Assessment of the CORDEX-CORE Africa simulations: evaluation and uncertainties in the mean and extreme indices climate change signal

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1) Introduction

CORDEX-CORE is a new phase of CORDEX simulations with higher resolutions (0.22 degrees) consisting of two RCMs forced by three CMIP5 GCMs. This higher resolution ensemble could provide added value to regional climate change information however, since the data has just recently been released, more studies are required to validate and report on its climate change signal. Thus, the purpose of this analysis is to place the CORDEX core (CCore) brand new simulations within the context of the previous CORDEX 0.44 (C44) and CMIP5 simulations.

2) Methodology

We investigated the mean and extreme indices for temperature and precipitation over Africa using the CORDEX-CORE ensemble. These results are compared to the results of the driving models as well as to the lower resolution CORDEX-phase 1 ensemble (C44).

3) Results

The mean DJF and JJA temperature values are reported here for the reference period, 1995-2014. All 3 ensembles show a reasonably good representation of the seasonal temperature, with a tendency towards a cold bias over the Sahara in both seasons and Southern Africa in JJA.

The seasonal precipitation change (Fig. 4) shows an increase in DJF precipitation over Central Africa which is more pronounced in CCore, and a more pronounced drying over Zambia, Southern Africa and Madagascar compared to the CMIP5 and C44. In JJA CCore shows a precipitation increase in the Sahel which is more pronounced than in CMIP5 and C44 and a drying in the Western Africa which is not shown by either of the two.

The seasonal precipitation change for RCP8.5 for Tmin and Tmax are displayed in Fig. 5. Tmax shows a slightly smaller increase for CCore in the Sahara region, with a similar increase over the rest of Africa.

End of century climate projections for RCP8.5 for Tmin and Tmax are shown in Fig. 6. The 3 ensembles are compared for the average temperature and precipitation anomaly for the near and far future RCP8.5 scenarios. The bar plots indicate the 5th and 95th percentile value of each of the ensembles in all regions for temperature change. The CCore shows the same range of uncertainty compared to the driving GCMs and the C44 ensemble. For precipitation the uncertainty range always overlaps with the C44 and CMIP5 ensemble, but is quite region independent.

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