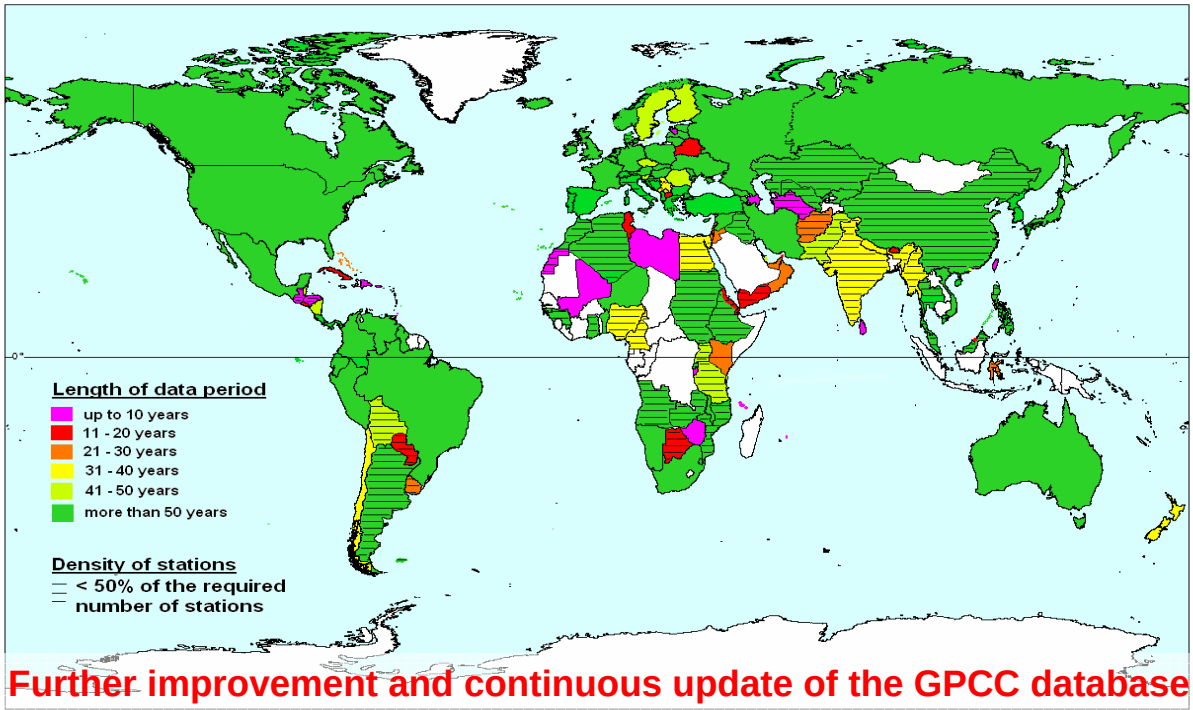


We have: Dense weather radar and automatic rain gauge networks in developed regions

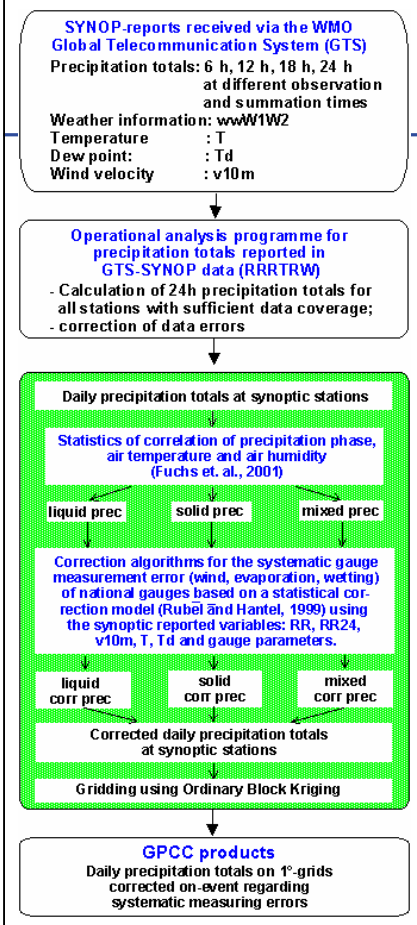
We have: National and regional high resolution QPE products based on radar and rain gauges

Outlook

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



-> Further improvement and continuous update of the GPCC database (Acquisition of non real-time observation data with equal weighting of monthly and daily sums, improvement of near real-time data exchange)



Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Calculation of daily precipitation, precipitation type (solid, liquid) from SYNOP reports

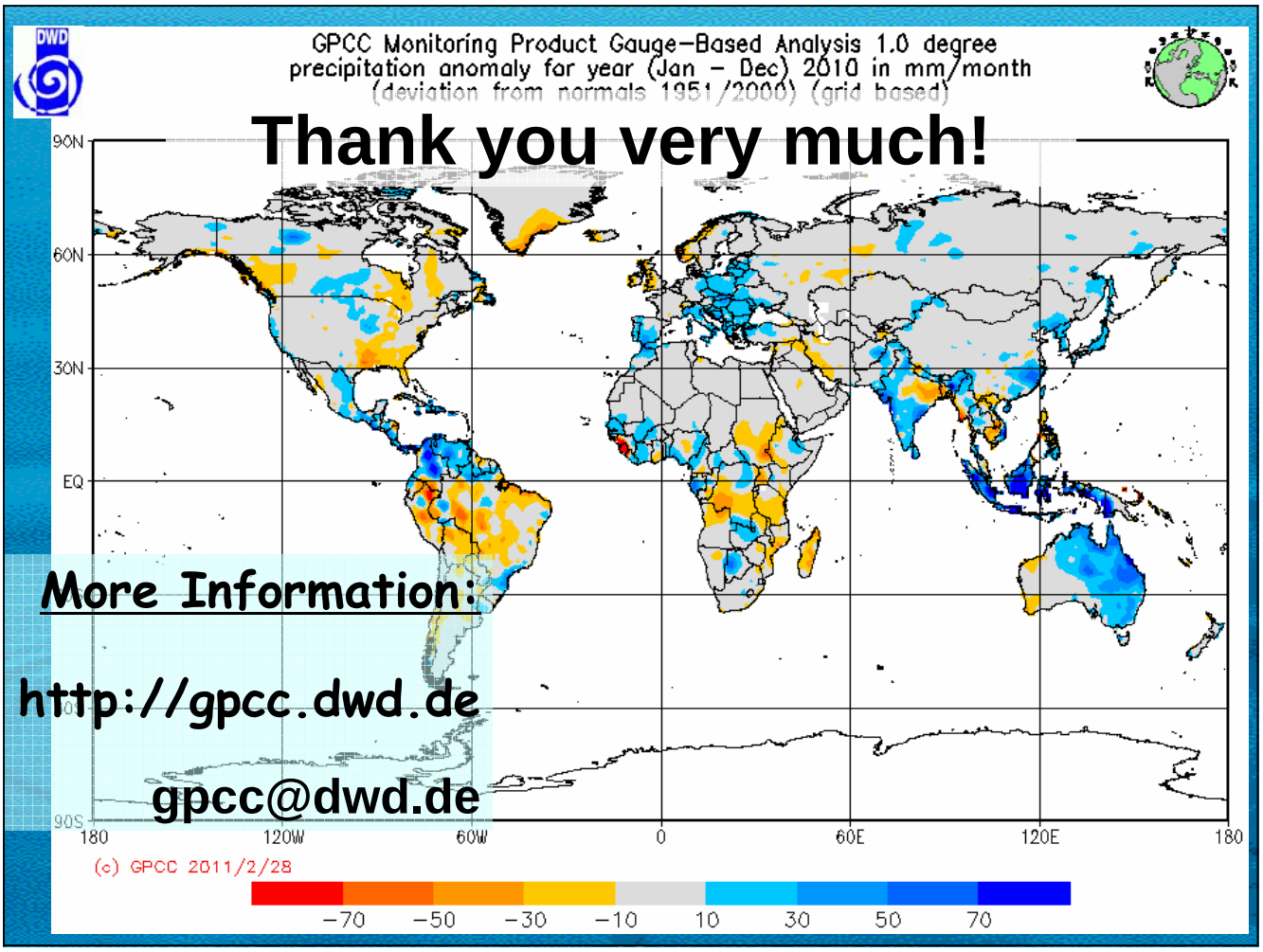
and interpolation of the daily data

Commencement in 2011

Outlook & Recoms

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

- ➔ Development and publication of a new homogenized precipitation analysis (HOMPRA) covering 55-Years from 1951-2005.
- ➔ Commencement of a daily near real-time precipitation analysis product by year 2012, supported by an accordingly extended data acquisition.
- ➔ An expert mode of the GPCC visualizer with more complex functionalities.
- ➔ Support of regional high-resolution reanalysis projects making use of radar information and modeling.
- ➔ Development of a new satellite-gauge data set in cooperation with CM-SAF as part of a project funded by the German Ministry for Research and Education.
- ➔ Collect requirements of GTN-H community towards integrated products
- ➔ Utilize web services approaches for data integration and fusion


GPCC Monitoring Product Gauge-Based Analysis 1.0 degree
precipitation anomaly for year (Jan - Dec) 2010 in mm/month
(deviation from normals 1951/2000) (grid based)
Thank you very much!
More Information:
http://gpcc.dwd.de
gpcc@dwd.de
90N
60N
30N
EQ
90S
180
120W
60W
0
60E
120E
180
(c) GPCC 2011/2/28
-70
-50
-30
-10
10
30
50
70