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Modeling of rainfall interception by means of large-eddy simulation

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The interception process is, besides by the type and intensity of precipitation, influenced by the structure of vegetation and the distribution of meteorological conditions within the vegetation. Many existing models do not parameterize the structure of the vegetation at all or simplify it extremely. Thus, the allocation of micrometeorological measurements (e.g. of evapotranspiration) to measurements of water storage is not possible due to different source areas.
The use of high-resolution vegetation data within models allows the localization of intercepted water within the stand and a mapping of evaporative conditions. The application of a large-eddy simulation (LES) model, which is able to reflect the spatial heterogeneity of meteorological conditions within the stand, allows a detailed description of the whole interception process by using information about the vegetation structure (PAD, plant area density in $m^2 m^{-3}$).
The contribution introduces the principal layout of a potential module for the LES model PALM, which is well parallelized and therefore suitable for use on supercomputers. It presents the input and output quantities and the basic approaches.
The site of investigation is a managed mixed forest stand (mainly Picea abies, height 30 m; a long-term CarboEurope monitoring site) within the Tharandter Wald near Dresden, Germany. The study area includes a 50x90 m clearing and shows the typical heterogeneity of Central European forests. Terrestrial laser scans provided data for the high-resolution vegetation model.
First results of LES with a fine resolution of 1 m^3 will be presented for the study area. The simulation is limited to neutral atmosphere and only the wind distribution is considered. The study's priority is to show the effect of using high-resolution vegetation data on the flow regime within the forest. A validation of the results is possible through wind data from four measurement towers (from DFG SPP 1276 MetStröm), which provided data up to 42 m above ground.