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Assimilation of near-surface observations: Impact on the atmospheric boundary layer

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The near-surface weather is strongly influenced by cloud formation and interactions between the land surface and the atmospheric boundary layer. An accurate forecast of the atmospheric boundary layer needs a consistent initial state of the boundary layer variables. Several in situ and remote sensing observational systems monitoring the boundary layer are available. They have the potential to improve short-range numerical weather forecast, which is crucial for renewable energy power predictions, because the production of renewable energy power is strongly dependent on wind fields and cloud coverage.

The land surface temperature is one important observed component of the surface energy balance. We present results of Observing System Simulation Experiments (OSSE) assimilating synthetic land surface temperature retrieved from geostationary satellites (SEVIRI instrument) . Land surface temperature is assimilated into the fully coupled COSMO model (COnsortium for Small-scale MOdelling) and has direct impact on atmosphere and soil variables. The assimilation process is based on the local ensemble transform Kalman filter (LETKF). First regional impact studies of hourly land surface temperature assimilation will be presented. A clear sky period in march 2017 is selected to maximize the fraction of usable observations within a five day window. The investigation itself is focused on the effect of land surface temperature assimilation on the prediction of soil and lower atmosphere variables. A positive impact of land surface temperature assimilation on atmosphere and soil temperature is found. Further ground-based observations such as 2 meter temperature, 2 meter relative humidity, and global radiation and possible dynamic bias corrections will be discussed.