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Analysis of sultriness-triggering parameters using high resolution regional climate simulations

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Under changing environmental conditions - which are a consequence of global climate change - living comfort should be maintained. A change of the temperature and humidity is expected, which affects the living comfort of people and is analyzed here. The study is performed in the framework of a project funded by the Baden-Württemberg foundation and couples the outdoor and the indoor climate as well as the thermal-hygric behavior of walls by thermal-energetic building simulations driven with regional climate model data. The intention is to avoid, too wet and sultry indoor climate by passive plaster systems.
High resolution regional climate simulations are made with the non-hydrostatic regional climate model COSMO-CLM (CCLM) and driven by data from the global climate model (GCM) ECHAM6 for projection as well as ERA-Interim reanalysis (ECMWF) for validation. The global data are dynamically downscaled with CCLM up to a convection permitting mesh size of 2.8 km; past (1981-2010) and future (2021-2050) periods are considered. To estimate the range of possible future developments an ensemble is created by the use of two emission scenarios, RCP4.5 and RCP8.5, coupling CCLM with the soil vegetation atmosphere transfer scheme VEG3D (additionally to TERRA) and climate simulations with different GCMs as forcing models. Also a bias correction of the RCM runs is done to use them for the impact studies.
The evaluation of the model simulations showed a high dependency of sultriness conditions in southwestern Germany on the large scale weather conditions. For example, if the prevailing wind direction was southwest, a quarter of the days in summer had a mean value of specific humidity over 12 g/kg (assumed as a sultriness limit here) in the Rhine valley (mean over 30 years). These large scale conditions were analyzed with the objective weather type classification of Dittmann and Bissolli. In the next step, factors affecting sultriness, for example orography, landuse or local wind systems, will be assessed.