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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Climate change impacts on river discharge in West Africa: a review" *by* P. Roudier et al.

P. Roudier et al.

philippe.roudier@jrc.ec.europa.eu

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=> We thank referee #4 for its useful comments which helped us to improve the paper and to submit a new improved version of the manuscript. We answer below to each comment point by point.

This work is very interesting on climate change models and prediction of river flows. A very positive point concerns the study area which covers the entire West Africa. The predicted results are much contrasted, with high uncertainty. The major finding is that changes in rainfall would be the main factor affecting rivers flows. But not any clear trend is depicted. This finally raises the issue of the validity of climate models. How the accuracy of these models can be improved in future studies is also quite well addressed

in the manuscript. However, in its current state, the work is reserved for quite a small audience, familiar with climate models. I fear that the interest of such an important work escapes most JHESS readers. I recommend to the authors, insofar as the paper is a review of results from various models, to include in the manuscript a section giving the principles of these models and scenarios, whether simple or advanced ones.

=> We added some details about emissions scenarios and climate models:

"Most studies used climate variables directly from General Circulation Models (GCMs) or Regional Circulation Models (RCMs) that simulate climate variables using physical equations representing the circulation of the atmosphere and/or ocean. GCMs/RCMs can differ in terms of the conceptualization and parameterization of processes, as well as in their spatial resolution, which is typically circa 2.5° for GCMs and 0.5° for RCMs. To simulate the response of the global climate system to increasing greenhouse gas (GHG) concentrations these models were forced by future GHG emission scenarios. Many different types of scenarios are available and are clustered in three main groups, that were created in chronological order and used for the different IPCC reports: the early IS92 (Leggett et al., 1992) including for example scenario IS92a or IS92c, the SRES (Special Report on Emission Scenario, see Nakicenovic and Swart (2000) for a description) with e.g. A1B, A2 or B1 and the RCPs (Representative Concentration Pathways, Moss et al. (2010)) used in the fifth IPCC report (RCP 4.5, RCP 2.6, RCP 8.5). Each group is constituted by contrasted scenarios representing low level of GHG emissions (e.g. for the SRES, scenario B1 that leads in 2100 to an average warming of +1.9C) or high level (A2, that leads to +3.1C, see Meehl et al. (2007))."

A presentation of the six basins selected for this work (Niger, Volta, Senegal, Gambia, Sassandra) would be also helpful. The paper is well organized and written. Captions of some figures should be expanded, as they are too small and almost unreadable.

=> We added a table describing the parameters suggested by referee #4 and we added the basins borders to the map. We also expanded the labels, see at the end.

=> References:

Leggett, J., Pepper, W. J., Swart, R. J., Edmonds, J., Filho, L. G. M., Mintzer, I., Wang, M. X., and Watson, J.: Emissions Scenarios for the IPCC: an Update, in: Climate Change 1992: The Supplementary Report to The IPCC Scientific Assessment, Cambridge University Press, Cambridge, UK, 68-95, 1992.

Meehl, G. A., T.F. Stocker, W.D. Collins, P. Friedlingstein, A.T. Gaye, J.M. Gregory, A. Kitoh, R. Knutti, J.M. Murphy, A. Noda, S.C.B. Raper, I.G. Watterson, Weaver, A. J., and Zhao, Z.-C.: Global Climate Projections, in: Climate Change 2007: The Physical Science Basis.Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, edited by: Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and Miller, H. L., Cambridge University Press, Cambridge,United Kingdom and New York, NY, USA., 2007.

Moss, R. H., Edmonds, J. A., Hibbard, K. A., Manning, M. R., Rose, S. K., van Vuuren, D. P., Carter, T. R., Emori, S., Kainuma, M., Kram, T., Meehl, G. A., Mitchell, J. F. B., Nakicenovic, N., Riahi, K., Smith, S. J., Stouffer, R. J., Thomson, A. M., Weyant, J. P., and Wilbanks, T. J.: The next generation of scenarios for climate change research and assessment, Nature, 463, 747-756, http://www.nature.com/nature/journal/v463/n7282/suppinfo/nature08823_S1.html, 2010.

Nakicenovic, N., and Swart, R.: Special Report on Emissions Scenarios, edited by: Nakicenovic, N., and Swar, R., Cambridge University Press, Cambridge, UK, 612 pp., 2000.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 2483, 2014.

River	Mean annual flow	Catchment area	Length of upstream mainstem (and total length)
Niger (Malanville)	1053 m^3/s	1000000 km^2	2367 km (3478 km)
Senegal (Dagana)	687 m^3/s	268000 km^2	1550 km (1757 km)
Black Volta (Bamboi)	263 m^3/s	134200 km^2	843 km (1355 km)
White Volta (Pwalagu)	125 m^3/s	63350 km^2	555 km (1334 km)
Volta (outlet)	1106 m^3/s	394100 km^2	1245 km
Gambia (Gouloumbou)	149 m^3/s	42000 km^2	451 km (799 km)
Sassandra (Soubre)	331 m^3/s	62000 km^2	-
Bani (Mopti)	1101 m^3/s	281600 km^2	1004 km (3457 km)
Benue (Yola)	22 m^3/s	107000 km^2	431 km (1541 km)

Fig. 1. characteristics of the selected rivers. All values come from the Global Runoff Data Centre (GRDC).

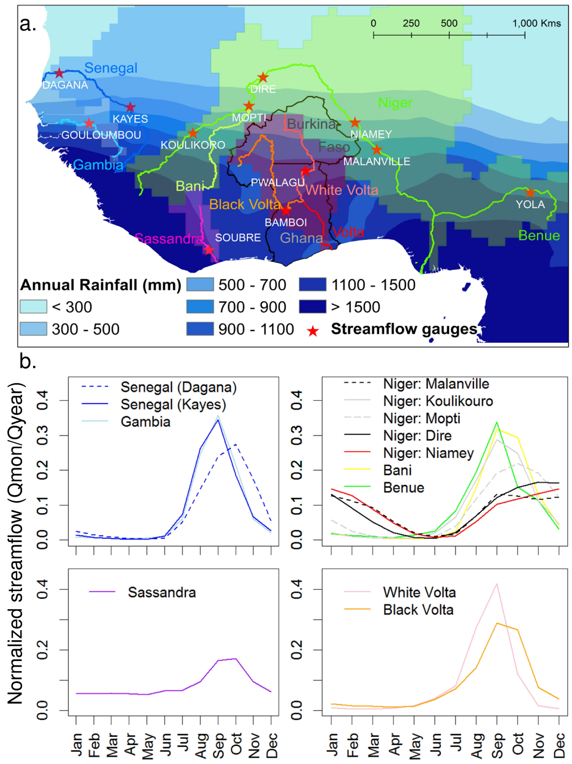

Fig. 2. see figure 1 in manuscript