

## ***Interactive comment on “Copula and ARMA based study of controlled outflow at Farakka barrage” by Uttam Singh et al.***

**Anonymous Referee #3**

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The manuscript presented uses copulas to estimate outflows at Farakka barrage. They develop and test different types of copulas and compare them with stochastic ARMA models. They show that copulas outperform ARMA models. The manuscript has several significant weaknesses and, consequently, I regret to inform the authors that I must propose its rejection.

First of all, the manuscript lacks neither a research gap nor a research question that justifies the use of the proposed methodology. Authors should clearly present a research question (why is the purpose of using copulas) and why do they believe that copulas are a suitable alternative to answer it. Without these considerations, one may believe that the paper is just an academic exercise with no purpose but to prove they can do copulas. The introduction needs to be substantially re-written, results should

C1

be aligned to the question introduced and conclusion should indicate why the use of copulas properly answered the research question.

Furthermore, there are some points in the research presented that need to be improved from my point of view. I do not understand why they use data between 1949 to 1968 to calibrate copulas and data between 1969 to 1973 to validate them. There are no data records after 1973? I also lack a proper explanation of the input and output variables, since there are just two mentions (and one is in the conclusion) about the fact that the variables used to make copulas are the pre-monsoon and the post-monsoon discharge values (although it is true that a reader familiar with copulas may guess by himself/herself which variables are used). Which months of each season are used to generate discharge scenarios for the next month? Authors should be careful when presenting the research in order to allow it to be replicable and fully understood by potential readers.

Another point in which the manuscript should be improved is the fact that the information provided is not balanced according to its importance. For example, authors devote 1.5 pages to explain the wide-known concepts of Mean Square Error, Akaike Information Criterion or Bayesian Information Criterion while they do not indicate where Farakka barrage is located and why is it important to model its outflow. For a reader, it will be more important to know the latter. Similarly, they spend 2 pages explaining how the copula parameters are estimated and validated while they devote 16 pages to the explanation on how to develop an ARMA model. A proper research paper should sort the information according to its importance, providing detailed explanations of the novel concepts rather than focusing on well-known indices and in the benchmark method.

Moreover, the abstract and the introduction are very poor and totally fail to summarize and frame and present the research done, respectively. The introduction in particular is written carelessly and its content is unsorted, going back and forth with concepts, applications and indices. For example, they present the types of copulas they use in lines 43-45, but the explanation on what a copula is appears in lines 86-88, after the

C2

presentation of the criteria used to choose among different types of copulas (lines 59-65). A review of the state-of-the-art, the research gap and how this gap is addressed is totally absent in the introduction. As a result, any potential reader would be either lost or angry after reading the introduction, being unlikely that he/she reads the rest of the paper. The English language used by the authors is also poor, I encourage them to get it checked by a native English speaker. Authors should entirely re-write the introduction.

Considering all the points raised, and the fact that the paper needs a significant re-writing, I would not provide detail comments.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2018-380>, 2018.