Session: C11 Poster: M129B

Regional sea ice thickness distribution in the Svalbard region and Fram Strait from airborne and in situ observations

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The thickness of sea ice in the Arctic is a crucial parameter when assessing the status of the ice cover in connection with climate research. Knowledge on ice thickness is also important for validating coupled climate models. Sea ice extent has been monitored over the past decades continuously from satellite, but until recently ice thickness information has been mainly based on direct observations and airborne surveys. With sea ice thickness data collected from air (helicopter) and surface in the Fram Strait (Greenland Sea), over seasonal fast ice in Svalbard fjords, in the Arctic Ocean north of Svalbard, and in the Barents Sea off the island of Hopen, we give an overview on the regional sea ice thickness distribution. Measurements are performed using airborne and ground electromagnetics, as well as drillings. From longterm monitoring sites near Svalbard (Hopen since 1966, Kongsfjorden since 1997) we can conclude on trends in sea ice thickness changes, whereas observations in the Arctic Ocean with Greenland Sea and the edge of the Arctic Basin shed light on the spatial ice thickness distribution on a regional scale. Additional more sporadic fast ice thickness measurements are conducted in the Svalbard fjords Storfjorden and Rijpfjorden. The four different Svalbard locations have different settings, and different atmospheric and hydrographic background conditions, resulting in different ice characteristics. The time series of seasonal ice thickness measured near Hopen since 1966 shows a significant negative trend. Measurements done over drift ice in the Fram Strait and north of Svalbard between 2005 and 2010 give insight in the spatial distribution of ice thickness characteristics in the region. Transects across the Fram Strait detail the lateral variability of modal and mean ice thicknesses, and observations in different years illustrate the interannual variability of those characteristics. They also help interpreting continuous recordings from moored upward looking sonars in the same region.