Evaluation of interpolation scheme and extreme value indices based on GPCC's Full Data Daily Data

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Precipitation is a globally fundamental parameter that has an influence in many fields and determines the hydro-meteorological cycle.
The Global Precipitation Climatology Centre (GPCC) provides the daily in-situ precipitation product Full Data Daily (FDD). The FDD is a reliable raster product, based on global land-surface precipitation totals. The database includes data provided by national meteorological and hydrological services, regional and global data collections as well as WMO GTS-data. The FDD is characterized in particular by the detailed quality control of the input data. This poster introduces a test study on the methodological decisions for FDD. The study gives us the opportunity to estimate and quantify the influence of the methodical decisions and to improve the understanding of the FDD.

Data base

To understand the influence of the interpolation procedure on raster extremes not only in theory, but also to quantify the regional differences and the influence of the number of stations, we created a **9-year test data set**. The FDD test data set covers the period **Jan 2000 - Dec 2008** with **daily temporal resolution** and **1° spatial resolution**.

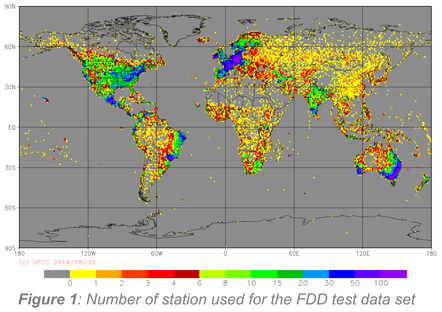

Figure 1: Number of station used for the FDD test data set

Interpolation methods

To test the impact of the interpolation method, we recalculated a sub-period of FDD using modified Spheremap or krigging as interpolation scheme. Two two global data sets are generated each with a different interpolation method.

Modified Spheremap (Willmott et al. 1985)

- Application of Shepard's scheme on a sphere (Shepard 1968)
- Combines angular and distance weighting
- Uses at least 4, at most 10 stations
- Search radius depends on station density
- Interpolation runs on 0.25°/0.5° sub grid
- Using area weighting and land-portion weighting to calculate on final grid
- Runs operationally since 1995, as anomaly interpolation on basis of our Climatology since 2008

Kriging (Krige 1966)

- Statistical interpolation scheme
- Calculates correlations on basis of variograms
- Not operational at GPCC
- Uses at least 4, at most 10 stations
- Search radius depends on station density
- Test version applies only one variogram for global interpolations

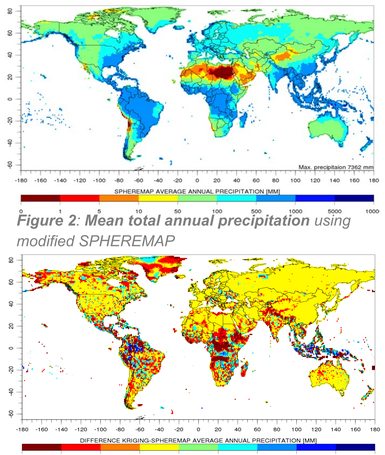

*Figure 2: **Mean total annual precipitation** using modified SPHEREMAP*

*Figure 3: **Difference** of mean total annual precipitation calculated by modified **SPHEREMAP** and **KRIGING***

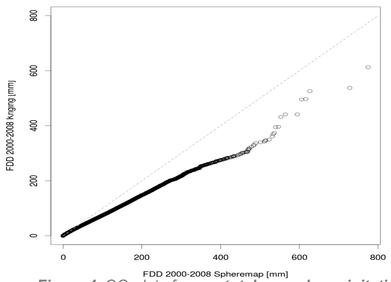

*Figure 4: QQ-plot of **mean total annual precipitation** calculated by modified SPHEREMAP and KRIGING*

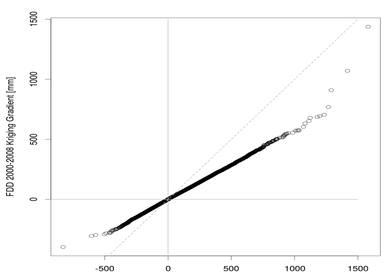

*Figure 5: As Figure 4, but for the **gradient** to the surrounding grids.*

Order of operation - ETCCDI on a grid

We have a look into the influence of the order of operation on area values (**1°x1°** resolution) by a) calculating the extreme value indices ETCCDI on the time series first and interpolating later and b) interpolating first and then calculating the ETCCDI.

1) **Station ETCCDI** on the grid.
➔Calculate station based ETCCDI
➔Interpolate ETCCDI
2) **Grid ETCCDI.**
➔Interpolate Precipitation
➔Calculate ETCCDI

Which is better? - There is no better. These are answers to different questions.

Summary

- ➔Modified SPHEREMAP produces higher values and higher gradients
- ➔Strongest differences in areas with data sparsity
- ➔Station based ETCCDI produce slightly higher values for RX1/ RX5
- ➔Data sparsity doesn't seem to be the main reason for differences
- ➔RX1DAY/ RX5DAY single extreme points stick out
- ➔SDII high differences between dry areas and areas with precipitation (e.g. Sahel zone)
- ➔R10MM high differences in areas with high precipitation

New Products End 2020/ Begin 2021

- ➔Climatology
- ➔Full Data Monthly
- ➔Full Data Daily
- ➔HOMPRA Europe

And a comprehensive study based on interpolation methods and order of operation based on the entire period.

Table 1: Extreme precipitation indices. They are adopted from the ETCCDI set by Peterson et al. (2001, Appendix A) and CCI/WCRP/JCOMM Expert Team on Climate Change Detections and Indices.

Indicator	Definition	Unit
Rx1day	Maximum 1-day precipitation	mm
Rx5day	Maximum 5-day precipitation	mm
SDII	Mean daily precipitation amount on days > 10 mm	mm
R10mm	Count of days > 10 mm	# days
CDD	Maximum length of dry spell (< 1mm/day)	# days
CWD	Maximum length of wet spell (> 1mm/day)	# days

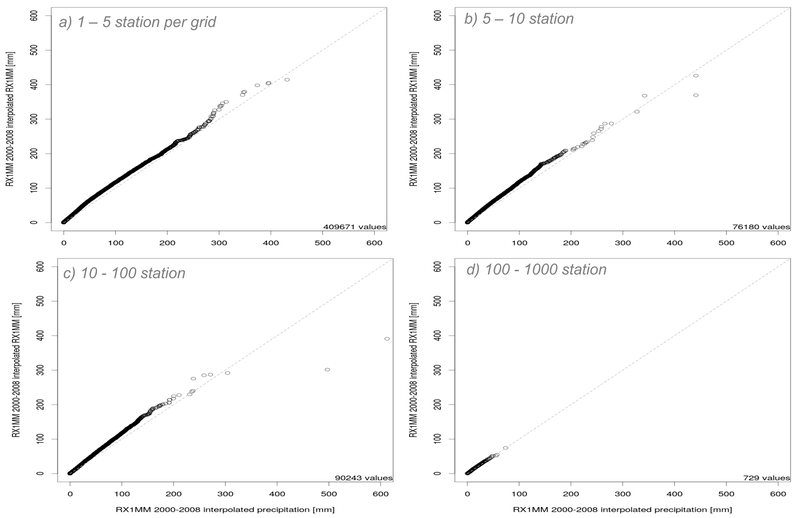

*Figure 6: QQ-plot showing the influence of the order of operation for **RX1DAY**, separated by the **number of stations** per grid.*

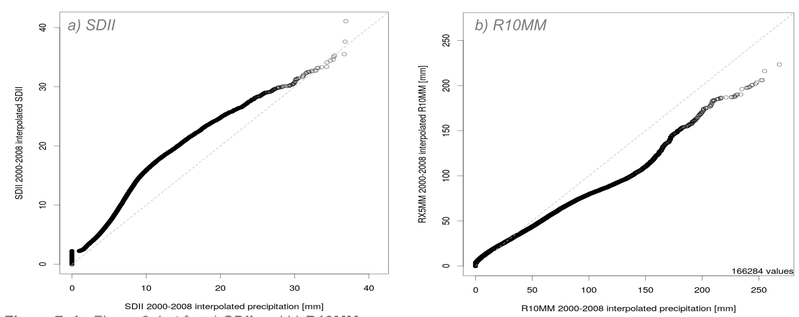

*Figure 7: As Figure 6, but for a) **SDII** and b) **R10MM**.*

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