Effects of sea surface temperature and sea ice cover changes on atmospheric moisture, moisture transport and clouds in the wintertime Arctic

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Data & Methods

- This study is based on the model experiments which are performed in CRiceS project Task3.3
- As Identical as possible experiments are performed utilizing four different climate models, NorESM (SU), EC-Earth (FMI), CESM (CICERO) and OpenIFS (UHEL)
- In these experiments only the atmospheric part of the model is used and SST (sea surface temperature) and sea ice cover are given as an input for models
- SST and sea ice cover is taken from ACCESS model CMIP6 historical and scenario SSP126 (not presented) and SSP585 experiments
- The aim of this study is to analyse how changes in SST and sea ice cover affect atmospheric moisture, moisture transport, and moisture related physical processes in both polar regions based results form all four models
- This poster only presents results for the Arctic based on NorESM simulations
- In baseline simulations SST and sea ice cover represent present day conditions. Future SST and sea ice cover are taken at the end of the century from the SSP585 model experiment

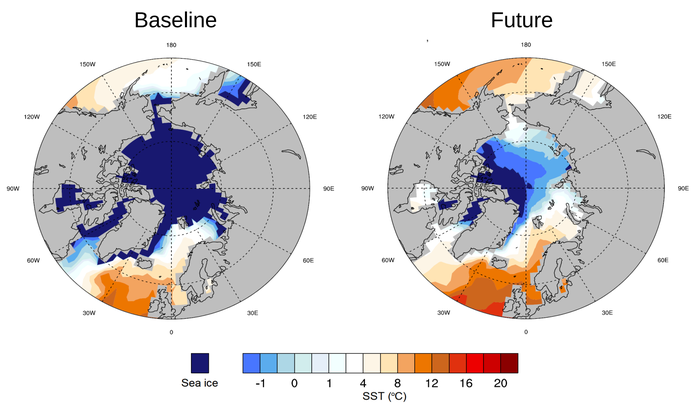

FIGURE 1. Winter (DJF) mean SST and sea ice cover in baseline and future simulations

Results

- Changes caused by increased SST dominate the effect on atmospheric moisture, moisture transport as well as evaporation and precipitation
- Changes in sea ice cover increase atmospheric moisture in a shallow layer near the surface and mostly only in winter due to increased evaporation from open sea
- However, changes of sea ice cover have a bigger influence on cloud ice and liquid water content than changes in SST

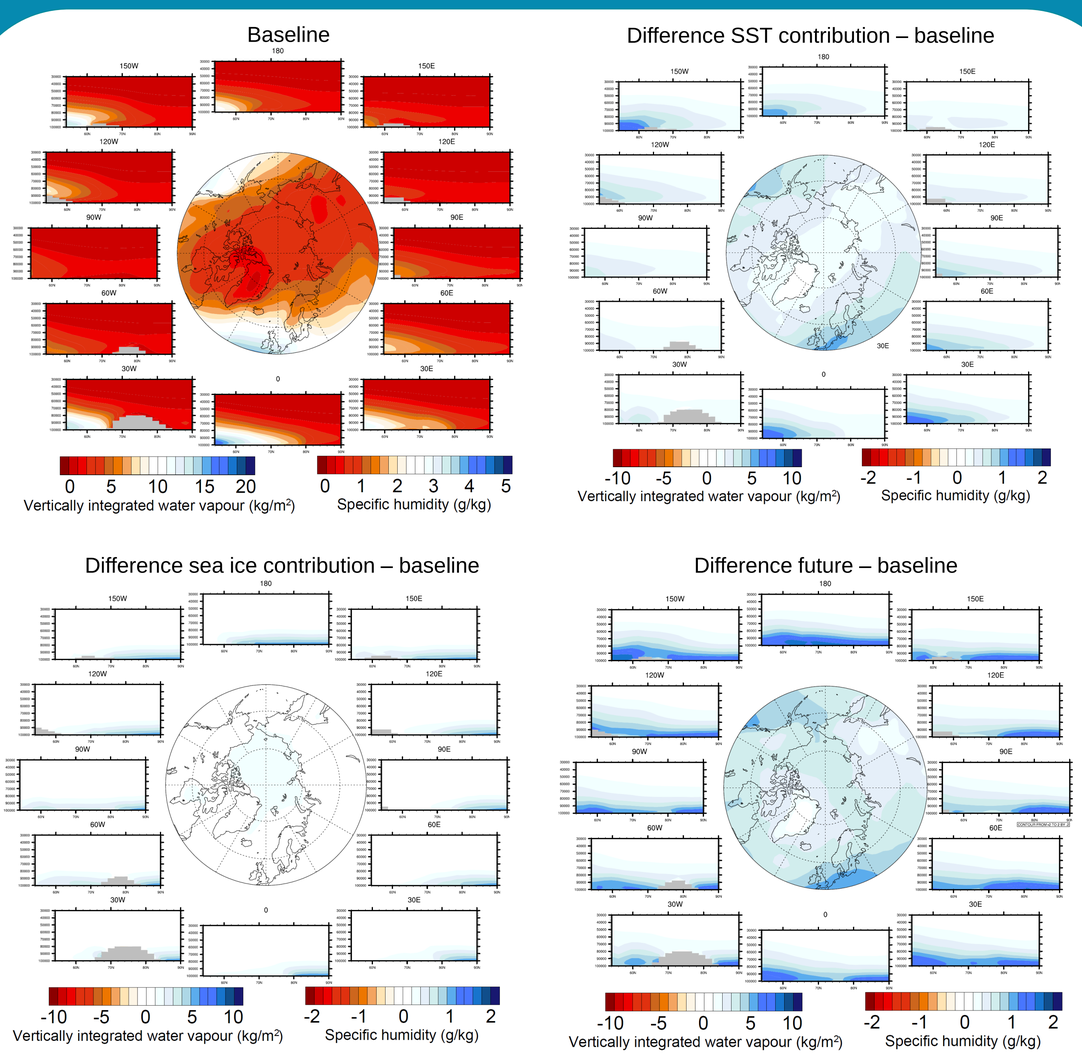

FIGURE 2. Winter (DJF) mean specific humidity and vertically integrated water vapour in baseline experiment and differences between future and baseline experiments

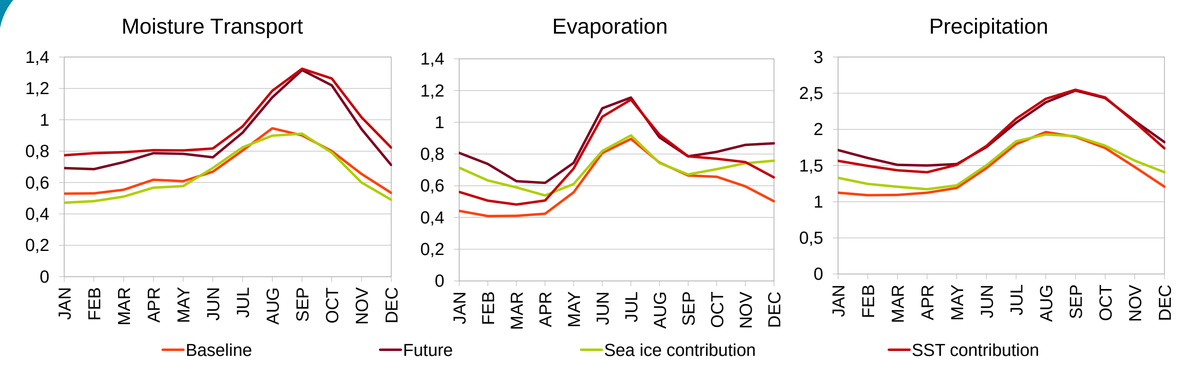

FIGURE 3. Monthly mean convergence of moisture transport, evaporation, precipitation (mm/day) on the area north of 60°N

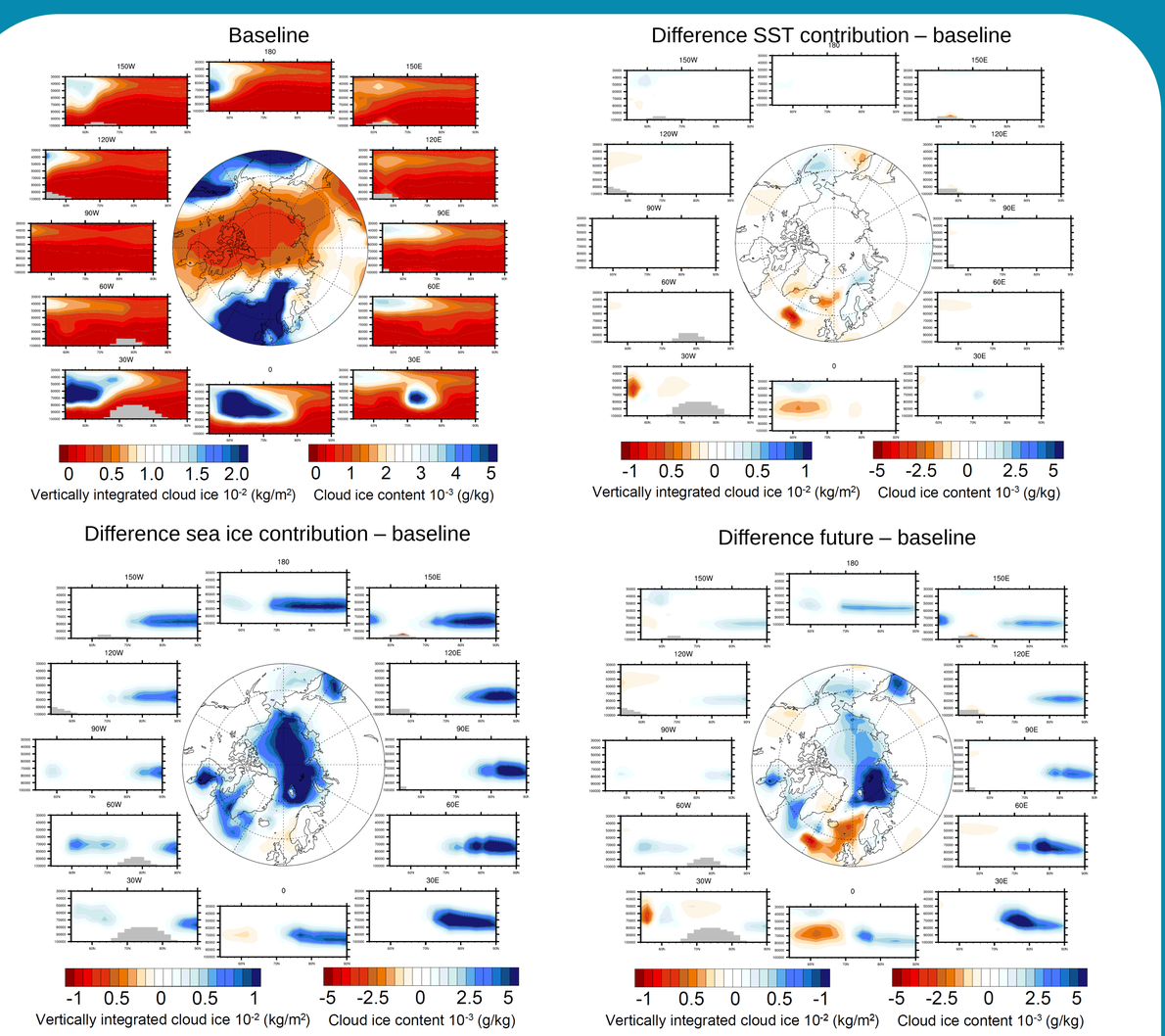

FIGURE 4. Winter (DJF) mean cloud ice content and vertically integrated cloud ice in baseline experiment and differences between future and baseline experiments

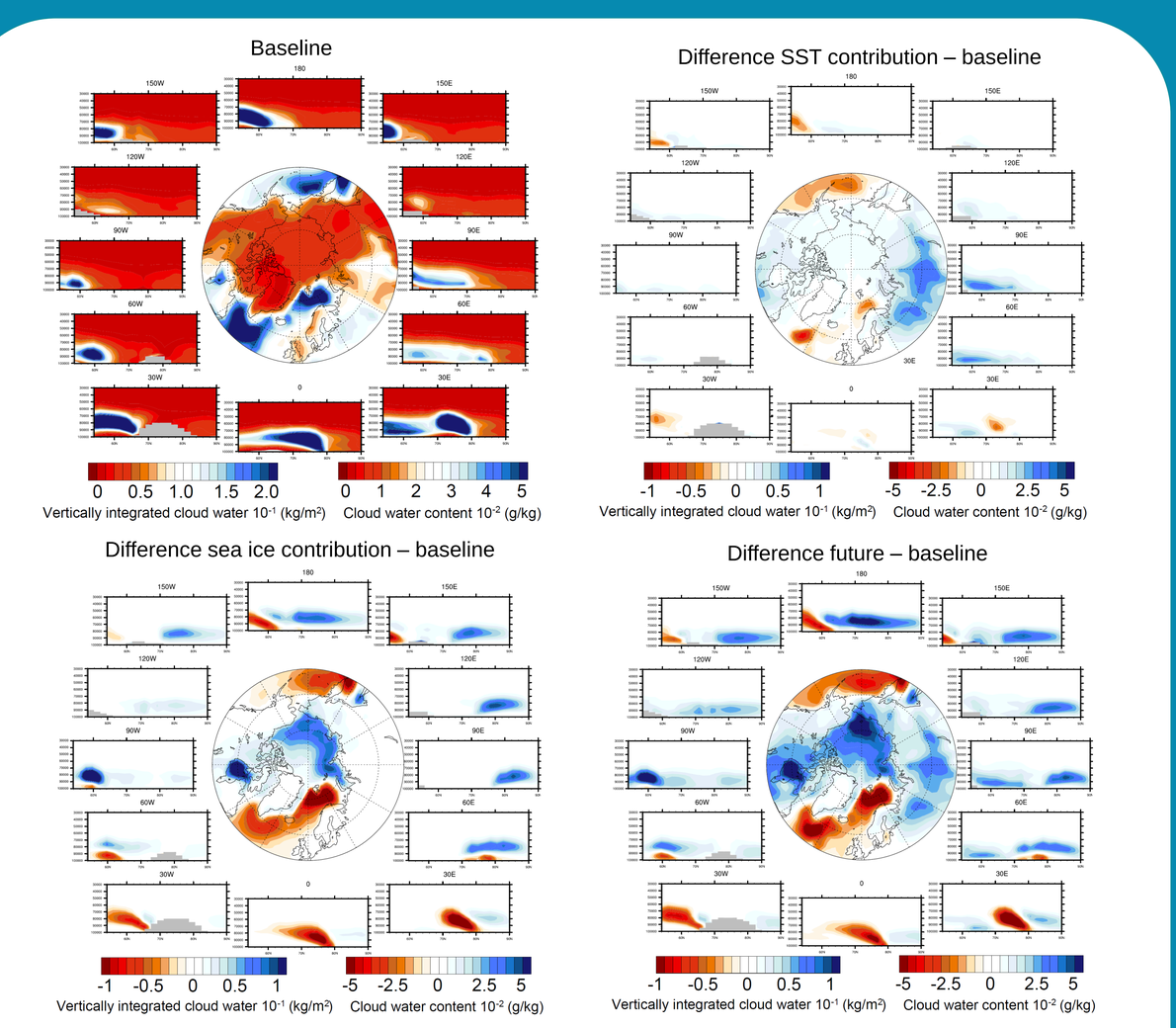

FIGURE 5. Winter (DJF) mean cloud liquid water content and vertically integrated cloud liquid water in baseline experiment and differences between future and baseline experiments

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