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High resolution modelling of the decreasing Arctic sea ice

K. S. Madsen, T. A. S. Rasmussen, J. Blüthgen, and M. H. Ribergaard
DMI, Copenhagen, Denmark (kma@dmi.dk)

The Arctic sea ice cover has been rapidly decreasing and thinning over the last decade, with minimum ice extent in 2007 and almost as low extent in 2011. This study investigates two aspects of the decreasing ice cover; first the large scale thinning and changing dynamics of the polar sea ice, and secondly oceanic oil drift in ice affected conditions. Both investigations are made with the coupled ocean – sea ice model HYCOM-CICE at 10 km resolution, which is also used operationally at DMI and allows detailed studies of sea ice build-up, drift and melt.
To investigate the sea ice decrease of the last decade, we have performed a reanalysis simulation of the years 1990-2011, forced with ERA Interim atmospheric data. Thus, the simulation includes both the period before the recent sea ice decrease and the full period of decrease up till today. We will present our model results of the thinning and changing dynamics and discuss how they relate to satellite observations. The relation to the upper ocean heat content is also investigated.
The decreasing sea ice has opened up for increased ship traffic and oil exploration in the polar oceans. To avoid damage on the pristine Arctic ecosystem, this requires careful environmental assessments. Here, one important tool is to investigate how a possible oil spill will drift and disperse. Through an ensemble of simulations, we will demonstrate the drift of imaginary spills off the Greenlandic coast for both a release at the surface and the in the deep ocean, and it will be discussed how sea ice affects the drift.