



An estimate of the impact of trapped melt ponds on sea ice thinning

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Melt ponds form on Arctic sea ice during the melting season and their presence affects the heat and mass balance of the ice cover. Towards the end of the melt season melt ponds cover up to 50% of the sea ice area decreasing the value of the surface albedo by up to 20%. The dramatic impact of melt ponds on the albedo feedback mechanism for sea ice melt has been demonstrated in previous studies. Here, we focus on the refreezing of melt ponds. As the ponds freeze from above, they gradually release latent heat that inhibits basal ice growth. The refreezing process can take up to three months. Freezing of the melt pond comes to an halt if the pond's freezing point reaches the air temperature since the Stefan condition for sea ice growth is not met anymore. Since the ice in presence of melt pond will stay thinner and flatter for longer, the areas where ponds are present are likely location for pond formation in the subsequent years.

The presence of a pond trapped in the ice delays significantly the sea ice growth at locations where melt ponds form. The potential volume loss of sea ice per year in the Arctic considering a melt pond cover of 20% is up to 1000 km³ without considering the presence of snow.

Within the ASBO (Arctic Synoptic Basin-wide Observations) project we have developed a model of refreezing melt ponds that uses mushy layer theory to describe the sea ice and takes account of the presence of salt in the refreezing melt pond. We use this model to investigate the rate at which melt ponds refreeze, releasing latent heat, and their impact on sea ice growth.

In this work we would like to present model result with climatology input. We will give an estimate of the impact of the melt pond presence on sea ice growth in the Arctic basin.