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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Spatially shifting temporal points: estimating pooled within-time series variograms for scarce hydrological data" *by* A. K. Bhowmik and P. Cabral

Anonymous Referee #2

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This manuscript describes a method for estimating temporally pooled variograms. Whereas the authors claim that their method gives some improvement to what they refer to as existing methods, I struggle hard to see the advantage of their method. Actually I would normally have rejected this manuscript, but seeing that Reviewer#1 had similar concerns, which the authors claim to have addressed well in a revised version, I will give them the benefit of the doubt and give them a second chance and recommend major revision. I have not seen the revised version though, so my comments will only refer to the current version.

My main concern is that I do not see the reason for introducing a rather complex idea of

spatially shifting the points when the method just seems to estimate the 0 time lag bin for a spatio-temporal variogram. The authors claim in the answer to Reviewer#1 that averaging the fitted daily variogram parameters (as suggested by Gräler et al., 2011, but seems to be d) rather than c)) is the only way for estimating pooled variograms. My intuitive thought for creating a pooled variogram, however, would rather be to compute the weighted average of all empirical semivariances for each spatial lag. This is also how I understand method c) of Gräler et al., 2011, although it is unclear if they do a weighting according to the number of pairs for each time step. If I understand the method of the authors correct, this should give the same result, just without the added complexity of a random spatial shift. Using the data and the script from the supplement, the averaged variogram can then be computed as in section 2.2 of the vignette of the spacetime package in R: http://cran.r-project.org/web/packages/gstat/vignettes/st.pdf :

spacedata = spacedata[,c("PRCPTOTWet", "years")]

spacetime.dir = variogram(PRCPTOTWet $\sim$ 1, allSpPoints, alpha=41.90442, width=27.51, cutoff=550, dX = 0)

This variogram seems to be exactly equal to PRCPTOTWet.dir.SSTP, just achieved in an easier and less counterintuitive way. For a possible publication, the authors therefore have to explain if I have completely misunderstood something here, or if there are some additional advantages of their method.

Minor issues:

A method for variograms in data scarce regions can be just as useful in developed countries, so please remove the limitation to development countries.

The authors recommend temporal pooling of variograms as this can overcome the issues of few data points. However, they should then also discuss the issue of how temporal correlation affects the effective number of observations, and that long time series from a few locations with the same temporal pattern will only give minor improvements

to the individual variograms.

P2246, L2 As far as I can see Schuurmans et al. (2007) refer to an experiment where a few rain gauges were put out with very small distance between them. This is independent of the use of pooled variograms

P2249, Eq 1. What are n and N? This matrix could well be better explained.

The description of the variogram on P2250 looks a bit strange. Is the spatial lag a distance or a vector?

The I's and j's around Eq 5 does not seem to be the related to the 1, ..., n of Eq. 5. Does the first part of Eq. 5 really reduce the uncertainty of short distance spatial variability?

P2251 L16 I do not think a was replaced with the anisotropy parameter, rewrite.

P2252 L23 I guess it should be 1948-1975?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 2243, 2015.