The meteorological UAV SUMO: A new perspective for the evaluation of atmospheric boundary layer schemes in fine-scale atmospheric models

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The vertical structure as well as the spatial and temporal variability of the atmospheric boundary layer (ABL) is of great importance. The basic meteorological variables such as temperature, humidity and wind build up the pillars for the understanding of exchange processes between the earth's surface and the atmosphere. Increased computational capabilities enable operational meso-scale atmospheric model simulations down to 1 km and even distinctly below for limited area and time studies.

In this study high resolution runs are performed for the area of Hofsjökull in Iceland with the Advanced Research Weather Forecasting model (AR-WRF). The current AR-WRF version (3.0.1) offers four different ABL schemes. In a sensitivity study these ABL schemes are tested and compared with respect to soundings of mean meteorological variables (such as temperature, relative humidity and horizontal wind) taken by the Small Unmanned Meteorological Observer (SUMO) and a net of meteorological stations which were set up during the field campaign FLOHOF (Flow over and around Hofsjökull). Thereby, the spotlight is set on two synoptical different days. Case 1 with calm conditions and case 2 with rather strong wave activity caused by moderate winds facing the mountain Hofsjökull.

The value and applicability of SUMO will be discussed in the context of evaluations of atmospheric boundary layer schemes in fine-scale atmospheric models.