

Diary 2 – 20 March 2012

Contemplating a frozen polynya

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The Arctic Science Partnership is investigating the physical, biological and biogeochemical processes in a thick ice fiord and comparing this to an adjacent polynya. A polynya is a Russian word meaning 'puddle'. It refers to an area of open water in a place and time when you would expect there to be sea ice. As of this writing, the polynya had frozen over and we now have a very thin ice cover (20-40 cm) covered with and new snow fall (20 cm) of low density ($250 \text{ kg}\cdot\text{m}^{-3}$). This makes an excellent contrast (physically, biologically and biogeochemically) to the fast ice of the fiord, which is about 110 cm thick, with a much older and thicker snow cover (80 – 110 cm). This contrast provides insights into how ice of different age controls the exchange of light, heat, gases and how these are related to how carbon is exchanged between the atmosphere, through the sea ice/snow system, and with the ocean.

Our team has to be extremely careful working in the polynya as it may open unexpectedly, casting scientist and our machinery into a very cold ocean. To make this work safer we use an air/ice boat (aka - the 'skippy boat'). This boat is capable of travelling over the ice and over the open water. It can work safely in both environments and travel freely between the two. It also provides a safe shelter if someone was to fall through this thin ice. As an added safety feature all scientists working on the ice must wear immersion suits.

Our sampling in the polynya includes all the same measurements we are doing over the thick ice sites. These include all aspects of the ocean column (biology, salinity, density, temperature, turbulence, chemistry, gas exchange, etc), the sea ice and snow (microstructure, salinity, density, temperature, gas exchange, etc), and the atmosphere (surface energy balance, gas exchange and microbial backgrounds). Through a comparison of the thick ice/snow of the fiord and the thin ice of the polynya we hope to better understand how carbon is exchanged across this ocean-sea ice-atmosphere system and thereby develop a better understanding of the role which the Arctic plays in climate change.

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