Large Eddy Simulations at Ny-Ålesund with ICON-LEM

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To understand and parameterize cloud processes, information about several quantities (e.g. humidity) and its variability on all spatial- and time scales are essential. Part of these information can be provided by large eddy simulations, but before those can be used as a virtual reality, a detailed evaluation based on observational products is required.

Here, first large eddy simulations have been performed over Ny-Ålesund with the ICON-LEM (Dipankar, et.al. 2015) and are set into context to the extensive observations of the AWIPEV atmospheric observatory. Model simulations have been realized by applying a 4-way nesting with 600 m, 300 m, 150 m and 75 m horizontal resolution, using open boundaries and a realist orography. Initial and hourly forcing data are taken from the ECMWF Integrated Forecasting System. Model results for the location of the AWIPEV observatory are provided as highly temporally resolved, i.e. 9 s, column output and are thus comparable to the temporal scales of the measurements. The measurements encompass, among others, observations from the recently installed 94 GHz cloud radar, from ceilometer, microwave radiometer, radiosondes, and standard meteorological observations.

A first qualitative comparison between model results and observations for one day (16 August 2016) revealed a reasonable model performance: the occurrence and timing of low-level and high ice clouds during that day is well captured. Fig. 1 shows examplarily the time series of observed and modeled liquid water path (LWP) on that day. Except for the clouds around noon, the timing and variability of LWP is well reproduced by ICON-LEM.

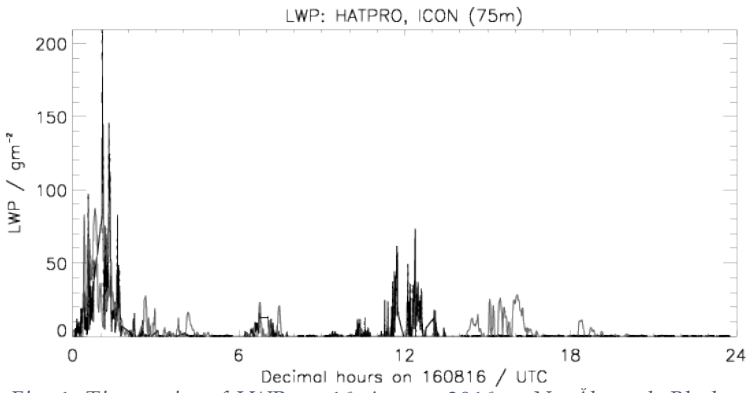

Fig. 1: Time series of LWP on 16 August 2016 at Ny-Ålesund. Black: Observed LWP from microwave radiometer. Grey: LWP from ICON-LEM using 75 m resolution

Here, we will present an extended model evaluation, which will also be based on a longer time series (e.g. 13 – 24 September 2013). In this time period, radiosonde information is available 6 times per day and thus allows for a detailed evaluation of the modeled boundary layer structure.

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References

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