

Q&A Report

Jul 05, 2022

Topic **Groundwater modelling in Python**

#	Question	Answer
1	70% going to right river is because of head difference of soil characteristics?	live answered
3	Is there a github repository with the code of the examples?	All examples in the book are available here: https://github.com/pythongroundwaterbook/analytic_gw_book
4	How do you model an aquifer with discontinuous impervious interbeds within the aquifer please?	That would be a more difficult solution. In the course we will do a low permeable top, even a discontinuous top!
5	Are the Jupiter notebooks provided electronically with the online version of the book?	They are online, but you can not run them live. You have to install Python. For the course, there will be an option to run the notebooks of the course online.
6	Where was used the porosity in the calculation?	The porosity was indeed not used. Well spotted! It is used to compute travel time, but I didn't show the travel time in the example.
7	Does the river extend to the base of the aquifer?	Yes, for this example. The book has an example for a partially penetrating river.
8	Is the hydraulic conductivity typically isotropic? Or different between vertical and horizontal directions?	The hydraulic conductivity is indeed commonly smaller in the vertical direction than in the horizontal direction. We did not need that for this example. In the book there are several examples where we evaluate the effect of vertical anisotropy.
9	does river flow need to be considered? I might have missed this	does river flow need to be considered? I might have missed this
		We approximate the river stage as constant. So we do not need the river flow.
10	Are these demonstrations above the formulas made in Python or another separate software? If the former, then is it Bokeh or a different Python lib?	All figures (also all figure sin the book) are made with Python and matplotlib. The code of all examples is available, but not the code of the figures (which would be a bit boring, as they are just plotting commands).
11	For the regions that Storativity, Transmissivity, and other hydraulic attributes are not accurate or even available, how do we deal with the parameters? will they considered empirical in accordance to aquifers being confined or unconfined?	live answered
12	1. how much infiltration water can different type of soil hold before discharging to waterbody? 2. do we need to consider the soil type when model/calculate the ground water?	The amount of water stored depends on the storativity parameter. But it also depends on the aquifer type, because in an unconfined aquifer, the water table can rise, so that causes quite large changes in storage. In a confined aquifer, the pores are already saturated, so there storage changes are much less (they depend on the elasticity of the aquifer) http://www.aqtesolv.com/aquifer-tests/aquifer_properties.htm Representative storativity values are listed in a table just over halfway down the page
		Thanks very much for your answer. Where can i find the storativity parameter of the different type of aquifer/soil?
13	what is the hydrogeology specific package?	I think he is applying the formulas using Numpy and Pandas, and then visualizing the result using matplotlib.
		thanks Ahmed
		Indeed. We use numpy and scipy for the computations. And matplotlib for the visualization.
14	sir please share the jupyter notebook	They mentioned that the Jupyter notebooks will be available within the payed course.
		All examples are from the book. The code for all book examples is online: https://github.com/pythongroundwaterbook/analytic_gw_book
15	What are the causes that cause the drilled bore hole after a short time of working, it can produce the minimum amount of water which is different from early discharge.	The final example of today will be a pump test. During the earliest stage of pumping, the storage of the wellbore itself may be important. During the later stages, flow from one aquifer into another (across aquitards) will also start playing a role
16	can you explain the last 2 charts again	The river stage example: The left graph showed the change in head in the aquifer due to the passage of a flood wave. In the far right portion of the aquifer, the heads are still influenced by the initial head increase, whereas closer to the river the heads have already dropped off because after 4 days the river level dropped back to its original level. This sets up hydraulic head gradients in the aquifer that make that water flows towards the river to the left of the groundwater divide, and (still in response to the initial head increase) to the right on the right-hand side of the groundwater divide
17	Looking forward for that	Thank you.
18	Could you explain how the black line is calculated?	live answered
		The capture zone envelope goes through the stagnation point. You can find that using a standard search method. Examples are in the book and will be mentioned in the course.
19	What is the one thing you'd wish to advise someone that's just starting to program in Python? Books, practices, etc?	The course by Dr. Charles Severance is an excellent starting point. It is freely available on YouTube on the freeCodeCamp channel. It is a 13-hours-long, but you will have a solid foundation to build upon from there on...

		<p>What we use in the class I teach at the university is:</p> <p>http://mbakker7.github.io/exploratory_computing_with_python/</p> <p>It has short videos, Jupyter Notebooks with examples and exercises (with answers!). When you master the first 4 Notebooks, that should get you through most of the course.</p>
		thanks to you both!
20	i did not have enough experience in python. my general question is why we use pythan. when there are user interference like modflow software are available?	Automation.
20	i did not have enough experience in python. my general question is why we use pythan. when there are user interference like modflow software are available?	<p>The power of analytic solutions and Python is that you don't need a complicated numerical model. It gives you insight in the flow field and quick answers that you can understand. MODFLOW can of course do much more complicated settings, but also requires a lot more input data and a discretization of the model area. Analytic solutions also have great value to check your MODFLOW model to make sure you are doing things correctly.</p> <p>Hope this helps.</p>
21	previous problem by mark is 2D but quoting 3D flow volumes?	Yes, it is integrated flow. The flow integrated over the entire aquifer thickness.
22	How difficult would it be to add say a steady state recharge on top of the Theis solution, i.e. limit the Radius of Influence. Thanks.	That is actually fairly simple: You can simply add it, as superposition holds!
23	If we have more than one aquifer layer in a well, which type of changes we will in your present code for analysis?	live answered
24	Is there a minimum knowledge in Python need to take the full course?	<p>Even without any Python knowledge, you can take the class. During the interactive sessions, you can still change the input parameters and learn how the flow field changes. Better is to have a bit of basic knowledge by mastering the first 4 notebooks from:</p> <p>http://mbakker7.github.io/exploratory_computing_with_python/</p>
25	Is there a way to prioritise what time window the best fit solution would focus on?	Yes, there are criteria. If I am not mistaken, the Kruseman and De Ridder book goes into more details on this. The book is available for free online nowadays
26	Would you say the python is more on the beginner side instead of the intermediate?	If you have no Python knowledge, you can still learn a lot. You will learn more when you master the beginner or intermediate level.
27	Thanks Vincent / Mark / Krey, very valuable, I need to run. It looks like Amazon is shipping the hard cover copy now! Cheers Mick	Yes, the book is shipping. Hope you find it interesting!
28	<p>Thanks for the first reply, there are two more questions that i want to ask:</p> <p>1- for concluding over the well information and their heads in a time series, time gaps for how many steps would be acceptable for preventing any possible bias in the results?</p> <p>2- for expanding results to the behaviors and effects over an aquifer, are there any observation well number limit that needs to be touched?</p>	<p>Time gaps are no problem. Observations don't need to equally spaced, as the solution is analytic.</p> <p>Not really, the more the better!</p>
29	great talk, thank you	
30	Thanks Guys, it was very informing ! I am keen to	