

Referee report:
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Impacts of climate change under CMIP5 RCP scenarios on the streamflow in the Dinder River and ecosystem habitats in Dinder National Park, Sudan

General comments:

In general, the manuscript is technically sound and the story is described in understandable way. This is an important step forward in the search of future impacts of climate change on the streamflow in Dinder River Basin (DRB), and its relative expected impacts on the Dinder National Park (DNP) ecosystem habitats in the Sudan. Although the results are unexpected, and not entirely easy to interpret, I think the paper should be accepted for publication. This manuscript is good in all respects. The contribution is important, the exposition is clear, and the references are balanced. However, I have some comments on this manuscript, reacting its good works, and strongly recommend acceptance.

Specific comments:

1. On page 10162; line 5: the authors presented the annual average of the river to be $1.9 \times 10^6 \text{ m}^3$ during the previous 40 years. According to the book on "the hydrology of the Nile" by J. V. Sutcliffe and Y. P. Parks (1999), the annual average flow of the Dinder River is $3.086 \times 10^6 \text{ m}^3$ during (1907-1960), decreased to $2.797 \times 10^6 \text{ m}^3$ during (1907-1997). It seems to be a general decreasing trend in the annual river flow. Moreover, Tavakoli and De Smedt, (2011) and Setegn et al., (2011), stated that arid and semi-arid areas are particularly more vulnerable to changes and expected to suffer from water shortage due to precipitation reduction. In contrast, the author's results showed an increasing patterns in the annual future streamflow. Accordingly, I would like to ask the authors to react on this, and give explanation on why the streamflow results from this study are in contrast with the previously mentioned studies. Also how certain are the authors about their results taking into account the uncertainties represented in future emissions scenarios, GCMs projections, downscaling approaches and hydrological model parameterization.
2. On page 10162; lines 9, 10 and 11: the authors state that the land use of the study area has changed over time due to over increasing population density and agricultural practices without giving any evidence.
3. On page 10162; line 14: the authors wrote "The sandy river bed is left with only a few pools (Mayas)". By definition, Mayas are not pools inside the river bed, but they are oxbow lakes and wetlands that are naturally formed along the river floodplain.
4. On page 10174; lines 12, 13 and 14: the authors state that the Dinder streamflow declined by 47 during (1972-1977). To me this is too much when taking into account that the year 1975 is the wettest year in the records. According to the Ministry of Water Resources and Electricity (MoWRE) data the mean annual streamflow decline in this period by about 7%. In contrast the authors state that "the streamflow decline by 20% during (1978-1987)" which is expected to be more than the decline during

(1972-1977) when taking into account that the year 1984 is the driest year in the records. Also according to MoWRE data the mean annual streamflow decline in this period by about 40%.

5. On page 10183; Table 1 content information only on the resolutions of the two climate models. I suggest to remove this table and combined this information with the descriptions of the two models in section 2.4.

Technical corrections:

6. On page 10161; line 12: I suggest to change “(2) investigation of the potential impact” to “investigate the potential impact” to be consistent with (1) “assess the climate change”.
7. On page 10161; line 20: Typing error “their affect” must be corrected to “their effect”.
8. On page 10161; line 24: the sentence seems to be not correct, I think the authors are talking about the Dinder River (DR) as a water stream, not about the Dinder River basin (DRB). So the correct sentence will be “the Dinder River (DR) is the largest tributary of the Blue Nile...etc.
9. On page 10162; line 1: the authors state that the entire basin elevation ranges from 2646m at an Ethiopian plateau to 515m. While the digital elevation map in Figure 1 showed that the elevation varied from 2646m to 407m.
10. On page 10163; line 3: the authors stated that the DNP elevation variation ranges from 2646m at an Ethiopian Plateau to about 515m. The 2646m is the highest elevation in the entire basin not in the DNP. Also it is important to note that the whole DNP is located inside Sudan and not extended to the Ethiopian plateau.
11. On page 10163; line 13: typing error “Al-gwisi” should be corrected to Al-Gwisi (name of the hydrological station).
12. On page 10188; what is the physical meaning of the minus sign (-) in Table 6?
13. On page 10189; Figure 1: there is a typographical error in the caption. The topographic map of the basin is based on the 90m digital elevation model not 90 km.
14. On page 10190; Figure 2: there is a typographical error in the caption. The word gauges should be changed to gauge, because there is only one gauge at Al Gewisi station. Also the sentence “SIM indicates to simulated flow” should be corrected to “SIM indicates the simulated flow”.