Hydrology and
Earth System
Sciences

Open Access

Discussions

Interactive comment on "The Analogue Method for Precipitation Forecasting: Finding Better Analogue Situations at a Sub-Daily Time Step" by P. Horton et al.

Anonymous Referee #2

Received and published: 11 July 2016

This is a good paper, testing an advanced analogue-based approach for statistical downscaling. The proposed method, although largely based on an existing method, but with new advancements, is an innovative one. The results show that the added value of the method is not that high or as expected, but this is also an important finding and of importance for future studies.

The paper is well written; I advise moderate revision.

Major comments:

The most important disadvantage of any type of analogue or resampling method is its limitation in sampling extremes. The method does not allow to sample more extreme

conditions than the ones available in the historical time series. I suggest the authors add a comment on this and explain to what extent also their method is influenced by this limitation. For the same reason, it would be useful to explicitly investigate the accuracy of the tail of the frequency distribution for the extreme precipitation values, e.g. by plotting the precipitation value versus exceedance probability or return period.

Given that HESS is a journal on hydrology and earth sciences, I would be good to specify more on the benefits of the method for applications in hydrology and water resources. I also note that the literature review is very limited; with only few international journal papers cited. Both comments can be addressed by adding some more literature review in the introduction section on the needs and limitations of existing methods for statistical downscaling in hydrology. Given the focus of the paper on the sub-daily time step, I suggest to refer more on the needs in urban hydrology. Some references that can be cited to refer to these needs and limitations of current methods given below.

Minor comments:

Line 47: "the observation time of the predictor": it is not very clear what was meant by this. I assume it refers to the time of the day (as specific in line 45), but I suggest to clarify this better.

Maybe I overlooked, but I do not find details on how the sample sizes N1 and N2 are determined and optimized. I assume they are determined by optimizing the SCRP score. In Table 4, the N1 and N2 values therefore are shown next to the SCRP score. But how exactly the optimization is done (which optimization approach starting from which initial ranges for N1 and N2) is unclear. I suggest to add short clarification on this.

Line 74: change "following" to "follows"

Line 102: change "precipitations" to "precipitation"

Line 152: change "all quantile seem" to "all quantiles are"

Line 216: change "ranges" to "range"

Line 272 – Header of section 4: I would not use the word "attempts" . . .

Suggested references discussing the needs and limitations of statistical downscaling methods for urban hydrology:

Willems, P., Arnbjerg-Nielsen, K., Olsson, J., Nguyen, V.T.V. (2012), 'Climate change impact assessment on urban rainfall extremes and urban drainage: methods and short-comings', Atmospheric Research, 103, 106-118

Arnbjerg-Nielsen, K., Willems, P., Olsson, J., Beecham, S., Pathirana, A., Bülow Gregersen, I., Madsen, H., Nguyen, V-T-V. 2013. Impacts of climate change on rainfall extremes and urban drainage systems: a review. Water Science and Technology, 68(1), 16-28

Sunyer, M.A., Bülow Gregersen, I., Rosbjerg, D., Madsen, H., Luchner, J., Arnbjerg-Nielsen, K. 2014. Comparison of different statistical downscaling methods to estimate changes in hourly extreme precipitation using RCM projections from ENSEMBLES. International Journal of Climatology, 35(9), 2528-2539

Willems, P. & Vrac, M. 2011. Statistical precipitation downscaling for small-scale hydrological impact investigations of climate change. Journal of Hydrology 402, 193–205.

Willems, P., Olsson, J., Arnbjerg-Nielsen, K., Beecham, S., Pathirana, A., Bülow Gregersen, I., Madsen, H., Nguyen, V-T-V. 2012. Impacts of climate change on rainfall extremes and urban drainage. IWA Publishing, 252p., Paperback Print ISBN 9781780401256; Ebook ISBN 9781780401263

Some other suggested references:

Zorita, E., Von Storch, H. 1999. The analog method as a simple statistical downscaling technique: comparison with more complicated methods. Journal of Climate, 12(8), 2474-2489.

Maraun, D., Wetterhall, F., Ireson, A. M., Chandler, R. E., Kendon, E. J., Widmann, M., Brienen, S., Rust, H. W., Sauter, T., Themessl, M., Venema, V. K. C., Chun, K. P., Goodess, C. M., Jones, R. G., Onof, C., Vrac, M. & Thiele-Eich, I. 2010. Precipitation downscaling under climate change. Recent developments to bridge the gap between dynamical models and the end user. Reviews of Geophysics 48, RG3003.

Furrer, E. M. & Katz, R. W. 2008. Improving the simulation of extreme precipitation events by stochastic weather generators. Water Resources Research 44, art. W12439.