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Observations and simulations of meteorological conditions over Arctic thick sea ice in late winter during the Transarktika 2019 expedition

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The parameterization of ocean/sea-ice/atmosphere interaction processes is a challenge for regional climate models (RCMs) of the Arctic, particularly for wintertime conditions, when small fractions of thin ice or open water cause strong modifications of the boundary layer. Thus, the treatment of sea ice and sub-grid flux parameterizations in RCMs is of crucial importance. However, verification data sets over sea ice for wintertime conditions are rare. In the present paper, data of the ship-based experiment Transarktika 2019 during the end of the Arctic winter for thick one-year ice conditions are presented. The data are used for the verification of the regional climate model CCLM. In addition, Moderate Resolution Imaging Spectroradiometer (MODIS) data are used for the comparison of ice surface temperature (IST) simulations of the CCLM sea ice model. CCLM is used in a forecast mode (nested in ERA5) for the Norwegian and Barents Seas with 5km resolution and is run with different configurations of the sea ice model and sub-grid flux parameterizations. The use of a new set of parameterizations yields improved results for the comparisons with in-situ data. Comparisons with MODIS IST allow for a verification over large areas and show also a good performance of CCLM. The comparison with twice-daily radiosonde ascents during Transarktika 2019, hourly microwave water vapor measurements of first 5 km in the atmosphere and hourly temperature profiler data shows a very good representation of the temperature, humidity and wind structure of the whole troposphere for CCLM.