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Comparison between the Community Land Model and the Terra Urb model in COSMO 5.0 over tropical Africa

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African urban inhabitants are expected to rise up to 75% of the continent's population at the horizon of 2050 (United Nations, 2014). This unprecedented demographic rise has led to an uncontrolled urbanization, and hence to a lack of public health infrastructures and administration within African cities. During the past decades, as an example, malaria's mitigating infrastructures have been constructed without considering the impact of urbanization. Indexes of malaria's risks have been based on rural areas, driving huge biases by not taking into account characteristics of the urban environment. In response to this challenge, the REACT project sets out to develop an index for malaria risk in urban tropical Africa. In particular, we aim to create two indexes that apply to the regional and local scale, respectively. Especially, intra-urban variability of the near-surface climate and the malaria's epidemiology thus needs to be described. To start, we first conduct a series of sensitivity simulations over a one-year period to determine which Land Surface Model (LSM) implemented within COSMO 5.0 is most suited for the purpose of this research.

The model domain will cover the Lake Victoria area, integrating Kampala within its boundaries. The regional climate is considered as tropical and interactions between Lake Victoria and its surroundings have been proven (Thiery et al., 2015; 2016). Since malaria depends on typical meteorological and climatic factors such as precipitation, relative humidity, wind speed and temperature, the first part of the project aims at finding which of the LSMs able to assess the more conveniently those epidemiological drivers. Indeed, the results of those runs will serve both the scales for inter- and intra-urban analysis (through a downscaling approach) and hence need to be as detailed as possible. The coupling of COSMO–CLM with the Community Land Model (COSMO-CLM^2; Davin and Seneviratne, 2012) is known to have a better integration of vegetation's influence on the meteorological circulations, while the COSMO-CLM coupled with the TerraUrb Urban Canopy Model (Wouters et al., 2015; 2016) is evaluated to have a robust representation of the urban areas' interactions with the atmosphere. Both couplings will be subject to the same boundary conditions and period of study before being compared with a reference run, only vegetated, performed with the COSMO–CLM2, and with a suite of observational products.