Bayesian model averaging for identifying the most robust conceptual model

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IDEAS TO IMPACT

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PREFACE

The current study presents the uncertainty assessment of conceptual models for the aquifer of Campina de Faro using Bayesian Model Averaging (BMA). The aquifer system in the area is bordered to the north by the less permeable deposits of Cretaceous, to the east by the Quelfes aquifer system and to the west by the Quarteira aquifer. These aquifers appear to be connected. The main flow direction is from north to south and the aquifer's main discharge is into the protected coastal lagoon, Ria Formosa .

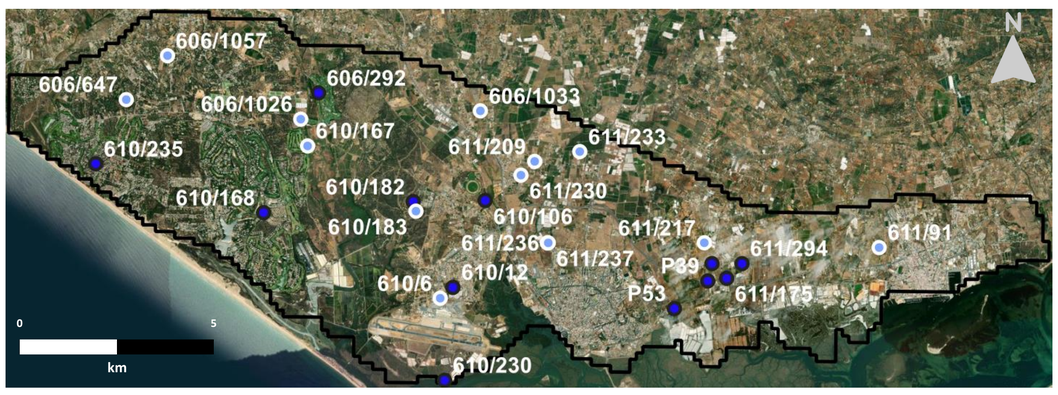


Figure 1. Monitoring points in Campina de Faro

METHODOLOGY

BMA is widely known as a statistical inference method that considers model uncertainty in data analysis. The fundamental idea behind BMA is to consider a set of candidate statistical models, each a plausible representation of the relationship between the variables of interest. These models may differ in their functional specifications, parametric structures, or other characteristics. Rather than arbitrarily selecting a single model as the "best", the BMA considers a weighted combination of all possible models, considering their likelihood and fit to the observed data.

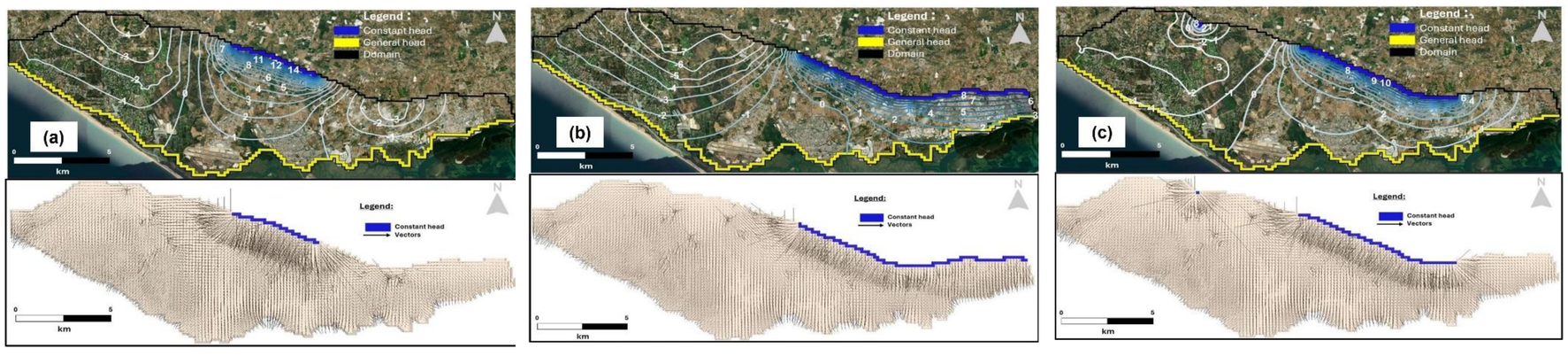
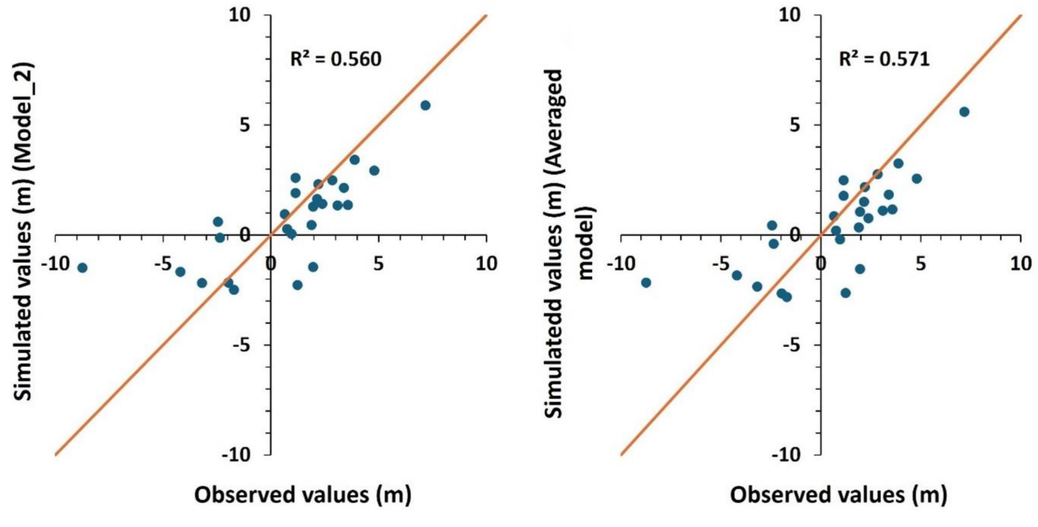


Figure 2. Different conceptual models for the study area

Boundary condition	Model name	Mean head at the boundary (m)
BC_0_a	Model_0	16. 4
BC_1_a	Model_1	8.5
BC_2_a	Model_2	10.6
BC_2_b		7.5

ESTIMATES & CONCLUSION

	rank	weight
Model_2	0	0.833
Model_0	1	0.167
Model_1	2	0.000



The uncertainty assessment from this study highlights the importance of model selection in groundwater management. The BMA and method proved effective results in identifying the most robust conceptual model for the study case, showing that adjustments to boundary conditions can significantly improve model performance. The findings present the necessity of ongoing model validation and fitting particularly when managing groundwater resources.

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