

Interactive comment on “Modeling water resources trends in Middle East and North Africa towards 2050” by P. Droogers et al.

Anonymous Referee #2

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General comments:

The work by Droogers et al. is an interesting study that aims to estimate the water shortage in the MENA region in 2050 as a result of a combination of climate change and other socio-economical factors. It is a very well written paper and deals with a very interesting research topic for the region. The manuscript could be enhanced by adding some more detail results on the validation of the hydrological model for this arid region.

Specific comments:

P 4382:

Line 9-11: "Results show that total demand in the region..." The demand (132 km³yr⁻¹)

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is lower than the shortage (199 km³yr⁻¹), is this right? It should probably say: "... will increase by 132 km³yr⁻¹" (as it says in page 4395).

Line 22: Include also the average renewable water resources per capita value for Sub-Saharan Africa, as several countries of this region are included in your model.

P 4383:

Line 22: "The study argues..." is repeated in two consecutive sentences. Change one of them.

P 4385:

It could be interesting to include, if available, the percentage of the region under the physical water scarcity limit.

P 4386:

Line 24:"... the period 2001-2010 is based on actual data on climate and water requirements." - Which is the source of the data?

P 4387:

Line 4: "PCR-GLOBWB can be described as a conceptual, ... model" - In the abstract and in page 4386 says "an advanced physical based model", unify please.

Line 7: "with the main difference that PCR-GLOB..."- Unify, use always PCR-GLOBWB. This occurs in a lot of places over the manuscript, PCR-GLOBWB and PCR-GLOB are used alternately.

Line 17: "This resolution is the optimum tradeoff between required detail for hydrological processes, data availability and calculation times."- Why? Include citation to previous study or defend the statement.

P 4390: There is no mention here nor in the description of the model (P 4387) to the input meteorological forcing data required by the model. Which data is used for the

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period 2001-2010? Which is the temporal and spatial resolution of the precipitation and potential evaporation inputted?

P 4391:

Line 1: "Center of for International..." - Delete the "of".

Line 2: It refers to Colombia University, it should say Columbia.

Line 22: Verify that the reference is correct (I didn't found the equation in the reference).

Line 23: 1) Numerate the equation - (1). 2) Check the formulation of the equation. It seems to me that the "-1" should be subscript, as: IWW_y^{-1}

Line 25: "where IWW is the industrial water withdrawal" - Change for: where IWW_y is the industrial water withdrawal of the year y.

Line 26: Change "doesn't" for "does not".

P 4392:

Line 21: Why nine? Explain.

P 4393:

Line 1: The model performs well globally, but what about in Africa and especially in dry areas?

Lines 7- 9: I understand the point, but in page 4384 it is stated that one of the issues with previous studies is that they are based on annual or monthly approaches rather than the required daily approach to capture hydrological processes. It is argued that this study addresses those issues. What is the point in making a daily hydrological model if at the end the long term average hydrology is validated?

Lines 13-15: I do not agree that there is a very good match between observed and simulated flow in every case. In the Blue and White Nile the match is not so good, especially considering that the long term average hydrology is being compared.

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P 4394:

Lines 19-22: This statement is right. However, if the whole same study was carried out for Eastern Africa, the water resources availability for the region (which is considered external in your study) could decrease. Here you are assuming that the change (increase) of external water resources availability is only related with climate change, but it could decrease due to the contribution of population growth other socio-economical factors in Ethiopia (for the Nile) and other regions.

P 4395:

Line 25: Why the groundwater supply shows only a small decrease? It says before in page 4395 Line 4, that "Groundwater recharge shows a very sharp decrease in almost all countries".

P 4396:

Line 26: "An increase in water shortages is projected for all countries." - Add: with the exception of Djibouti.

P 4397:

Lines 5-7: Another way to do it, which seems more straight forwards to me, is to assume that socio-economic changes would remain similar to current conditions, but climate change would occur as expected. Was this evaluated? Why you decide it to do it the opposite way? Explain.

Line 14: Rephrase sentence starting with: "Table 1... "

P 4398:

Line 13: It has been validated in arid areas also?

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