

Sea ice and ABL parameterizations in the regional climate model “CCLM polar”

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The parameterization of the atmospheric boundary layer and ocean/sea-ice/atmosphere interaction processes is a challenge for regional climate models in polar regions, particularly for wintertime conditions, when a strong stable boundary layer (SBL) is frequently over the polar ice sheets and sea ice. For the latter small fractions of thin ice or open water cause strong modifications of the boundary layer. Thus, the treatment of SBL, sea ice and sub-grid flux parameterizations are of crucial importance. The regional climate model CCLM was adapted to polar regions by implementing a two-layer sea ice model, a tile approach for sea ice, and modifications for the SBL. The modifications include an improved computation of the sea ice energy budget, a new parameterization of the subgrid-scale ice thickness (thin ice in leads and polynyas), non-linear averaging for the tile approach, new parameterizations for the roughness lengths of momentum and heat as well as a TKE-dependent asymptotic mixing length for the SBL. In-situ data and Moderate Resolution Imaging Spectroradiometer (MODIS) data are used for the verification of the CCLM simulations.