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Investigating the effect of varied turbulence parameterisation on the simulation of vertical PBL structures in COSMO-CLM

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The planetary boundary layer (PBL) sets the stage to various weather phenomena and its evolution is closely related to severe weather events. Accurate forecasts and climate projections of the PBL are therefore of great interest. As turbulence is the dominant mechanism of the PBL, its representation presents a crucial task in numerical weather prediction and climate modelling. Particularly regarding smaller-scale atmospheric processes, turbulence parameterisation is of increasing importance and its proper implementation raises expectations of improved model performance.

In the present study IFS-driven COSMO-CLM simulations at 3 km horizontal resolution are evaluated with respect to their ability to represent the vertical structure of the planetary boundary layer. Three model setups which differ either in specific parameters or in an entire turbulence parameterisation scheme are inter-compared as well as tested against radio sounding data from the station Vienna Hohe Warte. Two typical meteorological conditions–a gentle pressure gradient summer situation in July 2007 and a fog/stratus winter situation in January 2008–serve as case studies for the present work.

Preliminary results indicate the ability of the model to generally capture the boundary layer conditions. Whereas the fog layer height is underestimated in the analyzed model setups, potential improvements from a decreased asymptotic turbulence length in the convective situation are suggested.