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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Multiple Causes of Nonstationarity in the Weihe Annual Low Flow Series" *by* Bin Xiong et al.

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General Comment This work covered an interesting topic. It is qualified for HESS after a minor revision. Authors incorporated multiple variables into time-varying model by GLM, and called this a nonstationary mode considering TCCCs. They calculated and compared AIC of this mode with that of the stationary mode and the nonstationary mode with a single covariate in two stations in Weihe. Then they concluded this TCCCs nonstationary mode was the optimal one for nonstationary low flow frequency analysis in Weihe. It's a pity that they did a lot of work without clearly stating their motivation. Authors first raised an issue in review that the previous studies in low flow failed to provide a link between hydrological process and frequency analysis, and this made it difficult for tracing the origins of low flow change. While readers might think they intend

to trace these origins (which was also hinted by the title), they defended that "the goal of this study is to develop a nonstationary low-flow frequency analysis framework". It is better for them to keep consistent in the whole introduction section. Besides, to better show the advantage of this framework, which was composed of the time-varying andGLM method,they should compare it with other modelsusing only climatic indicators or a single indicator of human activity, just as they mentioned in the review, not just the mode with either AIk or BFI as the explanatory variable. In addition, there are some mistakes and improper statements in this paper; outlines of methods and results are unclear, and the discussion is weak. It is better for authors to put together contents of results and discussion, and further discuss their results and compared with other related works.

Specific Comment The logic of review in the introduction is not smooth. Some references mentioned in the paragraph starting from Line 52, such as Lars Gottschalk's work, were badly concluded and they'd better be put in the next paragraph.

A flow chart of methodology is needed.

Line 127 Meaning of this sentence is obscure.

Further explanation for the selection of 8 candidate variables is needed.

Indices more related to irrigation, like irrigation area, need to be considered, since (Line278) In the Weihe basin, the impacts of agricultural irrigation on runoff have been found to be significant.

Both those 8 explanatory variables and data resources can be summarized in two tables.

I don't see much use in Figure 2.

Why do you need to study all the series from AM1, 7, 15 to 30?

In some subplans in Figure 8, AIC of either M2 or M3 is worse than M1. What is the

probable cause? The conclusion in Line 391 cannot be directly generated from Figure 8.

What is the impact of location difference on the different AIC results in two stations? Needs to add discussion.

The standard of selecting M4 variables with stepwise selection method needs to be further clarified.

Table5 and 6 can be merged into one table.

Formula 2, no need to put “i=” on the top

Table2, add explanation for parameters down below the table

The definition, reason of selection, and formula of 8 indices should be listed in a table.

Line228, 234, 242 add blank space before the paragraph (need to check in the whole paper)

Line298 slash tag between “n” and “day” is missing (check the whole paper)

Line304 mistake in time tense

Line388 incomplete sentence

Figure1 mark the location of Weihe in the map of China with a rectangular frame

Figure3 adding R

Figure 3 &4 lines are too thick

Figure5&6 differences among colors are too delicate to be seen

Table 3 &4 add division lines among rows of different stations

Mistake in references, year of “Bivariate frequency analysis of nonstationary low-flow series based on the time-varying copula” was 2015

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