Assimilation of ground-based microwave radiometer observations into the convection resolving ICON model: observing system simulation experiments.

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State-of-the-art high resolution, convection resolving NWP models require dense and frequent observations to define the detailed initial conditions. Key variables needed for convection-resolving data assimilation are, among others, the 3-dimensional fields of temperature and humidity. In the boundary layer, both variables are not adequately (vertically, horizontally and temporally) measured by current observing systems. A network of ground-based microwave radiometers (MWR) has the potential to provide real time profile observations. In our study, we perform an Observing System Simulation Experiment and evaluate the benefit and the potential impact of MWR observations on the accuracy of the initial thermodynamic state of the atmosphere. The MWR observations, sensitive to cloud water content, temperature and humidity profiles, are simulated from the Nature Run (simulated "truth") with the radiative transfer model RTTOV-gb and assimilated into the convection resolving ICON-D2 model (2km resolution). In this contribution, we present impact studies of assimilating synthetic observations of a single MWR instrument and extend the approach for evaluating the effect of a network of instruments on the analysis and forecast of thermodynamic fields. We examine the impact of MWR observations in addition to conventional observations by comparison of assimilation experiments to the Nature- and the Control Run (no assimilation).