Hydrol. Earth Syst. Sci. Discuss., 5, S2164–S2166, 2008
www.hydrol-earth-syst-sci-discuss.net/5/S2164/2008/

Hydrology and Earth System Sciences Discussions

HESSD

5, S2164–S2166, 2008

Interactive Comment

Interactive comment on "Evaluation of radar-gauge merging methods for quantitative precipitation estimates" *by* E. Goudenhoofdt and L. Delobbe

E. Goudenhoofdt and L. Delobbe

Received and published: 12 December 2008

We would like to thank Milan Salek for his interesting review.

Responses to specific comments

ORI stands for original radar data (will be added in Section 3).

The resolution of the radar polar data is 250 meter in range and 1 degree in azimuth. It is interpolated on a cartesian grid with a resolution of $600 \times 600 \mathrm{m}^2$.

As requested by Referee 1, Referee 5, and Milan Salek, we give some explanations for the choice of the radar area considered as representative of the gauge point mea-

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

surement. We are aware that the spatial sampling issue is of crucial importance when radar areal estimates are combined and/or compared with gauge point measurements. Those spatial and temporal sampling uncertainties are extensively discussed in the literature (e.g. Villarini et al., 2008).

In our study, we use the average over 9 radar pixels around the gauge location as the corresponding radar precipitation estimation. This corresponds to an area of 1.8 x 1.8 km2. The gauge position is then closer to the central part of the radar rainfall estimation area. This allows limiting the effect of wind drift which can be very important (Lack and Fox, 2007). A specific treatment of the wind drift has been proposed in the literature but this issue is beyond the scope of our study. We agree with Referee 1 that the spatial sampling error increases when the radar estimate is based on a larger number of pixels especially in convective situation. However this effect decreases with increasing accumulation time and is therefore relatively limited at a daily time scale. Besides, the use of a larger radar estimation area allows reducing the temporal sampling error. All in all, we think our choice is a good compromise for reducing the effects of wind drift, spatial sampling and temporal sampling errors. Furthermore, these effects have probably a minor influence on our results, which are based on long-term statistics.

To verify the consistency of our choice, we analysed the results when using a single pixel estimate for verification of the original radar data during the year 2006. It appears that the mean absolute error increases from $2.383\mathrm{mm}$ to $2.421\mathrm{mm}$. This supports the idea that the 9-pixel average is more representative of the gauge measurement than the 1-pixel value.

Finally, in response to Milan Salek, we want to notice that nor the gauge location, neither the azimuth of the radar observations is uncertain. A monitoring of the azimuth accuracy of the radar antenna is performed using point targets (electrical towers) located in the vicinity of the radar.

Concerning the methods involving Kriging, we used a climatological linear variogram.

HESSD

5, S2164–S2166, 2008

No nugget effect has been tested directly with this linear model. However, spherical and exponential models with different values for the nugget effect have been tested but no improvement were noticed. The climatological variogram was assumed isotropic which is probably a good approximation for the region of interest. However, it would be interesting to study the effect of anisotropy, especially if a daily adjusted variogram is used.

The technical comments will be taken into account for the revision of our paper.

References

Lack S.A., N.I. Fox, 2007: An examination of the effect of wind-drift on radar-derived surface rainfall estimations. Atmospheric Research 85, 217-229

Villarini, G., P. V. Mandapaka, W. F. Krajewski, and R. J. Moore (2008), Rainfall and sampling uncertainties: A rain gauge perspective, J. Geophys. Res., 113, D11102, doi:10.1029/2007JD009214.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 2975, 2008.