

Interactive comment on “A coupled Bayesian and fault tree methodology to assess future groundwater conditions in light of climate change” by J. J. Huang et al.

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We wish to express our sincere thanks to you for the constructive comments, suggestions and valuable time spent on reviewing our manuscript. Accordingly, many modifications were made to clarify many items in the paper. Further explanations corresponding to your comments are listed as follows.

General Comment Authors applied Bayesian and faulty tree methods to assess the aquifer with the change of climate. The paper is interesting and suitable for the HESS journal. In essence, the paper applied the coupling of these two methods into a real

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case study. In the current version, I did not see any new knowledge/contribution or new methodology development to the scientific community. If authors want to highlight the application rather than the methodology development, the key question is whether this study could give new insights which can be borrowed by other similar cases in the world. Until now, I did not see this. I would like to recommend major revision with several specific comments below.

A: 1. To answer this question, we have added one paragraph in the section of introduction. Please see lines 100-117. 2. The novel methodology is that 1) we use the Bayesian data mining approach and data transfer technology to solve the validation problem for the fuzzy algorithm 2) the model was validated using long-series observed data which represents a wide spectrum of changing environment conditions and therefore it can be used in the assessment of climate change impacts 3) this model quantifies the interactive effects of climate factors and human activities on groundwater recharge conditions which have not been seen in other literature 4) the methodologies developed in this study, including the coupled modelling framework, the model validation approach, and the way to quantify the interactive effects of climate factors and human activities, are worth to be applied to other similar cases in the world

Comment 1 a case study does not indicate any contribution or new knowledge. A better motivation of this study is needed. Specifically, in the page 9363, 9364, what is the conclusion of previous studies? What is the difference between this and other studies, except that you applied a new approach to this case? why did you choose faulty tree and Bayesian analysis? What is the advantages of these approaches, compared with others?

A: 1. The conclusion of the previous studies is “These research findings indicate the water resources (surface and groundwater) in Minqin Basin are highly vulnerable to climate change.”

2. First, the fault tree and Bayesian data mining approach chosen for this study is

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totally different from other studies and we also quantify the interactive effects of climate factors and human activities, which have not been seen in any other literature. 3. The advantage for use of the Bayesian data mining approach is to take the maximum benefit of data and let data to speak them out. Fault tree provides a systematic way to find the causes of the risk from top to bottom; with the assistance of Bayesian data mining, the causative impacts can be clearly presented and quantified.

Comment 2 2) I have to confess that I am not an expert on climate modeling. I am curious that you only considered the variation in time, for example, for the temperature. Did you consider the spatial variation? The spatial heterogeneity also plays a key role.

A: The resolution of the CGCM used in this study is 3.75x3.75 degrees. The Minqin Oasis is a relatively very small area in the context of climate change. The spatial variation is therefore not considered in this study.

Comment 3 The conclusion is too general. A specific summary and suggestion are needed.

A: The conclusion and the abstract have been rewritten to address the reviewer's comments.

At the end, we would like to take the opportunity to thank you again for your valuable effort in making the paper clearer and better.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/11/C4605/2014/hessd-11-C4605-2014-supplement.pdf>

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