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Observing of entrainment using small UAS

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Entrainment processes between the atmospheric boundary layer and the free atmosphere are important concerning vertical exchange of momentum, energy, water vapor, trace gases and aerosol. The transition zone between the convectively mixed boundary layer and the stably stratified free atmosphere is called the entrainment zone (EZ). The EZ restrains the domain of turbulence by a temperature inversion and acts as a lid to pollutants.
Measurement flights of the mini meteorological aerial vehicle (M^2AV) of the Technische Universität Braunschweig were performed in spring 2011 to determine the capability of the unmanned aerial system (UAS) to measure the structure of the EZ. The campaign took place at the Meteorological Observatory Lindenberg / Richard-Aßmann-Observatory of the German Meteorological Service, which is located close to Berlin. Besides the M^2AV flights, standard observations were performed by a 12 m and 99 m tower, a sodar, ceilometer and radiosondes. A tethered balloon with measurement units at six different levels was operated especially for this campaign. The measurements of these systems were used to determine the inversion layer and to capture its diurnal cycle.
The talk will be focused on vertical profiles of the M^2AV up to the free atmosphere, detailed analysis of spatial series of $w'\theta'$ at different altitudes and on vertical profiles of normalized variances of the vertical wind component and the potential temperature.