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Forecasting the weather
- ensemble techniques
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Planetary boundary layer height sensitivity to soil hydraulic parameters: MM5 simulations

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In our study, we examine the relationship between the planetary boundary layer (PBL) and the soil hydraulic properties by using MM5 weather prediction system. The simulations were performed on six days using a horizontal resolution of 6 km. The days were in summer, fall and winter when weak convection was prevailing with almost no cloud formation. In the simulations two soil databases were used: one global, the USDA (United States Department of Agriculture), and one regional, the Hungarian HUNSODA (Unsaturated Soil Hydraulic Database of Hungary). Soil hydraulic parameter differences between the two datasets cause differences in evaporation and temperature of the surface. These differences can be sensed in a more or less unstable atmosphere also in upper PBL layers due to turbulent mixing.
In our study, we focused on the detection and the analysis of differences mentioned above. These differences were treated using Betts' mixing diagram approach which relates surface sensible and latent heat fluxes to the entrainment at the top of the PBL. The differences in PBL height evolution are treated by a significance test which takes into account the stochastic properties of the PBL. Results show that soil hydraulic parameter differences affect significantly the evolution of the simulated PBL height. It has to be noted that areas where significant changes were detected depend also upon weather situation. This dependence is more pronounced when the advection is stronger.