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Validation of simulated sea-ice concentrations from sea ice-ocean models and polynya classification methods in the Laptev Sea area using satellite data

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The Laptev Sea represents one of the most significant areas of net ice production in the Arctic. Most of the ice production takes place in a polynya forming at the fast ice edge during strong offshore wind conditions. The simulation of these polynya events is a challenge for current sea ice-ocean models, and validation of simulated sea-ice concentrations is necessary for model improvements. High-quality data sets of sea-ice concentration from remote sensing data are covering the period from 1978 to the present. These data sets are well suited for the validation of model results of sea ice-ocean models. Based on the brightness temperature observations obtained from the Advanced Microwave Scanning Radiometer (AMSR-E), the ARTIST (Arctic Radiation and Turbulence Interaction Study) Sea Ice (ASI) algorithm is used to calculate mean daily sea-ice concentrations. Here we use AMSR-E data for the validation of sea-ice concentrations in the Laptev Sea, which are simulated by the coupled sea ice-ocean models North Atlantic - Arctic Ocean - Sea-Ice Model (NAOSIM) and Finite Element Sea Ice Ocean Model (FESOM). The general distribution of the sea-ice concentrations, the simulation of the polynya events and the position of polynyas are examined for the period October 2007 to April 2008. In addition, the polynya signature simulation method (PSSM) was applied to classify open water, thin ice and thick ice. The results of the validation show that the simulated distributions of the sea-ice fields show similar structures, but an underestimation of sea ice concentration. The simulation of the polynya-events from the two models agrees reasonably well with satellite data. However, because of the absent fast ice edge in both models, the position of the polynyas is shifted to the coast line. Therefore it would be necessary to include the fast ice edge for simulating polynyas at the right position. Further investigations about the position of the polynyas will be performed with simulation results of this improved model runs.