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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Hydro-stochastic interpolation coupling with Budyko approach for spatial prediction of mean annual runoff" *by* Ning Qiu et al.

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This manuscript describes a coupling of the Budyko approach and hydro-stochastic interpolation. The topic is interesting, the results good, but revisions are necessary before possible publication, particularly related to the presentation.

I am a bit surprised by the relatively poor performance of the application of hydro-stochastic interpolation directly. It is also interesting that two methods that both over-estimate parts of the prediction area can achieve a better result together. I tried to understand how this could be from Figure 7, but the use of different color keys make it difficult to compare the maps. This should be the same for the three maps. I would

also have liked to see the similar map for the observations, and maybe also a map of the residuals. Adding these maps would also help the authors in improving the conclusions, which is currently more like a summary of the results section. I would rather like to see some more discussion around how the combined method can be so much better than the individual methods.

The methodology in Section 2.2 covers almost 5 pages, and is mainly from from Sauquet et al. (2000), somewhat rewritten. It should be shortened, and the text must be more precise.

In Eqs 1-2, is only one w calibrated for all sub-basins, or is it calibrated separately for each sub-basin. If the second, is it then interpolated to uncalibrated locations (or for cross-validation locations)?

The text needs improvement. Copy-editing is necessary, preferably from someone with knowledge about spatial interpolation. A list of necessary edits is given below, but the list is not exhaustive.

Some edits:

P2L14 I think it is better with "relationships between"

P2L19 Maybe rather "spatially interpolate runoff. . ."

P2L24 determination COefficient?

P2L31 "accurate way in spatial interpolation. . ." something is wrong.

P3L37 something is missing

P3L43 I think the authors rather want to say that "Geostatistical approaches are commonly used for spatial interpolation".

P3L44-46 "similarity of a generalized stochastic field" – what is meant by this? And what is multivariate here? Rewrite sentence.

P3L47 remove “of values”.

P3L49 “kriging is the MOST popular . . .”? (or is A popular)

P3 Kriging -> kriging

P4L57 remove “also suggested as”

P4L63-67 This sentence is not understandable.

P5L87 remove “of”

P94-96 Clumsy sentence.

P6L103-104 I do not understand what is meant here.

P6L111 incorporate -> combine?

P6L114-115 difficult to read, rewrite sentence.

P7L126 what is meant with terrestrial scale here?

P7L138 popularly -> frequently?

P8L152 Delete “interpolation” after Kriging and “The” before “Gottschalk’s”

P8L155-L158 The definition of basin area as specific unit should be at L155.

P10L188 (Sauquet et al., 2000) (Sauquet and Gottschalk, 2000) occurs several times, missing the last author.

P14L268 has the highest population density?

P14L272 more than 50% is exploited or water resources are overexploited?

P14L27 “increase difficulty in . . .” -> something seems wrong, revise

P14L279 data packages or digital elevation models?

P17L335 the EMPIRICAL covariance?

P17L342-343 “to obtain the . . .in sub basins A and B” is confusing and can probably be deleted.

P17L350 Maybe “This function is then used for the covariances in the covariance matrix in Eq. (17).”

P17L352 The sentence is clumsy. Also, as MATLAB is mentioned here, I guess it was used for all/most of the analyses? Whether yes or no, it is better to describe in general which software was used, maybe also if there were particular add-on packages.

P18L365 Departures (or deviations) FROM the trend.

P19L380 What is perdition here?

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