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Changes in Arctic Sea Ice Thickness the last 50 years - the effect of atmospheric forcings

M. S. Andersen (1) and A Sorteberg (2)

(1) Geophysical institute, University of Bergen, Norway (marianne.s.andersen@student.uib.no), (2) Geophysical institute, University of Bergen, Norway

Changes in the Arctic Ocean sea ice thickness the last 50 years due to variations in atmospheric forcings is investigated by using a coupled ocean-ice-atmosphere column model. The column model is representing horizontal average properties over the Arctic Ocean except the Barents Sea.

Results from a simple model like this can be used to evaluate the importance variations in parameters like solar radiation, atmospheric poleward energy transport and ice export has on the changes in ice thickness. This is important for our understanding of the climate system, and as a basis for more complex coupled climate models.

The model is building on the one-dimensional model by Björk and Söderkvist (2002). In the model, the ice cover is described by a thickness distribution and the atmosphere is a two stream grey body in radiative equilibrium.

The model is forced by monthly mean values of atmospheric poleward energy transport at the vertical boundary, solar radiation at the surface, precipitation in form of snow, wind, ice export, river inflow and Bering Strait inflow. The optical thickness, N, is used to tune the ice thickness in the model. Time step is one day, and the model is using interpolated values from the monthly mean forcings.

We have made the model more realistic by making the poleward energy transport in the atmosphere, D, dependent on height. We have also added the ability to give time series as input instead of a fixed annual cycle.