Kurzfassungen der Meteorologentagung DACH
Garmisch-Partenkirchen, Deutschland, 18.–22. März 2019
DACH2019-210

Towards LES model validation comparing remote sensing data to simulations in Stuttgart

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Due to raised awareness of urban health concerns, be it air quality or thermal comfort, the demand for improved micro meteorological modeling capabilities has increased over time. In the context of the Urban Climate under Change "[UC]^2" Project funded by the Federal Ministry of Education and Research (BMBF), an effort is made to develop a flexible Large Eddy Simulation (LES) model, which can provide said capabilities. An important part as to evaluate this new model and its capabilities is to characterize its ability to correctly produce local flow features and capture the temporal development of turbulence. Between February and September 2018, one laser ceilometer and two (and from July onwards three) doppler wind Lidars were used to collect data in the urban valley of Stuttgart (Germany) and at the end of the Neckar valley outflow in S-Mühlhausen. The third instrument was deployed in S-Bad Cannstatt in summer, near the location where the urban and Neckar valleys merge. The regional and local differences in the measured and simulated windfields provide insight into the model's capability to accurately produce local secondary circulations, as well as produce reasonable response to large scale forcing. The temporal evolution of turbulence and convection further demonstrates the representativeness of simulated dynamics and thermodynamics. As an initial step, we simulated a clear spring day using the Weather Research and Forecast model (WRF-LES) with the aim to characterize the simulated regional scale forcing data that will be used to drive the Parallelized Large Eddy Simulation Model for Urban applications (PALM-4U). The results of this initialization step and the implications for future building-resolving simulations will be presented. Having characterized the behaviour of the initial conditions, we aim to pursue the actual PALM-4U simulations and publish the results in due course.