

This paper aims to improve water resources allocation under uncertain inflows. This was achieved by incorporating the Copula function into Robust optimisation and probabilistic analysis of robustness algorithm (ROPAR), so that the uncertainties in multiple inflows can be considered. The paper seems relevant and interesting for the readers of this journal. However, there are several issues to be addressed and clarified before considered publication:

1. Literature review in the introduction needs to be improved to highlight the motivation and the innovation of this study:

(1) In the introduction, some limitation statements are too arbitrary without clearly explaining what previous studies did, and the purpose of doing so. For example, [Line 49-55] The authors stated that several works consider uncertainties in the water resources allocation problem without explicitly evaluating the robustness, and then jumped to the conclusion that they did not explicitly evaluate the robustness. What is scenario building/TSP, and how it is effective for planning?

(2) The authors should highlight and explain “Why does robustness need to be considered?” This is important because there are other Copula-based optimisation studies for water resources allocation but not consider the robustness.

(3) More explanation of the limitations of ROPAR [Line 76-81] is needed to understand the limitations of the current version and the motivation for adding the Copula function into ROPAR. For the limitations, I do not think that ROPAR has not been applied in water resources allocation is a “limitation” of the algorithm itself. And why does the joint probability need to be considered? This should be explained with a context of how the current ROPAR works, and the need for considering joint probability before this paragraph. The authors state that “it does not take into account the relationship between two objective functions” – if ROPAR shows the Pareto front, why does it not consider the relationship between two objective functions?

2. Methods used need to be better explained:

(1) How the Copula function is used in the paper should be explained in more detail.

(2) Why “it follows a normal distribution with a mean of 1 and standard deviation of 0.05” [Line 153]? How are the mean of 1 and standard deviation of 0.05 selected? Is it applied to the case study only or part of the generalisable methodology framework?

(3) How the ideal set of solutions is selected needs to be better explained in detail as this is directly connected to the results in Figure 6.

(4) The statement in Line 174-175 is not correct. Whether robustness criteria is minimised or maximised should depend on the management objectives. For example, if one tries to maximise the water supply reliability, the expected value of the water supply reliability should also be maximised not minimised.

(5) Why use a weighted sum method for normalized RCs?

(6) How is water demand considered in this study? Only Figure 3 shows the demand proportion for each city. Then what is the minimum and maximum water demand in equation (14)?

3. Results also need to be better explained:

(1) What are AIC and BIC [Line 236-237], how are they used in this study and how to read the results of Table 1?

(2) Section 4.3: NSGA-II can also be used in robust optimisation. How NSGA-II was used in this study, the parameter settings and which input value was used need to be explained. I did not see the optimisation results of using NSGA-II here.

(3) What does Table 3 show? Why is it important to show the number of solutions? This needs to be explained in the text.

(4) Figure 7 shows the robustness values from four different criteria. These are not Pareto fronts. The tradeoffs between the robustness values could be due to the tradeoffs between the original objectives (water deficit and pollution). This is not very surprising. Also, how the solutions are numbered? This might be related to the numbers in Table 3.

(5) Figures 8 and 9 need to be explained on how the x-axis and y-axis means before explaining the results. Also, in Figure 9, the proposed methodology performs worse than the deterministic method if I understand correctly. Then why the proposed method should be used?

(6) What is “comprehensive” performance in Line 329? How are deficit and population considered in this part?

(7) Figure 12 is complicated but important for the readers to understand the results. So it would be important for the authors to clearly explain what the figure is about/how to read the figures before analysing the results.

(8) The beginning of analysis for Figure 13 [Line 366-370] is not very relevant to the figure. The text focuses on the tradeoffs between supply deficit and pollution, which was shown in Figure 6.

(9) Where do different sectors of water (agricultural, domestic and industrial water) come from? How were they considered in the method?

4. The structure of the paper needs to be re-organised:

(1) Figure 1 in the introduction should be part of the methodology if I understand correctly, and needs to be explained in text to help the readers understand the flowchart.

(2) The Methodology should come before the case study, introducing the general framework proposed. And then explain the case study and how the framework is applied to the case study.

There are a lot of details in the methodology that apply only to this case study, for example, Line 143-147.

(3) There is part of the method of the Copula function seems to be a literature review (Section 3.1), which is not suitable for taking up a lot of spaces in the methodology.

(4) Section 3.2: It would be better to compare the CM-ROPAR and the current version of ROPAR with a figure. And the description looks like a mix of algorithm description and the normal description text.

(5) Section 4.1 in the results is part of the method, not the results.

5. Several terms need to be better defined:

(1) How is robustness defined? It may be defined very differently for different areas of study.

(2) [Line 14] multiple uncertainties/ [Line 16] numerous uncertainties: when I first read "multiple uncertainties", I thought this paper deals with multiple sources of uncertainties, such as inflows due to climate variability/climate change, water demand due to population growth, etc. Or it can refer to input uncertainties and model structure uncertainties. And in Line 76-77: the word source is again misleading. But in this paper, "multiple uncertainties" refers to the multivariate uncertainties in multiple inflows in the system.

(3) What is "explicitly" [Line 54] evaluating the robustness and "hidden" [Line 62-63] in the objective function?

(4) What is the joint probability of these sources [Line 77]? How is joint probability defined/calculated? What does the "source" refer to?

(5) What is "wet-dry encounters" [Line 104]? How is it defined?

(6) How is normalized RC [Line 201] defined?

(7) Why is water deficit considered as "Social Goals" [Line 208]?

6. I would suggest the authors polish the writing of the paper, especially focus on the accuracy of certain words and sentences used. This includes but not limited to the following:

(1) Line 13-14: Why ROPAR is a well-suited tool for dealing with uncertainty?

(2) Line 15: What are the differences between the robust optimization proposed and the developed ROPAR?

(3) Line 28: Why mention water quality problems since the paper does not deal with water quality issues?

(4) Line 42: How is multi-stage defined here?

(5) Line 44-46: There is an overlap between this sentence and sentence Line 32-33.

(6) Line 67: “answer” limitation is not correct

(7) Line 97: Here it seems Figure 2 shows the location of the river basin in China from the writing, but Figure 2 shows the conceptual figure of the water allocation scheme.

(8) Line 256: typo in the title: CM-ROPAR, not MROPAR. Please check through the manuscript.

(9) Line 370-371: What is scenario mean here? Is it a certain solution?

(10) There is a lack of explanation for many figures/tables. It would be helpful to add titles, x-axis and y-axis titles and units in the figure, and sentences in text to explain what the figures are about.