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A statistical-dynamical approach to downscale regional climate data to the city level

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There is a strong demand for climate services at the city level concerning the impact of climate change on the urban environment to devise adequate adaptation measures. URCLIM is a project that aims to provide such services based on climate data from high-resolution simulations. However, atmospheric climate models typically feature resolutions of 10 to 150 km. Therefore, additional steps are required to translate these datasets to the city-scale resolution (1-km). The URCLIM target is to produce urban climate time series using the CORDEX downscaling simulations as input for the land use model (LSM). The CORDEX ensemble includes different models (global, regional) and scenarios that allow to sample uncertainty at 12 km. However, it has been shown that a realistic translation from the 12 km scale to the city scale requires an additional downscaling step using an RCM coupled to a LSM (Hamdi et al., 2014). Unfortunately the computational costs of this step is enormous. Therefore an innovative statistical method is developed that skips this expensive step by correcting the input of the LSM, based on a limited set of climate simulations with two-way coupling. A validation of this method is presented that enables (relatively) cheap climate urban scenarios forced with a large set of RCM models to sample the uncertainty. The ALARO-0 is used as RCM and SURFEX-TEB as LSM, all forced with reanalysis ERA-Interim data over the Brussels Capital Region. Additionally different methods for the initialization of the LSM are tested. The new correction method is able to correct well heat-wave characteristics, the urban heat island and multivariate indices of human comfort.