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Lake Coupled Convection Permitting Regional Climate Simulations over the Lake Victoria Basin with RegCM4

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The Lake Victoria Basin is home to largest freshwater lake (Lake Victoria; LV) in Africa and second largest in the world. Each year on the order of 1,000 fisherman are lost on LV during intense night-time thunderstorms. LV is an essential component of the local economy while at the same time being one of the most hazardous lakes in the world. Despite this, until recently, understanding of the processes contributing to heavy rainfall events was very limited. In this study we present the first 3 years of a 10-year (2005-2015) convection permitting (3km grid-spacing) simulation (CPS) of the Lake Victoria Basin using the RegCM version 4.7. A lake parameterization scheme is utilized in order to couple the lake regions with RegCM, which has been shown to be of great importance for simulating a realistic lake surface temperature (LST) over LV. Results from the 2005-2007 period show that the CPS improves upon coarser resolution (25km) regional climate simulations of East Africa in several regards. First, the simulated LST from the CPS is much closer to observations and shows a more realistic asymmetric LST compared to the coarser simulation which had no lake coupling parameterization. In the coarser simulation the LST has a large cool bias and this contributes to a large dry bias over LV. The CPS shows a much-improved seasonal rainfall pattern over LV however, a wet bias consistently appears on the western coast of LV. This could be associated with a maximum in LST on the west side of the lake where the bathymetry is most shallow allowing the water column to heat faster than other regions of the lake. The distribution of rainrates over LV in the CPS is much closer to satellite derived rainfall observations compared to the coarse simulation, demonstrating the improvements made to the simulation of cloud microphysics processes when moving to convection permitting grid-spacing. Mesoscale circulations associated with the diurnal cycle over LV are an important driver of intense night-time thunderstorms. An analysis of the diurnal rainfall cycle over LV showed that both the coarse simulation and the CPS, in contrast with observations, have a peak in rainfall near mid-morning and very little rainfall in the afternoon. Satellite rainfall observations generally indicate a night-time peak in rainfall over LV associated with the intense thunderstorm events, thus investigation into why the CPS simulation and observations do not agree in this regard is ongoing. These simulations are being conducted in association with the Climate Extremes in the Lake Victoria Basin (ELVIC) modeling group.