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Surrogate climate change projections for the Lake Victoria region with a convection-permitting model.

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Extreme weather is posing constant threat to more than 30 million people living near Lake Victoria or depending on its resources. Thousands of fishermen die every year by severe thunderstorms and associated water currents, while hazardous over-land thunderstorms largely affect people living inland, continuously facing flood risks. These risks call for better understanding of such climate extremes over the region. Climate models are a useful tool to gain insight in the complex behaviour of thunderstorms, especially when simulated at convection-permitting resolution. Such simulations, explicitly resolving deep convection at fine resolutions, have been shown to improve the representation of extreme events in many parts of the world, also in equatorial East-Africa (Finney et al., 2019; Kendon et al., 2019; Van de Walle et al., 2019). As a response, the CORDEX-Flagship Pilot Study “climate extremes in the Lake Victoria basin” (ELVIC) initiative is currently setting up an ensemble of convection-permitting simulations over the region.

At this stage, future climate projections are needed to assess the impact of anthropogenic climate change on extreme weather the region. Therefore, a surrogate global warming approach following Schär et al. (1996), Kröner et al. (2016), Liu et al. (2016) and Rasmussen et al. (2017) has been applied to a convection-permitting COSMO-CLM simulation. In this approach, the lateral boundary conditions from the ERA5 (~31 km resolution) reanalysis are perturbed in accordance with the recent CMIP6 ensemble-mean end-of-century SSP5 8.5 climate change scenario. This approach confers three major advantages over the more conventional methods. First, by perturbing with the ensemble-mean, it excludes uncertainties of GCMs without the need for a time and computational intensive high resolution ensemble approach. Second, it avoids including present-day circulation biases. Third, no intermediate nesting steps are necessary, as the perturbed ERA5 allows a direct downscaling to the convection-permitting climate projection.

Besides the methodology, results for the Lake Victoria basin will be presented. Although the occurrence of extreme over-lake precipitation in the present-day climate is mostly controlled by large- and mesoscale atmospheric dynamics (Van de Walle et al., 2019), its future intensification is mainly attributed to increased humidity (Thiery et al., 2016). Furthermore, the effect of changed

large-scale dynamics is assessed, as not only temperature and humidity, but also wind forcing is modified.