

Interactive comment on “Hydrologic and geochemical modeling of a karstic Mediterranean watershed” by N. P. Nikolaidis et al.

Anonymous Referee #1

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General comments

Nikolaidis et al. applied the SWAT model to simulate hydrologic variability and nitrate levels of a karst aquifer system on the island of Crete, Greece. Although the study is potentially interesting and presents some relevant conclusions, it is also incomplete in many respects, includes several serious mistakes, and is not on a comparable level with other studies on karst hydrogeology published in international journals.

The hydrologic behavior of karst aquifer systems can only be understood on the basis of a thorough hydrogeological analysis and a valid conceptual model. However, this article only presents some verbal description of geology, but no geological or hydrogeological maps and sections, and no conceptual hydrogeological model of the aquifer system.

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The authors determined the "extended karst contributing area" by trial and error using SWAT and playing with different HRUs. This is a serious mistake. Karst catchments can only be delineated based on hydrogeological considerations and by means of tracer tests.

Figures 1, which is supposed to present the test site, does not indicate the location of the test site; it also has no scale, no north arrow, no legend, etc. Where are all the springs and gorges that you are talking about? What is the structure and geometry of the aquifer system, etc.?

This article was not ready for submission. Before resubmitting this paper, the authors should improve it substantially, considering the general and specific comments made in this review. At present state, my recommendation is rejection.

Specific comments

Introduction, first paragraph: This is a poor general description of karst systems. Please refer to some relevant international papers and textbooks dealing with karst hydrogeology and consider the terminology and concepts used in these international standard references.

P. 3, line 21: You state that 75 % of the Mediterranean is irrigated? This is obviously nonsense. Do you mean 75 % of the agricultural land in the Mediterranean?

P. 3-4: This is a simple recital of who did what, but not a thorough discussion of the state of science in karst hydrogeology and karst modeling.

P. 5, first paragraph: This is not only true for Mediterranean karst. It is commonly known that topographic divides often do not match with groundwater drainage divides in karst. See first specific comment: Please refer to international papers and textbooks.

P. 5, line 8: What is a karstic system under pressure? Do you mean a confined / artesian aquifer? Please use terms and concepts commonly used in hydrogeology.

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Line 15: In a dynamic system, like an aquifer, dilution is not only a function of water volume, but also and mainly a function of flow rate.

Section 2, page 6: This is a poor and incomplete description of the geological setting. What is missing here is a geological map, geological cross sections and/or block diagrams, etc. What means "has an intense geomorphology"? Did you do tracer tests to delineate the catchment?

P. 9, line 22: Dispersion is not (not only) a result of fluctuations of the water table. You can get dispersion even without any fluctuations.

P. 10, lines 10-11: This is a serious and fundamental scientific mistake: You cannot determine the extended karst contributing area in this way! This can only be done based on hydrogeological considerations and tracer tests, but not by trial and error using SWAT and playing with HRUs.

Reference list: The reference list misses most relevant papers and textbooks in karst hydrogeology.

Figure 1 is unacceptable: No location, no scale, no north arrow, no information on geology, etc. Furthermore, your model cannot estimate the extended karst area.

Fig. 2a and b: The model simulated three peaks, but only one peak has been observed?

Fig. 2 and the following figures: This is very poor Excel design but not compatible with international standards of how to prepare nice graphics! Please check figures from other papers and take them as an example. Almost everything about your graphics is poor: Lines are too fat, the scales of the X-axes (time axes) is inappropriate, there should be no heading inside the figures, etc.

Technical corrections

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The drawbacks of this paper are serious so that technical comments are not required at this stage.

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