

## ***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.***

**Anonymous Referee #2**

Received and published: 14 September 2014

### General comments

The paper presents a combination of a fault tree methodology with a fuzzy logic and Bayesian data mining in order to assess the impact of climate change upon the groundwater table depth in the Minqin Oasis in China.

In my opinion the paper does not contribute with new scientific knowledge. The authors present an application to a case study where the results are scarce. The main result is the estimated groundwater table drop, and it is not clear how this number was calculated. The estimated groundwater table drop rate considering climate change is very

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similar to the “actual” rate, which according to the authors is due to the intensive exploitation. From the discussion is not clear what the real impacts of the climate change are. No conclusions are given regarding the methodology neither the application.

I recommend mayor revisions, which should be focused on clarifying the research question, improving the results and discussion, and giving insightful conclusions.

### Specific comments

In the abstract it is mentioned: “To assist planning to protect against desertification, a fault tree methodology, in conjunction with fuzzy logic and Bayesian data mining, are applied to Minqin Oasis, a highly vulnerable regime in northern China.” And neither in the results nor in the conclusions it is mentioned how the used methodology assists on planning to protect against desertification.

In the introduction it is mentioned: “Investigation of climate change impacts on lowered water tables will provide a clearer picture of the potential for ecosystem failure and provide insights into selection of optimal measures for improving the environment.” And nothing is mentioned in the conclusions about it. How much will affect to the ecosystem a drop on the groundwater level of 0.6 m/yr-1? There is nothing said about optimal measures for improving the ecosystem.

In the introduction is missing a review of the state of art of the use of the fault tree method in subsurface hydrology. It is also missing a clear research question that the paper tries to answer.

I think a better explanation of the method is needed.

In section 2.3 it is mentioned that the natural vegetation needs 500 mm for a healthy growth, but the paper focus on the depth to the groundwater table. How deep can the groundwater level be in order to still have healthy vegetation?

What is the spatial resolution of the climate scenarios used? How many cells did you considered in your case study? What is the spatial variation of the variables consid-

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ered?

In section 3.2 there are several paragraphs that were already mentioned before.

In line 20 of page 9376, It is mentioned: "Risk factors for the decline of water table levels in the three scenarios could be transformed to the rate of descent in water table levels" This is most important result and it is not explained how it was calculated.

There is nothing mentioned about the recharge process.

Through all the paper it is mentioned several times that the climate change will have negative effects on the groundwater table. However, in line 10 (page 9376) it is mentioned that the risk factors are lower than the year 2004. It is also mentioned that 2004 was a dry year, why did the authors chose this year? It is also mentioned that the groundwater withdrawal is the responsible of the groundwater table drop. Therefore, what is the real impact of the climate change?

As already mentioned, I think the conclusions need a significant improvement. What are the advantages of using this methodology? Can the authors give some recommendations that can be extrapolated to other case studies? Can something be said about the climate change scenarios? How much will affect to the ecosystem the estimated groundwater table drop? In several parts of the text is mentioned that is important to have a healthy natural vegetation, how can this be achieved? What is the real impact of the climate change?

Technical corrections Line 11-13 on page 9362 – The sentence is not clear. Which implications?

Line 5 on page 9363 - What does 'bgs' stands for?

Line 11 on page 9364 - Include a reference to the statement.

Line 17 on page 9365 – Include a reference to the statement.

Line 28 page 9367 / line 1 page 938 – I believe that the number 8 should a superscript.

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Figure 1 – It should focus on the area of the case study

Figures 6, 7, 8 and 11 can the three scenarios be shown in one figure?

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 9361, 2014.

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