Project: **1531**

Project title: **EKLIPS3plus1**

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## Report

During the first year of EKLIPS3plus1 the focus was on the development of downscaling algorithms for climate scenario simulations. We used data stored at DKRZ to prepare the necessary analysis routines.

Most of the computational time granted for 2026 was used to prepare and conduct reference simulations with the regional model COSMO-CLM and the urban climate model PALM-4U. A setup for simulations, to assess the thermal comfort within a city, was developed. We successfully installed PALM-4U on Levante and performed a simulation for a a hot summer period in August 2022 in the centre of Wuppertal. In order to simulate realistic meteorological episodes, PALM-4U requires a so-called dynamical driver from a regional climate model. The INIFOR interface shipped with PALM-4U was designed with the purpose to use COSMO-CLM simulations as the basis for the dynamical driver. For our test simulation we prepared the dynamical driver by conducting nested simulations (12km, 2km and 300m) and downscaled the chosen situation from ERA5 reanalysis. The size of the domain for PALM-4U was set to 1.2 km x 1.2 km and the horizontal resolution to 5 m. Some debugging became necessary and we used more node hours than anticipated in our last proposal.

A collection of plotting routines was developed on a jupyter notebook in order to inspect the results (e.g. Figure 1). We now have a technically working suite of scripts that can be used to simulate further events.

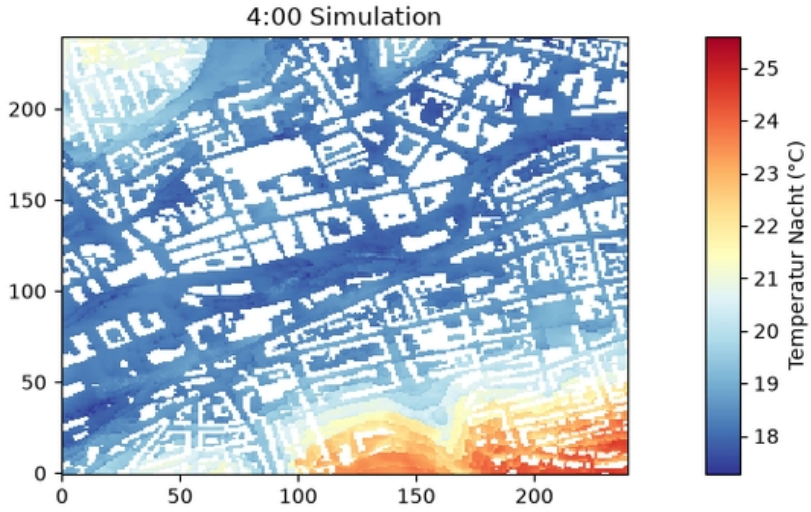



*Figure 1: Night time temperature in the centre of Wuppertal on August 13 2022 4:00 local time, simulated by PALM-4U*

Unfortunately, the analysis of the test simulation revealed a cold bias. This was further investigated and traced back to the dynamical driver from COSMO-CLM (Figure 2).

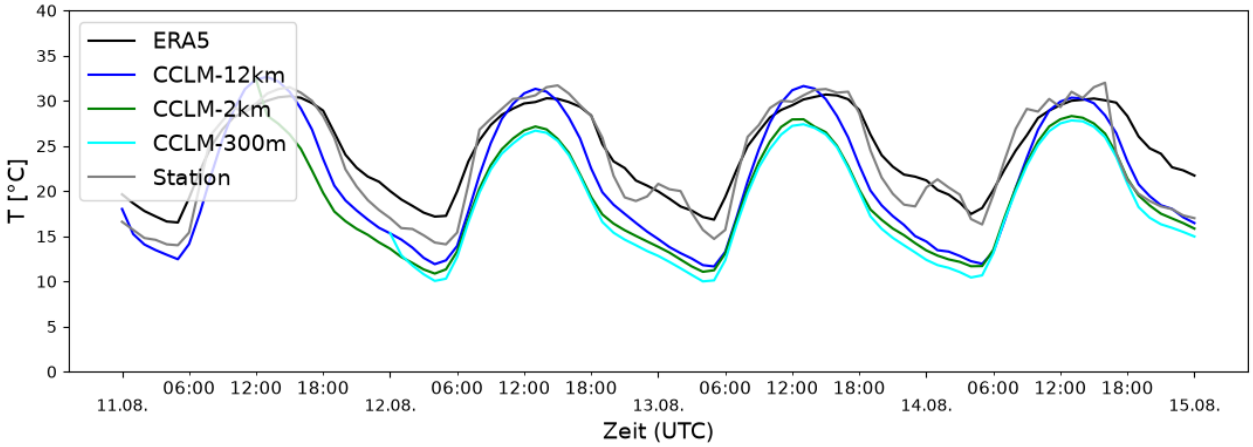



*Figure 2: Time series of surface temperature over Wuppertal in observations and nested COSMO-CLM simulations for a hot summer period.*

Using the NUKLEUS simulations stored on Levante we compared the regional model output of COSMO-CLM and ICON-CLM for further hot periods in our study region. As ICON-CLM shows closer temperature agreement to the observations we have decided to switch to ICON-CLM for the preparation of dynamical drivers. The necessary adjustments will be made in 2027. Further PALM-4U simulations are planned for 2027 and 2028.