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Dry and moist convective cells in the convective boundary layer over a Black Forest summit - synergetic effect of combined in situ and remote sensing observations

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During the COPS experiment performed in 2007, several in situ and remote sensing systems were operated at the supersite Hornisgrinde - a summit of the northern Black Forest. Combining the data allows investigating convective cells in the CBL and exchange processes between the boundary layer and the free troposphere.
For this case study, data from the surface flux station, radiosoundings, cloud camera, cloud radar, wind lidar, differential absorption lidar (DIAL), and infrared radiometer were used to analyse two periods, during which dry or moist convective cells occurred over the Hornisgrinde mountain top. The measurements of the vertical wind speed (wind lidar, cloud radar) and humidity (DIAL, infrared radiometer) were used to calculate the turbulent moisture flux profile in the boundary layer and entrainment zone. In both cases (dry and moist convection) a strong transport of moisture from the boundary layer to the free atmosphere was observed. The vertical wind speed measurements also show that strong downdrafts were present in the surrounding of the convective cells. The characteristic features of the dry and moist convective cells were compared.
The study shows that a combined use of different monitoring systems enables to record the entire structure of the convective cells, particularly in the case of moist convection.