Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2018-351-RC2, 2018

Hydrology and Earth System Sciences
Open Access
Discussions

Interactive comment on "Estimating Radar Precipitation in Cold Climates: The role of Air Temperature within a Nonparametric Framework" *by* Kuganesan Sivasubramaniam et al.

Anonymous Referee #2

Received and published: 26 July 2018

General comments:

The authors apply the non-parametric k - nearest neighbour method (k-nn) to estimate radar precipitation from gridded surface observations of rainfall and temperature for the Oslo region in Norway. They show that utilising temperature as second predictor variable reduces the root mean squared error significantly compared to a k-nn model without temperature and com-pared to the original procedure using a constant Z-R-relationship or separate snow/rain Z-R relationships.

The application of this method for radar rainfall estimation including temperature is novel and of interest not only for readers living in regions with colder climates. The

research is done systematically and quite carefully. The paper is written well and clear in structure. However, there are three major points and some minor things which need attention before the paper can be published. One main point are the lengthy introduction and background sections which could be shortened. A second important point concerns the method to estimate the partial weights. It becomes not clear, that this method is really providing optimal weights. And, third, there seems to be an issue with the back-calculation of Z using the inverse Z-R relationship on a different time resolution as for the original forward calculation. Detailed information about this and the minor things are given below.

Detailed comments:

1. Sections1 and 2: Both sections together cover almost 4 pages and represent the introduction with the state of the art. This is quite lengthy. The introduction is very general; the background is more focussed on the topic at hand. I would suggest to shorten these parts especially the introduction significantly and may be use the background as introduction.

2. Eq. 1: As predictor R(t) is used. Why not using Z(t) as predictor? For R(t) already a (wrong) Z-R-relationship has been applied, introducing great uncertainty. If a linear re-lationship is required a log-log transformation of Z(t) and Rest(t) could be applied be-forehand. This needs at least to be discussed.

3. Fig. 1: The units for observation length and elevation are missing. Also the text of the legend is tiny and nard to read.

4. Section 5.1: It is not clear if the estimation of the partial weights using partial information correlation (PIC) is really beneficial or even optimal. In order to prove the merit of PIC I would suggest to test two additional cases a) equal weights for P and T and b) using simple linear partial correlations. The performance for the latter two cases measured by RMSE should be worse than by PIC weighing.

5. Fig. 4: This bar plot is not easy to read. I would suggest to use box-whisker plots in-stead.

6. Page 16, line 1: The back-calculation of Z from R using a non-linear relationship on hourly data gives an estimated average Z value for each hour. This estimate can be quite different from the observed average Z value if the rainfall distribution within the hour is not unique. In the forward calculation the Z-R relationship is applied on 7.5 min Z values to calculate 7.5 minute rainfall intensities. Because of the non-linearity of the Z-R relationship a simple back calculation on a different time step than the one the original calculation was applied is not possible. For non-linear functions f is E[f(x)] < > f[E(x)].

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2018-351, 2018.