

## **Review of Paper**

### **Title: The WASCAL high-resolution regional climate simulation ensemble for West Africa: concept, dissemination, assessment**

#### **General vote**

The paper is of great interest as it makes available some sets of high-resolution data that could be used for impact studies over West Africa. Few ensemble experiments have gone down to such resolution. However, it needs some substantial improvement in order to make it accessible to the reader.

#### **Major issues**

1. The Validation of the output was not deep enough. In his introduction, the author mentioned the importance that RCMs simulate key monsoon components. However in his analysis, he has not assessed the representation of AEJ, TEJ and Sahel Heat Low, some key elements of the WAM.
2. The comparison of the model output and CORDEX data is also not well addressed. Given that it is a new dataset and that there have been considerable effort in making available CORDEX outputs for Africa, it would be an added-value if the paper could compare what has been added as value compared to the WRF (For instance in figure 2 and 3). Moreover, the WRF output for CORDEX is available; the author did not use that to compare his simulations.
3. The whole paper needs to be revisited to ensure a better flow and correction of some sentences.

#### **Introduction**

There are many sentences that need to be rephrased to make them easily meaningful to the reader. I have mentioned a few of them as well as some incoherencies in WAM systems.

Line 9-10: Keep same as line 14-15; West African Science Service Center on Climate Change and Adapted Land Use (WASCAL)

Line 11: "... increased variability." should be "... increasing variability"

Line 17: "... climate observation network" to "... meteorological observation network"

Line 23: "... 10km for long term projections". Are we talking about predictions or projections?

Line 27: "... where rainfall is limited to only a few months per year, ...": This is not true for Coastal areas. Please rephrase it or state it for Sahel countries.

Line 14-16: "Current state of the art for the African continent are long-term climate projections generated at a resolution of 50 km and for a large number of combinations of forcing data sets (i. e. GCMs) and RCMs within the Coordinated Regional Downscaling Experiment CORDEX". This sentence needs to be reformulated...

Line 17: "On shorter time scales ...". Should be "At shorter time scales ..."

Line 17-18: The sentence “On shorter time scales, regional climate projections were generated for selected areas at a higher resolution of 25 km within CORDEX, employing 10 different RCMs (Nikulin et al., 2012” needs to be reformulated.

Line 19-21: “.... that the added value of the higher resolution provides an improved simulation of the annual cycle of precipitation and in regional differences in the response to global warming”. Please reformulate the sentence; it could be “... that simulation at higher resolution has improved the signal of annual precipitation cycle and reduced the uncertainty in the response to global warming.”

Line 24-26: “The work presented here advances the regional downscaling efforts for the region through the generation of a high-resolution, ensemble regional climate simulation experiment for entire continental West Africa and large parts of the 21 st century at a horizontal resolution of 12 km”. Needs rephrasing.

Line 26: “ Weather Research and Forecasting tool” . T’ a regional climate model not just a tool

Line 29-30: “ impact modelling and further downscaling experiments to convection-permitting resolutions.”. Please reformulated

Line 30-31: “The model data generated in this experiment is made available for download to the public through two data portals to ensure easy access”. Simply could be “The experiments outputs are freely accessible on .....(provide the links of the portals).”

Lineall model runs show increasing temperatures by 2.5–3 ° C on average until the end of 35: “... and an outlook on the future modelling experiments” should be “... and provides a outlook for future ....” the century, with WRF-H exhibiting the strongest climate change signal ( $\sim 4$  ° C) and WRF-G the weakest ( $<2$  ° C).

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In a similar fashion, Fig. 3 displays the annual cycle of monthly precipitation. Again, AgMERRA fits the observations from

UDEL closely. The difference between the 12 km and 60 km WRF runs is larger for precipitation than it is for temperature, with

a tendency to generate more precipitation in the higher-resolution runs than the lower-resolution runs. This is true for all case

## **Methods**

Line 3: “... the green house gas ...” should be “ ... the greenhouse gases ...”.

Line 5: “... the RCP4.5 scenario – in light of the COP21 agreement made in Paris in December 2015 – is a reasonable scenario”. That is not quite sure, otherwise provide reference of the statement.

Line 7-9: Rephrase this “The selected GCMs, on the other hand, cover the extremes in temperature and precipitation of the GCM ensemble used in CORDEX and span a larger range of conditions until about 2060 than the two scenarios and are able to reproduce the dominant, large-scale atmospheric features over West Africa (Nikulin et al., 2013; Elguindi et al., 2014)”

Line 30-31: “The figure also highlights the three dominant agro-climatological regions in West

Africa, following a north-south gradient in annual precipitation". This is not true. Please remove this sentence or reformulate it. What you drawd was not based on precipitation gradient, otherwise it could not have been so straightly designed.

Page 4, Line 31: "All data is provided in a netCDF CF-1.6 ...." is that sentence ueful in the text?

Page 5 ,Line 3: "... applying lateral boundary conditions to nested models can cause severe problems, up to the point where the RCM solution becomes inconsistent with the forcing data." Provide reference