



Interactive comment on “Assessment of conceptual model uncertainty for the regional aquifer Pampa del Tamarugal – North Chile” by R. Rojas et al.

Anonymous Referee #3

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This paper is an extension/combination of the authors' previous work published in Rogas and Dassargues (2007) and Rojas et al. (2008a). The GLUE-BMA-based model averaging method developed in Rojas et al. (2008a) was applied to the alternative groundwater flow models developed for the Pampa del Tamarugal Aquifer (PTA), which was modeled in Rogas and Dassargues (2007). I believe many observations from this study related to multimodel analysis will be of interest to the groundwater modeling community.

While field applications of newly developed methods are always interesting and impor-

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tant to further evaluate and develop the method, the field application presented in this study does not appear to provide much insight for evaluation and/or development of the GLUE-BMA-based model. In other words, this manuscript appears to be more like an application rather than for theoretical advancement.

Below are my detailed comments that may be useful for the authors to improve the paper quality.

1. Objective of this study

It is unclear about the authors' purposes of conducting this real-world modeling. While the authors explained significance of conducting groundwater flow modeling for the PTA, it would be useful to explain what particular problems were tackled for the real-world application. For example, for the variables simulated by the flow models, BMA performance is different and model uncertainty behaves also in different ways. If the authors can focus on the most important variable for the PTA models and have more in-depth discussion, this manuscript would be more interesting. For example, if the outflow (Figure 8e) is the most important variable for this modeling, there may be no need to consider the alternative models.

1. Effect of parameter distribution

The ranges of parameters listed in Table 3 are very large, varying in several orders of magnitude. Given that the uniform parameter distributions are assumed in this study, the deviation between the results of this study and those of previous studies (e.g., those shown in Figures 6 and 8) might be related to the parameter distribution. On the other hand, it appears that parameter correlations are not considered in the sampling. This may also affect the modeling results. For example, in the context of model calibration, the estimates of hydraulic conductivity and recharge are correlated. Ignoring this correlation may yield biased results.

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In the titles of Figures 6 and 8, the authors referred the results of “previous studies”, but it is unclear which previous studies the authors are referred to.

(3) Thinned samples

The thinning may affect the calculation of mean and variance, in particular when the thinning was conducted at regular frequency, irrelevant to the statistical distribution of the data. It may be worthwhile to investigate this effect.

(4) Difference between the modeling results of BMA and single models

Although the authors presented modeling results in terms of the likelihood surfaces and the distribution functions of various variables at different locations. It would be useful to present the modeling results of the individual models (or of several most plausible models). This will give readers an overview of the difference of the model results in terms of their spatial distributions. The spatial distribution would be complementary to the likelihood surfaces and the CDFs.

(5) Principle of parsimony

Since the posterior model probabilities calculated using the GLUE-BMA method are simply based on model-fit, the principle of parsimony is not considered. Would this affect the model averaging results?

(6) Standard deviation discussed in pages 5899 and 5900

It is understandable that the rule of three sigma is used, but it is unknown based on what the value of 10m is assumed. Is it reasonable to test validity of this assumption based on the field observations?

(7) Future research

Some discussion of future research for this site may be interesting.

Some minor comments:

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- (1) Line 27 of page 5885. Replace “a fourth model” by “fourth model”.
- (2) Line 17 of page 5893. Approximation to what?
- (3) Lines 18-19 of page 5898. Edit this sentence.
- (4) Line 10 of page 5904. What is “ca.”?
- (5) Lines 15-17 of page 5905. What is the significance of this observation?
- (6) Lines 12-14 of page 5906. This sentence may need clarification.

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