H050-14 - Combination of regional modelling and in-situ data analysis for groundwater assessment in the Mediterranean region

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Abstract

The Mediterranean region is recognized as a climate change and anthropogenic pressures hotspot, especially with the high seasonality of precipitation and increased water demands. The coastal areas, in particular, are significantly vulnerable to the effect of this critical situation. In such conditions, groundwater plays a fundamental role in water security in the Mediterranean region. Groundwater is considered as a strategic freshwater reserve. However, its status remains poorly characterized, and its total budget uncertain.

In this study, we argue that large-scale groundwater modelling has shown great potential for improvement of our physical understanding of groundwater systems functioning and to the guidance of implementing science-based adaptation and sustainable mitigation measures in the Mediterranean.

In recent years, groundwater modelling has moved from local to regional/global scale, offering insights into the status of data-scarce regions. However, it remains unclear to what extent those models can be used to support management decisions. This study aims to evaluate the performance of three global gradient-based groundwater models to represent the groundwater levels at steady-state and transient regimes in different Mediterranean aquifers.

In this investigation, the groundwater models of Fan et al. (2013), de Graaf et al. (2017), and Reinecke et al. (2019) are used. Comparison between the groundwater level predictions of the three models was conducted. Then, comparison between the water table depths simulated by each model with the corresponding in-situ data in three case studies: La Mancha aquifer in Spain, an island aquifer in Crete, Greece and the Cap Bon Peninsula in Tunisia, were performed.

Preliminary results showed that there is a large discrepancy between the three compared model outputs. More specifically, the de Graaf et al. (2017) model presents a deeper water table than Reinecke et al. (2019) and Fan et al. (2013), while de Graaf et al. (2017) generally shows greater variability in simulated water table depth.

This study contributes in enhancing the role of regional-scale groundwater modeling as an important tool in assessing and predicting changes in groundwater levels in data-scarce regions, under considerable climate variability and increasing anthropogenic pressures.

Plain Language Summary

References

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de Graaf, I. et al. 2017. A global-scale two-layer transient groundwater model: Development and application to groundwater depletion. *Water. Resour.* 102, 53-67.

Fan, Y. et al. 2013. Global patterns of groundwater table depth. *Science* 339, 940-943.

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