



Automatic and Visual Radar to Raingauge Quality Check - a Performance Comparison -

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When adjusting radar data to raingauge measurements, both data sources should be reliable. The best results with data comparison can be obtained by experienced observers. However, in a real-time context and for long data periods, manual procedures may be prohibitive because of their required amount of time.

Three different methods to check raingauge and radar data have been compared:

- a visual data comparison based on qualified data screening
- a similar approach to the Automated Quality Check (AQC)
- an automatic time series shape comparison procedure (ATC)

The results of the three methods were evaluated on a day by day basis.

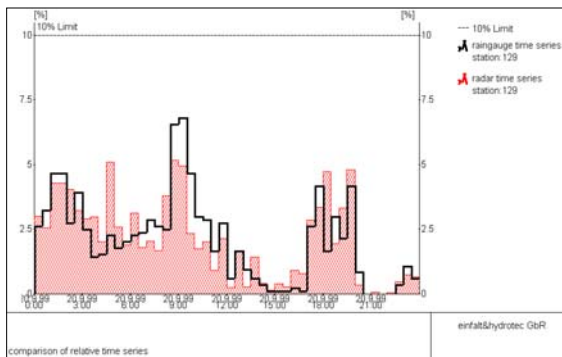


Fig. 1: Example for a nearly uniform agreement of radar and raingauge relative time series (station 129 of Piedmonte)

Used data sets

- 19 – 20 September 1999, Piedmonte region, Italy Monte Lema radar (Switzerland); 70 raingauges
- 1 – 7 June 2001, Northrhine Westfalia, Germany Essen radar (Germany); 29 raingauge

Conclusions

- The procedures can be used for initial data quality check as well as for measuring the improvement of radar data after correction.
- Both automatic procedures deliver results similar to the visual comparison:

	Comparison visual-AQC	Comparison visual-ATC
identical classification	110	158
one class difference	69	59
two classes difference	1	2
no rainfall	54	56
no comparison possible	109	68

Results of the two data sets

- The detection of a bad similarity of the two series is useful for the indication of insufficient correction of radar or raingauge data or to disapprove the data for radar data adjustment.
- A combination of an investigation of the precipitation volume and the shape of the time series is necessary for a comprehensive sight on the data quality. Therefore the two investigated automatic methods deliver useful results.

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The **Visual data comparison** is a subjective method.

Relevant characteristics for the visual comparison are the agreement of the distribution of the precipitation intensities and the correlation of the precipitation peaks.

The missing reproducibility of the results and the time consuming procedure are main disadvantages of this method.

The **Automatic quality control (AQC) procedure** is based on an approach of Amitai (2000). It defines five indices, which characterize the similarity between two time series based on collocated radar and raingauge data. In the VOLTAIRE project, a version of the procedure has been implemented in the VOLTAIRE QC library (Golz et al., 2006).

Data series pairs considered to be good need to fulfill threshold conditions for all five indices.

The **Automatic time series comparison (ATC) procedure** is a semi-empirical method to compare two time series, based on the temporal distribution of their relative shape. Each time series is transformed into a relative time series by normalizing the data on the daily sum (Fig. 1).

Four attributes were checked, and three similarity conditions needed to be fulfilled to yield a good comparison result.

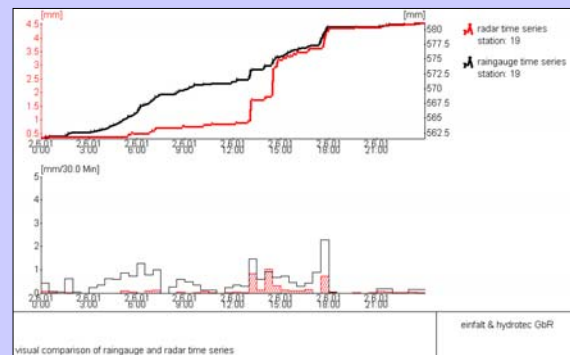


Fig. 2: Example for a bad agreement of radar and raingauge time series (station 19 of the BRW)

For the comparison of the different methods three evaluation classes were used:

- **Good** agreement (e.g. comparable intensity distribution, good agreement of the precipitation peaks)
- **Moderate** agreement between radar and raingauge
- **Bad** agreement (e.g. no agreement of the main precipitation peaks, different intensity distribution, no rainfall at one of the two time series, example in fig. 2)

The AQC and ATC methods are part of the **SCOUT** radar tools.

References

- Amitai, E., 2000. Systematic variation of observed radar-reflectivity rainfall rate relations in the tropics, *J. Appl. Meteor.* (Special Issue on TRMM), 39, 2198-2208.
- Einfalt T. and Golz, C., 2006. Radar data quality control - the VOLTAIRE software library, *ERAD 2006*, Barcelona.