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Improving Arctic Sea Ice Prediction Though Freeboard Assimilation

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With the presented work we aim to improve sea ice forecasts and our understanding of Arcitc sea ice formation though freeboard assimilation. Over the last years understanding Arctic sea ice changes and being able to make a reliable sea ice forecast has gained in importance. The central roll of Arctic sea ice extent in climate warming makes it a highly discussed topic in the climate research community. However a reliable Arctic sea ice forecast both on short term to seasonal time scales remains a challenge to be mastered, hinting that there are still many processes at play to be better understood.
One promising approach to improve forecasts has been to assimilate satellite sea ice data into numerical sea ice models. Mainly two parameters measured by satellites have been used for assimilation: Sea ice concentration, which is competitively easy to obtain from satellites measuring passive microwave emissions as for example obtained by the SMOS satellite, and sea ice thickness, which is not directly measured, but has to be calculated from surface elevation measurements, as for example obtained by Cryosat 2. Compering the skill, of assimilation products using sea ice thickness and sea ice concentration shows that sea ice thickness has a longer memory and is over all leading to a better performance then sea ice concentration assimilation. Knowing this, sea ice thickness assimilation is far from being straight forward. Surface elevation measurements, obtained from satellite altemitry measurements, have to be separated into snow and ice freeborad, by assuming a snow thickness, to derive sea ice thickness from. Most of the time this is done using a snow thickness climatology obtained from Soviet drift stations measuring snow over multi year ice during the period 1954-1991 with adaption over first year sea ice, where this climatology has proven to be overestimating snow thickness. The technique is widely used jet known to introduce an error.
To avoid errors caused by wrongly assumed snow covers the DMI and Aalborg University and DTU are at the moment collaborating on assimilating freebord instead of sea ice thickness into the CICE-NEMO modeling frame work using LARS NGen (LARS the Advanced Retracking System, Next Generation) sate of the art retracing software. In the presented work we will show first results of freeboard assimilation with a focus how this assimilation influences winter sea ice formation as well as the upper Arctic Ocean dynamics.