A Warmer Arctic Ocean: Some Observations from a Hovercraft

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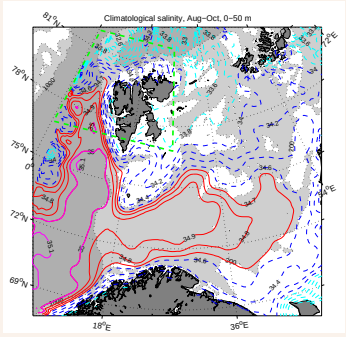
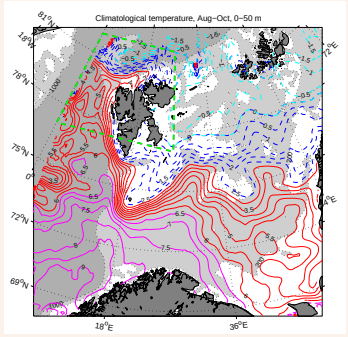
1 Hydrographic Background





In the sea north and west of Svalbard the northward flowing *Atlantic Water* encounters sea ice leaving the Arctic Ocean with the *Transpolar Drift*. Local mixing processes, vertical and horizontal, are known to be critical for the Arctic Ocean's hydrography, e.g.

- Summer ice melting ⇒ *Arctic Surface Water*
- Winter freezing ⇒ *Arctic Halocline* formation

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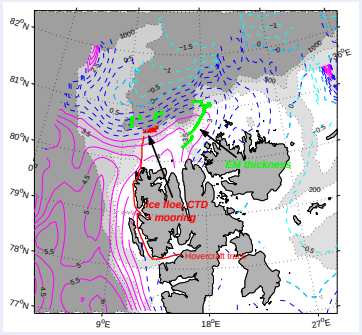
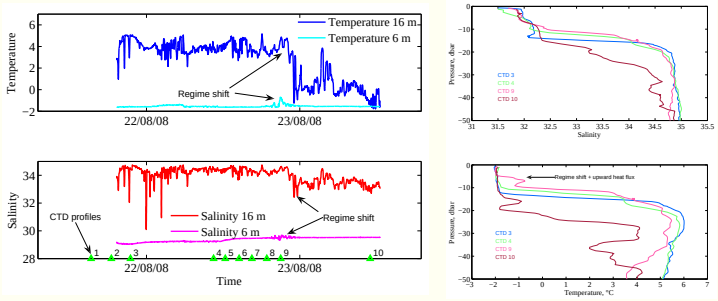
3 Observations from a Hovercraft



Hovercraft in drift ice north of Svalbard.

During August/September we had the opportunity to utilise a hovercraft for field work in the Marginal Ice Zone north of Svalbard.

5 Oceanic Heat Flux

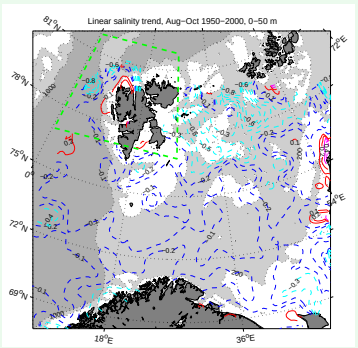


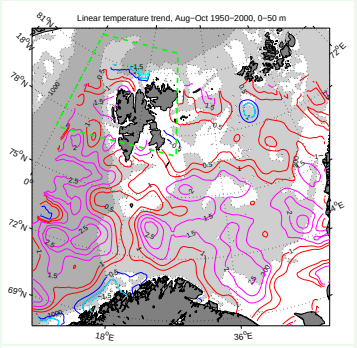
The temperature 20 m below the ice was 6^{o}C, clearly above the climatological mean. During our short drift we observed a strong regime shift associated with vertical heat transport toward the ice.

7 Conclusions

A hovercraft has proved effective to observe ice-ocean interactions and upper layer hydrography in the MIZ north of Svalbard. Although restricted to the calmy summer season, it has a considerable potential to monitor a key area of decadal changes in the Arctic.

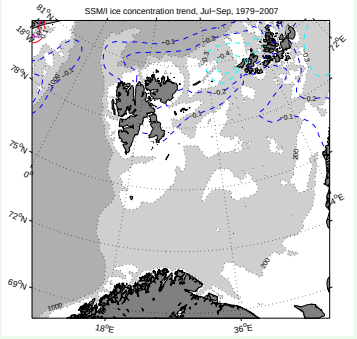
2 Changes during Arctic Warming



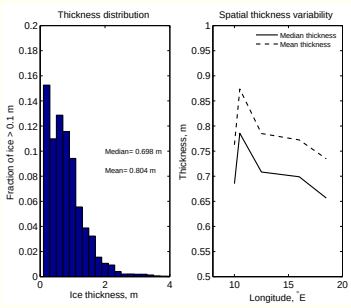


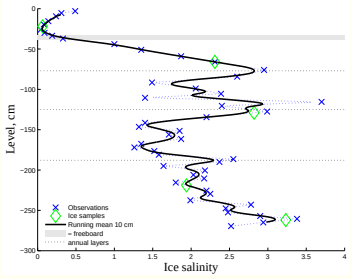
Recent Arctic climate change:

- Warmer upper layer in the Norwegian and Barents Seas
- Ice melt ⇔ cooling and freshening in the north
- Pronounced hydrographic changes north of Svalbard.



4 Basic Camp on an Ice Floe

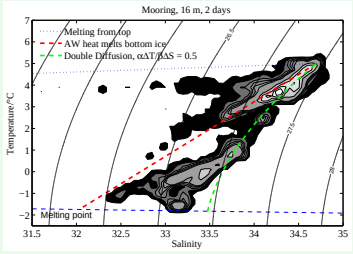


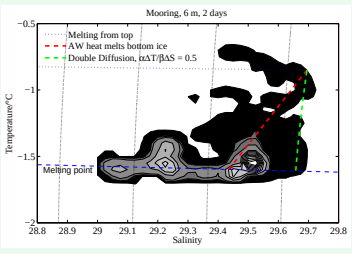


MY ice, salinity maxima indicating its age.

We found an almost 3 m thick multi-year ice floe, from where we obtained our observations. Under very calm conditions (wind ≤ 1 m/s) the floe drifted rapidly (11 km/day) eastward with the Atlantic inflow north of Svalbard. Thickness sections based on electromagnetic induction showed a uniform ice thickness over the MIZ.

6 Ice Melting and T-S Properties





T-S changes in the mixed layer and below the ice can be associated with ice melt ($\Delta T/\Delta S \approx L/(c_p S_w)$) and double-diffusive fluxes. Thermohaline staircases are seen in all CTD profiles.

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