



geoland - Observed Global Precipitation

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1. Motivation

Precipitation is one of the most frequently investigated climate quantities. Nevertheless, even today there does exist no operational precipitation product which is calibrated on a daily base [1]. Goal is to provide daily precipitation fields on a global regular 1° lat/lon grid due to a quality improvement of existing multi-satellite estimates by merging with bias-corrected rain gauge analyses.

2. Data

Daily 1° multi-satellite estimates of precipitation, the GPCP-1DD product [2], have been archived together with global bias-corrected rain gauge analyses based on about 6,000 synoptic stations for the period 1997-2003. The GPCP-1DD product is provided by the NASA and is a combination of IR estimates from geostationary (GOES, GMS, Meteosat) and low-earth-orbit (NOAA) satellites in the 40° N-S belt and rain estimates based on TOVS data from polar orbiting satellites (NOAA-12/14) outside.

3. Method

The bias-corrected rain gauge measurements are interpolated to a regular 1° lat/lon grid by *ordinary block kriging* and are merged with the multi-satellite product by *bivariate ordinary cokriging* to produce the CSP precipitation product. For the first version global constant auto- and cross-correlation functions are used. These will be regionalised according to a global climate classification [3] for subsequent versions.

References:

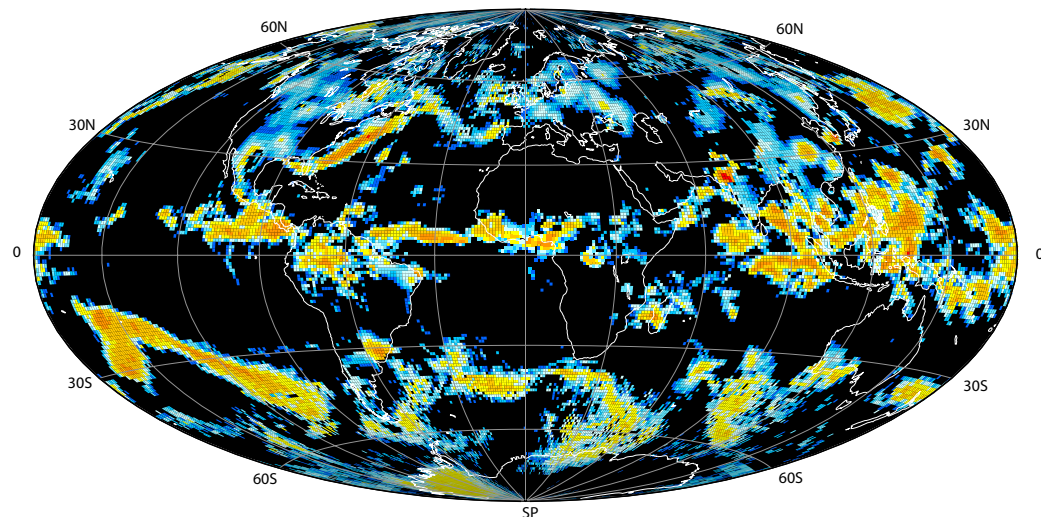
- [1] Rudolf, B., and F. Rubel, 2005: *Global Precipitation*. In: Hantel, M. (Ed.) *Observed Global Climate*. New Series on Landolt-Börnstein, Numerical Data and Functional Relationships, Springer, Berlin, 11.1 - 11.24.
- [2] Huffman, G. J., R. F. Adler, M. M. Morrissey, S. Curtis, R. Joyce, B. McGavock, and J. Susskind, 2001: Global precipitation at one-degree daily resolution from multi-satellite observations. *J. Hydrometeorol.*, **2**, 36-50.
- [3] Kotték, M., J. Grieser, C. Beck, B. Rudolf and F. Rubel, 2006: World Map of Köppen-Geiger Climate Classification Updated. *Meteorol. Z.*, submitted.
- [4] Rubel, F., 2004: A new European precipitation dataset for NWP model verification and data assimilation studies. In: Cote, J. (Ed.) *Research Activities in Atmospheric and Oceanic Modelling*, WMO/TD No. 1220, Report No. 34, Section 2, 11-12.

4. Operational Scenario

A first version of this combined precipitation product (CSP v1.0) has been calculated and validated for the year 2000. For verification purposes non-synoptic dense precipitation measurements based on about 21,000 stations over the ELDAS domain [4] were used. As the accuracy of the existing multi-satellite estimates of precipitation over Europe is well known (in terms of objective verification scores), a quality improvement of about 10 % can be shown.

The future production of the CSP precipitation product will run operationally at the Global Precipitation Climatology Centre (GPCC) at the German Weather Service.

01.07.2000 Precipitation [mm/d]
Source: CSP Precipitation V1.0 Statistics: mean = 2.68, rms = 6.86, std = 6.31, min = 0.00, max = 92.01



GPCP-1DD, Provider: NASA

multi-satellite estimation

Predefinition of ACFs and CCFs

bias-correction

block kriging

Synoptic Gauges, Provider: GPCC

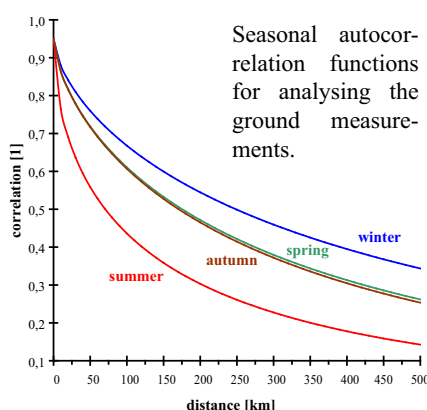
Conversion to user defined file formats (GRIB, ASCII)

cokriging

Archive at GPCC

Verification

Operational scenario performed at the (GPCC), methods depicted by coloured boxes developed by Biometeorology Group (IMP) during geoland.



Seasonal autocorrelation functions for analysing the ground measurements.

Continuous statistics

Observed	1.78
Estimated	1.94
Mean error	0.16
Mean absolute error	1.91
RMS error	3.97
Rank-order correlation	0.50

Categorical statistics

Hit rate, HR	0.66
Critical success index, CSI	0.50
Prob. of detection, POD	0.55
False alarm ratio, FAR	0.17
Bias score, BIAS	0.66
True skill statistics	0.38

Continuous statistics

Observed	1.78
Estimated	1.73
Mean error	-0.05
Mean absolute error	1.43
RMS error	3.13
Rank-order correlation	0.64

Categorical statistics

Hit rate, HR	0.72
Critical success index, CSI	0.59
Prob. of detection, POD	0.68
False alarm ratio, FAR	0.18
Bias score, BIAS	0.83
True skill statistics	0.46

Verification statistics of global daily precipitation product before (left) and after merging with surface measurements (right) for JJA 2000.