It is found that:

• it is best to update the multicategory sea ice state and to carry strongly coupled data assimilation of ocean and sea ice
• assimilation of SIC reduces error of SIT and improves the prediction skill of sea ice extent in all regions
• the largest impact is seen for regions that are semi-enclosed (e.g. Kara Sea, Hudson Bay) and regions where sea ice is exported from the Arctic (e.g. Greenland Sea)
• There may be light degradations in the some oceanic region but this need to be further investigated

3. Added value of sea ice for Reanalysis
We compare the performance of reanalysis based on FREE, NorCPMV1 and NorCPMV2 for the period 1985-2010. For SIT we use the independent ICESAT data set and for heat and salt content we use the EN4 objective analysis.

4. Seasonal predictions skill
We look at the delivered correlation of prediction of sea ice extent (Hilbert spectrum | SIC > 15%) that calculated from HadiSST2 for each lead-month (years) and calendar month (a-s) and organised by start date. A black dot indicates that the correlation is not significant.

Summary
• NorCPM is complemented with assimilation of sea ice concentration for S2S and S2D predictions
• it is best to update the multicategory sea ice state and to carry strongly coupled data assimilation of ocean and sea ice
• assimilation of SIC reduces error of SIT and improves the prediction skill of sea ice extent in all regions
• the largest impact is seen for regions that are semi-enclosed (e.g. Kara Sea, Hudson Bay) and regions where sea ice is exported from the Arctic (e.g. Greenland Sea)
• There may be light degradations in the some oceanic region but this need to be further investigated

NorCPM system & Experiment

Twin experiment: finding the optimal assimilation strategy to make best use of sea ice concentration

- Synoptic observations are generated from an independent pre-industrial (PI) run from NorESM
- Initialisation of sea ice further improves the correlation and extends the significance period into the boreal summer