

## ***Interactive comment on “Agricultural groundwater management in the Upper Bhima Basin, India: current status and future scenarios” by L. Surinaidu et al.***

### **Anonymous Referee #3**

Received and published: 21 November 2012

This paper is about the management of groundwater in basaltic aquifers of the upper Bhima River basin in India, in the context of future climate change and intensive exploitation of the resources of agriculture. This topic is highly interesting and surely important for the future of the region.

However, this paper suffers from several weaknesses. The most important problem is related to the simplicity of the numerical model. The authors describe the geological and hydrogeological contexts as highly heterogeneous, with variable layers, thicknesses, hydraulic conductivities and specific yields. They however use a very simple

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model with only one geological layer and uniform thickness, which does not really correspond to the weathered basaltic zone, as described in the paper. The specified stresses of the system (precipitation, recharge) are also described as very variable according to the location in the modeled basin. The inputs of the model are however prescribed as uniform over the area. Moreover, the conceptual model is not explained in details. There is a constant boundary condition in the southeast edge of the model, but we do not know exactly where this condition has been imposed. This should be referred in a figure. Concerning the other boundaries of the model, no information is provided in the manuscript. Similarly, the calibration of the model is not described sufficiently. I would like to see the results presented in a graph or a map of the region to analyze spatial trends. Additionally, it is not clear if the simulations have been performed in steady-state conditions (p10666, line 15), or in transient conditions (11 years period?, p10666, line 22). In p10667, the model calibration is considered as sufficiently robust to be used for predictions purposes but the arguments of the authors are not presented. Therefore, an important work must be performed to improve the model and its description in the manuscript.

Recharge and pumping rates are calculated using simplistic empirical relationships. The equations are presented in the manuscript without explanations, what is not acceptable. We do not know how groundwater discharge is implemented in the model. Is groundwater discharge only possible along the constant boundary condition or also within the basin? Future climate change scenarios are also implemented with very simple relationships, without any change in the frequency of rainfall events. Are the temperature changes considered in the analysis? The authors have to discuss the implications of all these choices on the predictions.

The geographical context of the basin could also be described with more details. For example, I think that adding the topography to Figure 1 could be very useful for the reader to understand the system functioning. Similarly, describing rainfall using calendar month names could also facilitate the reading of the paper. The authors use many

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local references in the manuscript. However, a lot of work has been performed in the topic of groundwater modeling and climate change scenarios. In a research paper, I think that a discussion should be provided about the work described in this paper in the context of past research.

Finally, the format of the manuscript should also be improved. Figures are not referenced sufficiently in the text. Some sentences are not clear or difficult to understand and some acronyms are not explained.

Considering these comments I recommend that a very important work should be performed to improve this paper.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 10657, 2012.

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