

Daily precipitation analyses of GPCC based on GTS data corrected on-event regarding systematic measuring errors

T. Fuchs (1), F. Rubel (2) and B. Rudolf (1)

(1) Global Precipitation Climatology Centre (GPCC), Deutscher Wetterdienst, Postbox 10 04 65, D-63004 Offenbach/Main, Germany, email: gpcc@dwd.de, <http://gpcc.dwd.de>

(2) WG Biometeorology, Institute of Medical Physics and Biostatistics, Veterinary University of Vienna, Austria, email: franz.rubel@vu-wien.ac.at

Introduction

Precipitation analyses based on conventional observations, like the operational precipitation analyses of GPCC, have to be corrected regarding systematic measuring errors of the gauges, mainly caused by wind influence and evaporation losses.

A crucial point is the determination of the phase of a precipitation event, because the correction factors for liquid and solid precipitation differ significantly. Differences between the gauged precipitation and the true precipitation amount are largest during snowfall and heavy wind (Goodison et al., 1998).

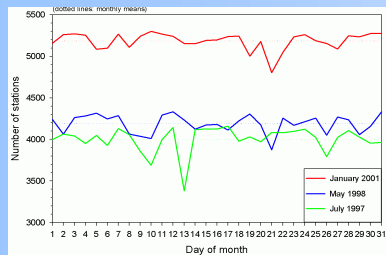
A recently developed (Rubel and Hantel, 1999) 'on-event' correction method of the systematic gauge measuring error was transferred from the GEWEX continental scale experiment BALTEX to global applications (Ungersböck et al., 2001).

Using the reported present weather, an analysis based on more than 600 000 global synoptic data from 16 winter months was done, which made it possible to relate air temperature and dew point temperature to the probable distribution of liquid, solid and mixed precipitation phase (Fuchs et al. 2001). Based on these informations, synoptic precipitation observations can be corrected regarding systematic measuring errors, which makes precipitation analyses more reliable.

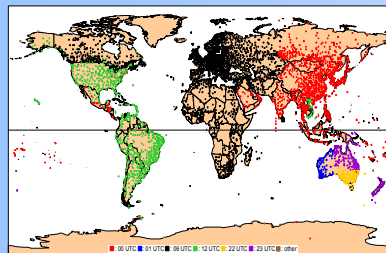
A global analysis of daily precipitation based on rain gauge GTS data is restricted due to the poor data density and different regional precipitation summation times.

As a new experimental product, GPCC analyses daily precipitation totals for the region of Europe on a $1^\circ \times 1^\circ$ -grid, beginning on January 1st 2001. Database are synoptic observing stations routinely received via GTS and corrected 'on-event' regarding systematic measuring errors. During the first half of year 2001, GPCC's 'on-event' correction factors were smaller than the monthly climatological corrections of Legates (1987).

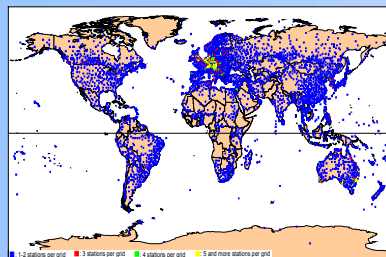
Database



Number of GTS-SYNOP stations usable for calculating daily precipitation totals corrected on-event for systematic measuring errors. Note the high day-to-day variability.

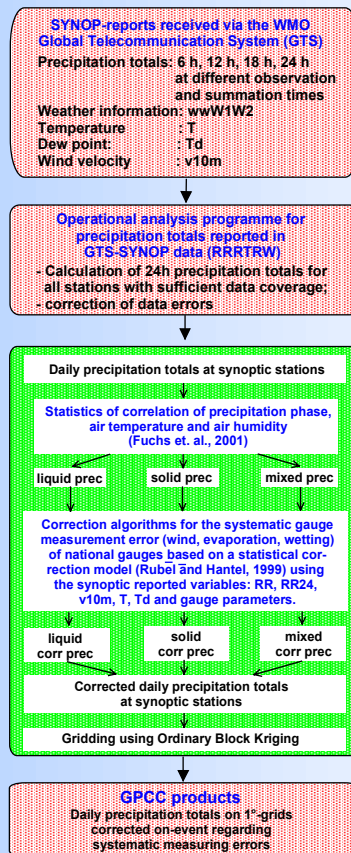


Summation times for calculating daily precipitation totals on 1° by 1° -grids based on GTS-SYNOP data. Day: 01.01.2001.



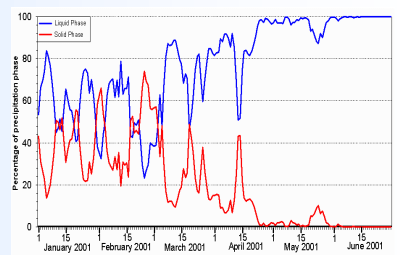
Number of stations per grid for calculating daily precipitation totals on 1° by 1° -grids based on GTS-SYNOP data. Most grids with more than 1 station are in Europe. Day: 01.01.2001, usable grids: 3851.

Data analysis scheme

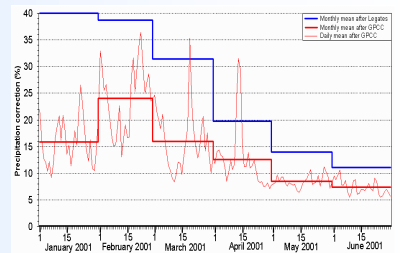


GPCC's scheme of data processing, correction and analysis of daily precipitation data based on synoptic data received via the Global Telecommunication System (GTS).

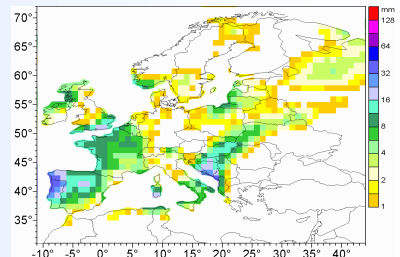
Results



Mean daily precipitation phases in Europe (31° - 72° N, 11° W - 44° E) from January until June 2001 based on GPCC's phase scheme.



Mean precipitation corrections in Europe (31° - 72° N, 11° W - 44° E) from January until June 2001 compared to Legates' mean monthly climatological corrections



Daily precipitation totals in Europe on 1° by 1° -grids, corrected on-event regarding systematic measuring errors. Analysis day: 26.01.2001

References

- Fuchs, T., J. Rapp, F. Rubel and B. Rudolf (2001): Correction of synoptic precipitation observations due to systematic measuring errors with special regard to precipitation phases. Phys. Chem. Earth (B), Vol. 26, No. 9, pp 689-693, in press.
- Legates, D.R. (1987): A Climatology of Global Precipitation. Publications in Climatology, Univ. of Delaware, 104 pp.
- Goodison, B.E., P.Y.T. Louie and D. Yang (1998): WMO Solid Precipitation Measurement Intercomparison. Final Report, WMO/ID-No. 872, Instruments and Observing Methods No. 67, Geneva, 88pp.
- Rubel, F. and M. Hantel (1999): Correction of daily rain gauge measurements in the Baltic Sea drainage basin. Nordic Hydrology, 30, 191-208.
- Ungersböck, M., F. Rubel, T. Fuchs and B. Rudolf (2001): Bias correction of Global Daily Rain Gauge Measurements. Phys. Chem. Earth (B), Vol. 26, No. 5-6, pp 411-414.