



Impact of the Laptev-Sea polynyas on the atmospheric boundary layer and sea ice formation

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Radical environmental changes are forecasted to occur in the Shelf areas of the Siberian Arctic during this century. The Laptev polynyas play a key role due to their impact on ice production and related feedback processes in the ocean and atmosphere. Observations and model studies have been performed within the BMBF founded project "Polynya systems face changes" (2007-2010) which is embedded in the IPY-project "Complex Investigations of Seasonal Cycle in the Arctic Seas". Four automatic weather stations which were installed along the fast ice edge in April 2008 reveal that the GME analyses (Global Model of Deutscher Wetterdienst) describe the synoptic conditions accurately (e.g. absolute error of wind speed between 0.2 and 0.5 ms⁻¹ and correlation coefficients between 0.8 and 0.9). Thus, these analyses are an excellent data set for nesting meso-scale atmosphere models and forcing ocean models. Realistic and artificial case studies are presented with the non-hydrostatic atmospheric model COSMO (Consortium for Small-scale Modeling, Deutscher Wetterdienst) and the Finite Element Sea Ice Ocean Model (FESOM, Alfred Wegener Institute) on a grid with a horizontal resolution of 5km. These simulations show that the polynyas modify the atmosphere till a height of several kilometers. Furthermore, an accurate simulation of ice surface temperature is essential to quantify ice production realistically. The highest ice production rate was simulated for a cyclone case at the end of December 2007, whereas ice production is marginal for the April 2008 polynya cases.