On the Reliability of GPCP-1DD Global Satellite Based Precipitation Estimates Over the Alps

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ABSTRACT

Recently one of the actual precipitation estimates of the Global Precipitation Climatology Project, the GPCP-1DD product, was introduced (Rudolf et al.,1999). The NASA (Huffman et al., 1997) provides for the research community with these GPCP 1 degree (latitude/ longitude gridded) daily precipitation fields based on a combination of different satellite estimates. In the 40° N-S belt IR estimates from geostationary satellites calibrated with SSMI/I data have been used. Outside this region the rain estimates are based on TOVS data from the polar orbiting satellites NOAA-12 and NOAA-14. These two satellites, with 0130/ 1330 and 0730/ 1930 local time equator crossing times, are flying simultaneously and provide global precipitation estimates based on a empirical relationship between rain gauge observations and a function of the cloud-top pressure, fractional cloud cover and relative humidity profile (Susskind et al.,1997).

High resolution observations from the MAP data archive have been used to evaluate the reliability of the GPCP-1DD products. Therefore the rain gauge measurements have been analyzed on the grid of GPCP-1DD products as basis for difference fields as well as commonly used accuracy and skill scores. Typical values for the mean error (difference) are ±2 mm/day and for the correlation coefficients 0.3 – 0.6. Probability of detection (POD), false alarm ratio (FAR) and true skill statistics (TSS) values are depending on the weather situation.

RESULTS

Daily rain gauge observations from the Mesoscale Alpine Programme (MAP) data archive have been used to analyze daily precipitation fields corresponding to those estimated from satellites (Fig 1). Based on these fields, which have been calculated from uncorrected rain gauge measurements using a kriging technique (Rubel, 1998), a comprehensive verification of the GPCP-1DD products was done from June - November 1997. Examples of the model domain are given in Fig 2. Timeseries of mean error (Fig 3) and selected verification measures (Fig 5) show the reliability of the GPCP-1DD products.

Additionally, daily correlations have been calculated, which are very poor. On monthly average these correlations are between 0.3 and 0.6 (Fig 4). The verification results indicate, that the 1DD resolution of the GPCP-1DD products might be too high resulting in an accuracy which is too low to use the products for NWP model or high resolution GCM verification. Nevertheless, the GPCP products are very useful in monitoring global daily precipitation regimes.

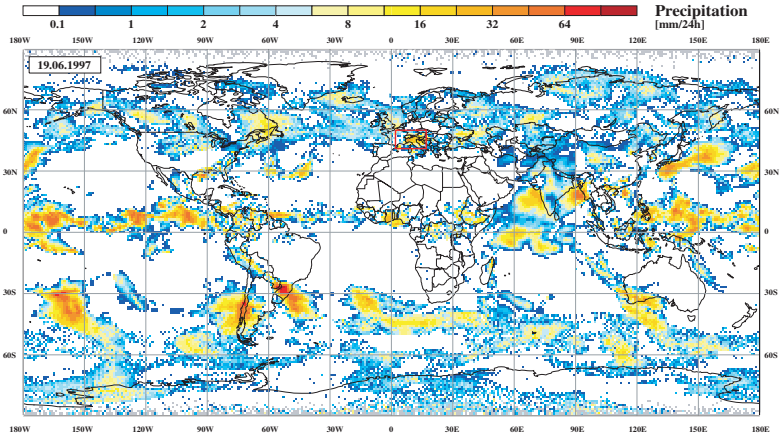

Fig 1 Global satellite precipitation estimates for 19 June 1997. Units in mm/day.

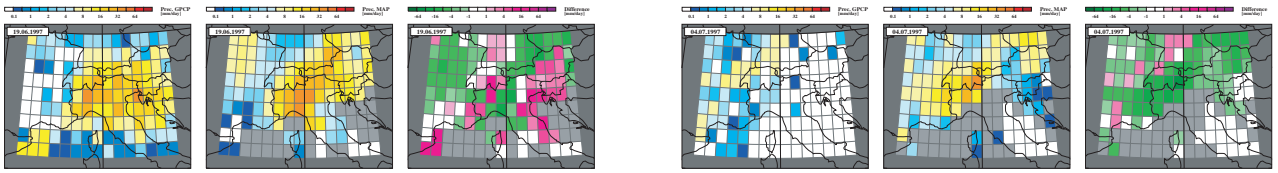

Fig 2. Comparison of observed (MAP) and estimated (GPCP) daily precipitation fields by 1° x 1° resolution over the MAP area, as indicated in Fig 1. The figure shows two typical situations; low estimation error on 19 June 1997 (left) and high estimation error on 4 July 1997 (right). Note, that the observations are not corrected for systematic measurement errors, resulting in an underestimation of about 5% during the summer months. (Rubel et al., 1999).

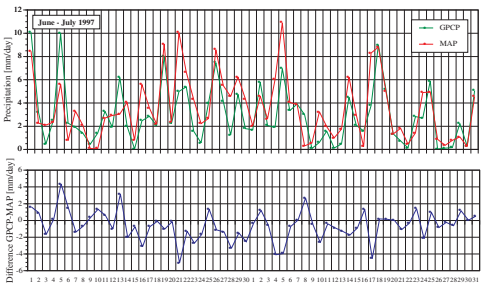

Fig 3 Timeseries of mean daily precipitation amount estimated from satellite (GPCP) and observed from rain gauges (MAP) as well as mean estimation error for June – July 1997.

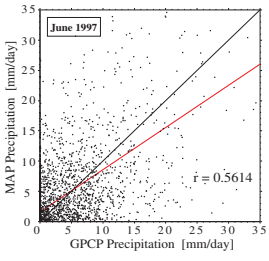

Fig 4 Monthly scattergram of daily values, GPCP vs. MAP for June 1997.

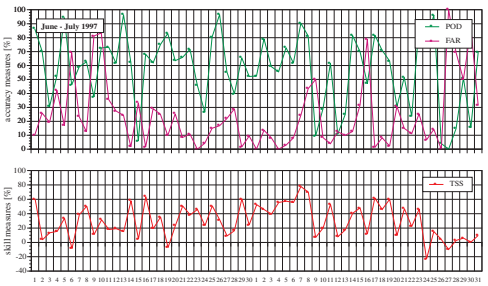

Fig 5 Timeseries of the accuracy measures POD and FAR and of skill score TSS for June - July 1997.

Acknowledgements

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