Hydrology and Earth System Sciences Discussions

Interactive comment on "Climatology of daily rainfall semivariance in The Netherlands" *by* C. Z. van de Beek et al.

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The authors would like to thank the reviewer for the comments. Our replies are

listed below.

There is no discussion about the quality control of this rain gage network. Can the Authors provide some discussion about it?

This is true and a short discussion and references will be added.

Pg. 2088, line 23: can the Authors elaborate on this sentence (and add one or more references)?

The use of semi-variograms to create random fields is described well by Diggle, P. J. and Ribiero Jr., P. J.: Model-based geostatistics, Springer, NY, USA, 230 pp., 2007. While it was not the goal of this paper to describe concrete applications we will add this and other references.

Could it be possible to add in Figure 1 a plot with the yearly cycle of rainfall?

This is certainly possible and will be added. A figure like Fig 7. will be created for Fig 3a. to illustrate this yearly cycle.

- Pg. 2089, section 2.1: could it be possible to add the value of the average intergage distance?

Certainly possible, and we will add a histogram to illustrate this.

- Pg. 2089, section 2.1: can the Authors please explain why values of rainfall less than 0.05mm are set to 0.05 mm rather than zero?

The hourly accumulations are available with an accuracy of 0.1 mm. Non-zero rainfall accumulations below 0.05 mm have been set to 0.05 mm in this dataset to indicate nonzero rain (this would otherwise be rounded to zero). While this might give a

slight overestimation for rainfall at very low intensities it allows for full coverage of all precipitation.

- Pg. 2090, lines 6-7: I personally don't have any particular problem with the isotropy assumption. However, could the Authors support this statement in a more extensive way, and add few references?

While the anisotropy is always an issue the effects are reduced due to the averaging over 90 days, which reduces the effects of wind direction. We also want to keep the number of parameters as low as possible to maintain a simple model. If too many parameters are included they might become interdependent and a sound statistical analysis would become highly complicated. We will add this to the text and some references on rainfall anisotropy.

- In estimating the semi-variogram, do the Authors use any robust fitting procedure? Can they please mention their fitting procedure?

The method is described in Diggle, P. J. and Ribiero Jr., P. J.: Model-based geostatistics, Springer, NY, USA, 230 pp., 2007. We will add a short description of the fitting procedure.

- In Equation 3, the Authors simplify the equation by removing the nugget. Is there any information about the quality of the 29 rain gages to suggest that measurement errors are negligible, therefore supporting their model simplification?

As can be seen in Fig. 3 the spatial variance is always above 1. The reported accuracy of the gauges is 0.1 mm, which means the nugget is around 0.01, which is negligible with respect to the total spatial variance. References to the quality of the network will be added as mentioned earlier.

- Pg. 2093 (Figure 3): can the Author provide any insight on why the signal in the standard deviation is much clearer than in the mean? Any physical reason for the 40-day differences between mean and standard deviation?

The rainfall climate of the Netherlands is such that total rainfall amounts are generally constant throughout the year. However, the spatial variation is governed by storm type, which does show clear seasonal variation in the Netherlands.

The shift might also be a result of the difficulty of fitting a function through the noisy signal of the mean. For the standard deviation this is much easier and therefore more accurate.

- Pg. 2095: I think that Figure 5 should be 6, and vice versa (see line 5 and rest of the text). Please check the figure numbering. See also Figure 10 on pg. 2098 (line 23): I think it should be Figure 11.

This is indeed a mistake and we will correct this. Figure 6 will be removed and simply be discussed in the text.

- Figure 5: as far as the range is concerned, it is not clear to me why the Authors fitted the cosine function to the data after sqrt-sqrt transformation, since the data is much more skewed. Please explain.

We applied the sqrt-sqrt transformation to the range to keep the applied changes similar to those of the sill. While the range did not truly need a transform as the data of the range was already fairly well distributed, the transform actually did improve the fit slightly. We will illustrate this in Fig. 7a and also look at the skewness and add this to the text.

- Figure 5: can the Authors please add the histogram of the RMSE before and after sqrt-sqrt transformation?

Certainly. We will add this to the figure.

- Please be consistent by either using "semivariance" or "semi-variance"

Good point and we will check everything to make it semi-variance.

- Pg. 2086, line 14: I would probably remove the adjective "closely"

Removed

- Pg. 2086, line 25: the Authors may want to add the following reference: Villarini, G., J.A. Smith, M.L. Baeck, P. Sturdevant-Rees, and W.F. Krajewski, Radar analyses of extreme rainfall and flooding in urban drainage basins, Journal of Hydrology, 381(3-4), 266-286, 2010.

Added

- Pg. 2087, line 16: it should be "satellites (e.g., Uijlenhoet"

Corrected

- Pg. 2087, line 23: the Authors may want to add the following reference: Villarini, G., and W.F. Krajewski, Review of the different sources of uncertainty in single-polarization radar-based estimates of rainfall, Surveys in Geophysics, 31, 107-129, 2010.

Added

- Pg. 2088, line 18: the Authors may want to add the following reference: Kirstetter, P.E., G. Delrieu, B. Boudevillain, and C. Obled, Toward an error model for radar quantitative precipitation estimation in the Cevennes-Vivarais region, France, Journal of Hydrology, doi:10.1016/j.jhydrol.2010.01.009, 2010 (in press).

Added

- Pg. 2086, line 11: Can the Author please explain the acronym "KNMI"?

We indeed forgot to explain this acronym. It stands for "Royal Netherlands Meteorological Institute" and we will add this.

- Pg. 2093, line 18: please explain the acronym "CV" in the previous line

It stands for coefficient of variation and will be added.

- Pg. 2094, line 14: why is there the word "semi" in front of "climatological"?

The dataset was extended at a late stage and this is a remainder in the text that was missed. Will be removed.

- Pg. 2095, line 5: the word "Figure" is missing in the brackets.

Added

- For consistency, do not use the capital letter when referring to a season.

Corrected

- Figure 5: please add the values to the x-axis.

Will be added

- Figure 9: Please add in the figure and the caption that the means are in the left panels and the standard deviations in the right ones.

Will be added for clarity

- Figure 13: shouldn't it be "semivariance/km" in the y-axis label? Also, please translate the labels on the x-axis into English.

It is indeed semi-variance and units will be converted to English.

C2607