EMS Annual Meeting Abstracts
Vol. 18, EMS2021-329, 2021
https://doi.org/10.5194/ems2021-329
EMS Annual Meeting 2021

Turbulence characteristics and coherent structures in the convective boundary layer analyzed using Doppler wind lidars during FESSTVaL@MOL 2020

Noviana Dewani[1], Mirjana Sakradzija[2], Linda Schlemmer[3], and Jürg Schmidli[1]
[1]Institute for Atmospheric and Environmental Sciences, Goethe University Frankfurt, Frankfurt am Main, Germany
[2]Hans Ertel Centre for Weather Research, Deutscher Wetterdienst, Offenbach, Germany
[3]Deutscher Wetterdienst, Offenbach, Germany

Doppler wind lidars are used to measure boundary layer turbulence, which is an important process to transfer heat and moisture within the boundary layer. Turbulence measurements using Doppler wind lidars were conducted during FESSTVaL@MOL field experiment from June to August 2020. The FESSTVaL@MOL 2020 is a part of the FESSTVaL (Field Experiment on sub-mesoscale spatio-temporal variability in Lindenberg) measurement campaign conducted at the boundary layer site Falkenberg, a part of the Lindenberg Meteorological Observatory – Richard-Aßmann-Observatorium (MOL-RAO). One Doppler wind lidar has been operated in vertical stare mode to characterize turbulence in the convective boundary layer during the summer. Two other Doppler wind lidars have been operated in low elevation angle PPI scan mode and one Doppler wind lidar has been operated in RHI scan mode. These three scanning configurations are used to investigate the dominant coherent structures near the surface.

The retrieved wind data from vertical stare mode are categorized into cloud-topped boundary layer and cloud-free boundary layer days. We will analyze the intensity of the turbulence using vertical velocity variance and dissipation rate of the turbulent kinetic energy and the source of turbulence using a skewness profile for both categories. These profiles will be combined with low elevation angle PPI scan mode to categorize the coherent structures near the surface by their intensity and origin. Besides, we will present the overview of the preliminary study about the evolution of mixing layer height before and after cold-pool passage from several cases during FESSTVaL@MOL 2020 using vertical stare and RHI scan data.