WRF humidity profile simulations in PBL: Sensitivity studies and comparisons with scanning water vapor DIAL measurements
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INTRODUCTION

Correct simulation of initiation and organization of convection is a prerequisite for accurate cloud and precipitation simulation. This is heavily dependent on PBL dynamics, thermodynamics and land-surface-atmosphere feedback processes.

In this case study, an ensemble of WRF version 3.4.1 simulations is utilized for examining the sensitivity of humidity profiles to PBL parameterizations and land-surface model (LSM) options over the area of Germany.

Simulated profiles are compared with water-vapor profile measurements performed with the differential absorption lidar (DIAL) of the University of Hohenheim (UHH).

DIAL provides high quality and continuous data set with very high accuracy and the highest spatial/temporal resolution of all existing water-vapor remote sensing systems (Behrendt et al., 2009).

SENSITIVITY TO PBL SCHEMES

Figure 5. Measured absolute humidity profiles compared with the ones simulated by WRF with Noah LSM and with 4 different PBL options.

SENSITIVITY TO LSMS AND PBL SCHEMES

Figure 6. Comparisons of the measured absolute humidity profiles with the ones simulated by WRF and with different PBL parameterizations.

OUTLOOK

- Simulations with longer spin up, higher number of vertical levels and eventually higher horizontal resolution.
- For verification and evaluation: include eddy-covariance measurement and soil-moisture network data located at the same sites as DIAL measurements.
- To analyze more and longer experimental periods with more situations in PBL (stable, unstable).

OPEN QUESTIONS

- How long must the spin up period be in order to optimize the model hydrological cycle?
- When manually adjusting vertical resolution in WRF, what would be the optimal height of the lowest vertical level in order to avoid cfl violation?
- Is this height/selection dependent on PBL parameterization options?

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REFERENCES

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