EGU21-1333
https://doi.org/10.5194/egusphere-egu21-1333
EGU General Assembly 2021

Sub-mesoscale cold-pool observations during FESST@HH 2020

Bastian Kirsch[1], Cathy Hohenegger[2], Daniel Klocke[3,2], and Felix Ament[1]
[1]Meteorologisches Institut, Universität Hamburg, Hamburg, Germany (bastian.kirsch@uni-hamburg.de)
[2]Max Planck Institute for Meteorology, Hamburg, Germany
[3]Deutscher Wetterdienst, Offenbach am Main, Germany

Cold pools are areas of cool downdraft air, that form through evaporation underneath precipitating clouds and spread on the surface as density currents. Their importance for the development and maintenance of convection is long known. Modern Large-Eddy simulations with a grid spacing of 1 km or less explicitly resolve cold pools, however, they lack reference data for an adequate validation. Available operational networks are too coarse and, therefore, miss the horizontal structure and dynamics of cold pools.

The pioneering field experiment FESST@HH aims to shed light on this observational blind spot. During summer 2020 a dense network of 102 ground-based stations covering the greater area of Hamburg (Germany) realized meteorological measurements at sub-mesoscale resolution ($\Delta x < 2$ km, $\Delta t \leq 10$ s), that provide novel insights into previously unobserved features of cold pools. Over three months more than 30 cold-pool events of different strength and size from various types of convection were detected. Analyses of prominent cases suggest a strong relationship between the local perturbations in air temperature and pressure within a cold pool, that allows inference about its vertical depth based on the hydrostatic assumption. Furthermore, temporary decoupling of horizontal variability in these signals reveal the presence of local non-hydrostatic pressure perturbations caused by convective downdrafts. The presented work will help to better understand the characteristics and life cycle of cold pools and to identify potential biases in convection-permitting simulations.