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Evaluating daily and extreme seasonal precipitations over continental Africa from a Regional Climate Model Simulation

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Spatial and temporal variability of rainfall over Africa offers considerable challenges on climate change over the region. This is because of the complexity of regional climates in Africa and their associated geographic features. Adding to that complexity are deserts, vegetation variations, numerous mountain chains that can alter regional climate and weather patterns, the influence of the land-sea contrast due to the presence of several large lakes and the surrounding Indian and Atlantic Oceans. This leads to strong fluctuations of rainfall that may cause drought and flood in the region. Therefore, being able to simulate the spatial distribution of mean precipitation is quite important but also capturing their occurrences and intensities is critical for Africa whose economy relies on rain-fed agriculture.

The International Centre for Theoretical Physics (ICTP) Regional Climate Model (RegCM3), driven by the newly produced ERA-Interim reanalysis, is used to investigate this issue. Several indices, such as the number of wet days and their intensity, maximum dry and wet spells length and the frequency of heavy precipitation days, are used to characterize the spatial variability of seasonal extreme rainfall over continental Africa. Model results are compared to both TRMM and FEWS rainfall data. They indicate that although the model captures the location of longest and shortest wet and dry spells, it tends to extend slightly the wet spell length around mountainous regions and along the ITCZ and the dry spell length over northern and southern Africa during austral and boreal summer respectively. This is mainly visible when compared to FEWS. Extension of the wet spell length may be partly related to the overestimation of the number of wet days. As a result, the intensity due to the wet days only is slightly overpredicted in these regions. This is, in turn, linked to the tendency of the RegCM3 to produce more intense and convective rainfall events in the ITCZ and the ZAB as shown by the number of heavy precipitation days. However, most of the time, the simulated extreme indices lie between the TRMM and the FEWS observations. Therefore, we conclude that RegCM3 is capable of capturing the spatial distribution and the occurrences of precipitation extremes over Africa within the range of uncertainties.