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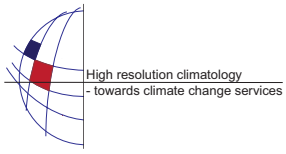

High-resolution simulations of a heavy snowfall event in Germany

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Winter storms associated with intense snowfalls often produce hazardous surface conditions that can paralyze community life by causing communication problems and traffic hazards. In winter 2005 the northwestern part of Germany had been affected by intense precipitation in terms of wet snow that snapped 82 power poles and more than 250.000 people lost electricity supply for several hours. In terms of the timing, amount and phase of precipitation, events of heavy snowfall are typically poorly predicted by current numerical weather prediction models. Predictions of heavy snowfall events are particularly challenging because forecasts of snow pose challenges on various scales, including the evolution of planetary-scale waves, extratropical cyclones and their attended fronts, and the microphysics of snow. For the particular case under investigation, a shallow melting layer (i.e. a layer with temperatures above the freezing level) was present above the surface, which implies that a correct numerical prediction is only possible if the melting process in this layer is accurately represented by the model – if this melting occurs too rapidly, then rainfall is predicted instead of snow. In this study simulations of this event with the COSMO model will be evaluated in detail. It will be assessed whether the model is able to correctly predict the observed temperature structure in the target area (i.e. the occurrence of the shallow melting layer) and the amount and type of surface precipitation. Also, the melting of snow in the model will be quantitatively analyzed and compared to results from laboratory experiments. This investigation will identify potential weaknesses of the model related to the occurrence of potentially damaging heavy snowfall events.