

Downward looking RDCP 600 used in Svalbard

Aanderaa provides the latest technology to help Polar Researchers track currents under sea ice

ProClim - Polar Ocean Climate

Process studies of water mass formation in polynyas and fronts in the marginal ice zone of the western Barents Sea and Svalbard



Climate scenarios suggest that most of the Arctic sea ice will disappear during this century.

Melting of sea ice depends on the vertical transport of heat from warm water towards the underside of the ice, and heat transport in turn depends on current profiles.

Another important polar ocean climate process is associated with the ice freezing which leaves salt behind in the liquid water.

This highly saline water sinks down and ventilates the deep ocean.

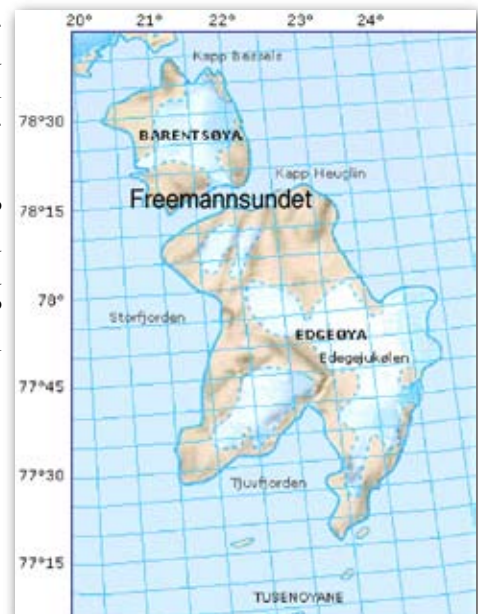
Precise current profiles are needed to document those two processes.

Scientists have come up with ingenious solutions to deployment problems because of their local knowledge.



Scientists from The University Centre, Svalbard (UNIS), The Geophysical Institute and the Bjerknes Centre for Climate Research in Bergen, Norway study ocean currents beneath floating sea ice in the Arctic.

A Recording Doppler Current Meter RDCP 600 is bought to do current profiling, and in April 2004 field campaigns at Svalbard were conducted. One deployment of RDCP 600 was done in Freemandsundet between Barentsøya and Edgeøya.



We are grateful for the chance to be an active part of this important scientific project, and can, without doubt, state that we have learnt a great deal about how to carry out this type of application and how to configure the RDCP 600 to give the maximum of exact data.

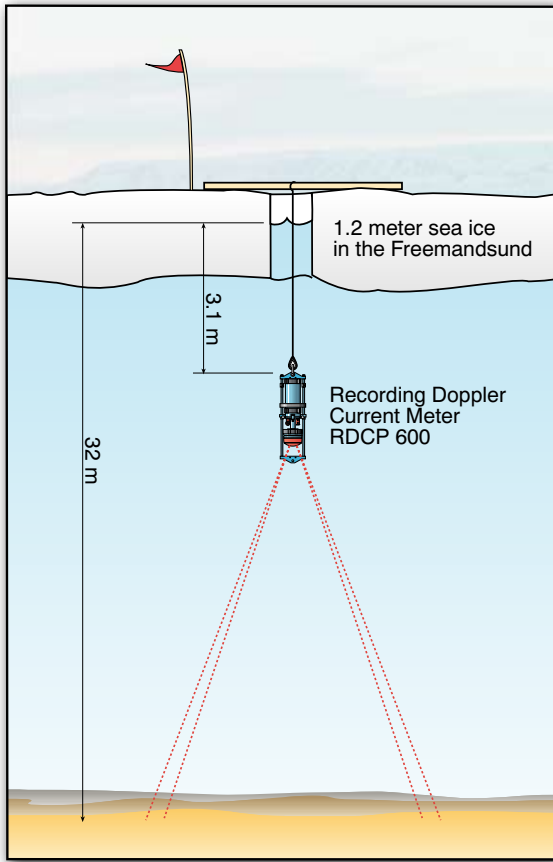
We are pleased to register that the RDCP 600 has proved to be as, if not more reliable than the other instruments in our product range even in these very cold waters.

The research is part of the Polar Ocean Climate Processes (ProClim) project, see www.gfi.uib.no/ProClim for more information.

Photograph courtesy of Ragnheid Skogseth, UNIS, ProClim Project

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The RDCP 600 deployed in an unusual but innovative manner



A hole was made in the 1.4 meter thick sea ice, and RDCP 600 was deployed 3 meters below the ice, looking downwards. The depth was 32 meters at the site.

The horizontal and vertical currents are shown in the plots below. The plots show clear tidal variations, and maximal horizontal velocity close to 50cm/s.

The sea temperature was well below zero degrees Celsius, see the temperature plot below.

The RDCP 600 was deployed by attaching it to a plank of wood which spanned the hole made in the sea ice.

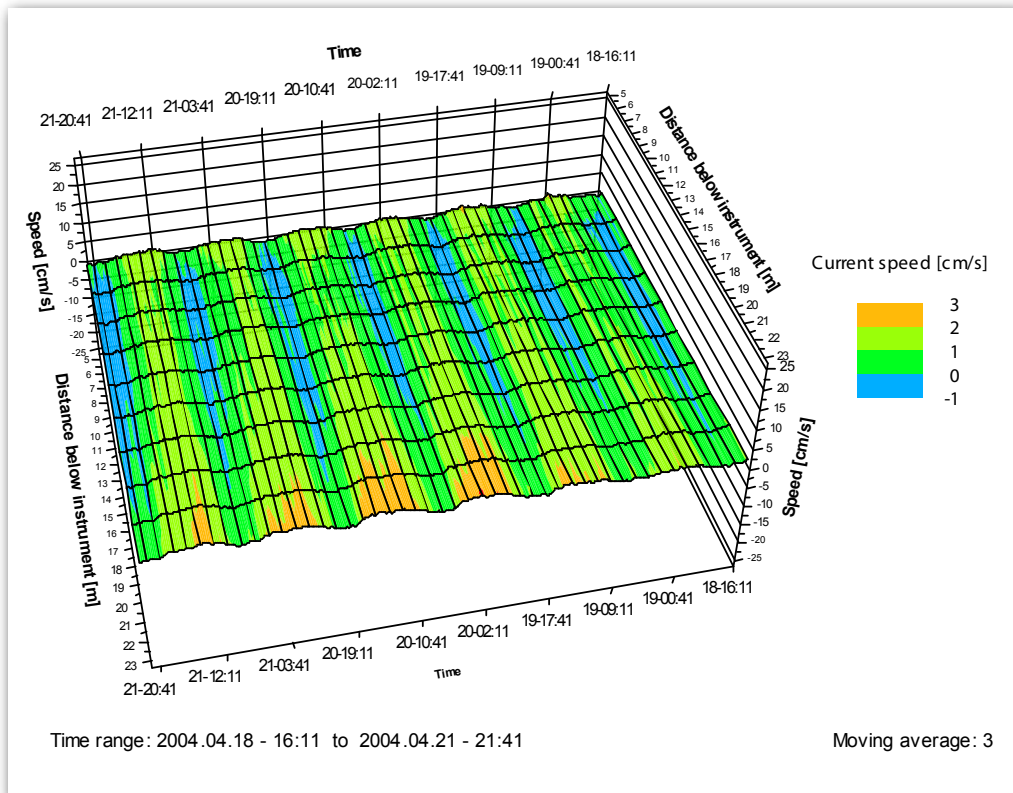
A flagged bamboo pole was used to mark the position for retrieval at a later date.

Oceanographers Lars H. Smedsrud, University of Bergen, and Ragnheid Skogseth at University Center of Svalbard (UNIS) used this instrument in their studies of Sea ice formations in leads and polynyas on Svalbard.

For more information see <http://www.gfi.uib.no/~larsh> or <http://www.unis.no>.

3D Graphs of the measured data are shown below and on the following pages.

3D Vertical Current - Column1



Vertical velocity. Positive velocity is upwards, negative velocity is downwards.

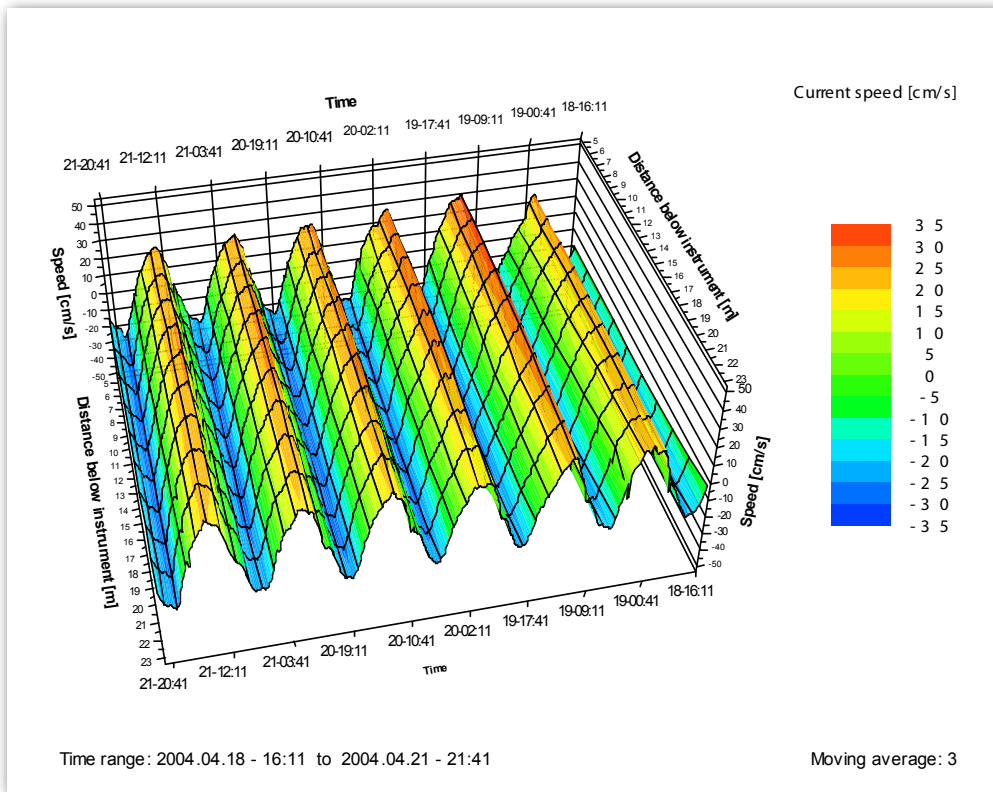
Time on x-axis, distance from the instrument on y-axis. The instrument looks downward, so positive y-axis is from bottom and towards the surface (the ice).

There are clear tidal variations in the current.

There is also a depth gradient in the velocity, giving the highest velocity closest to the bottom.

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3D North Speed - Column1



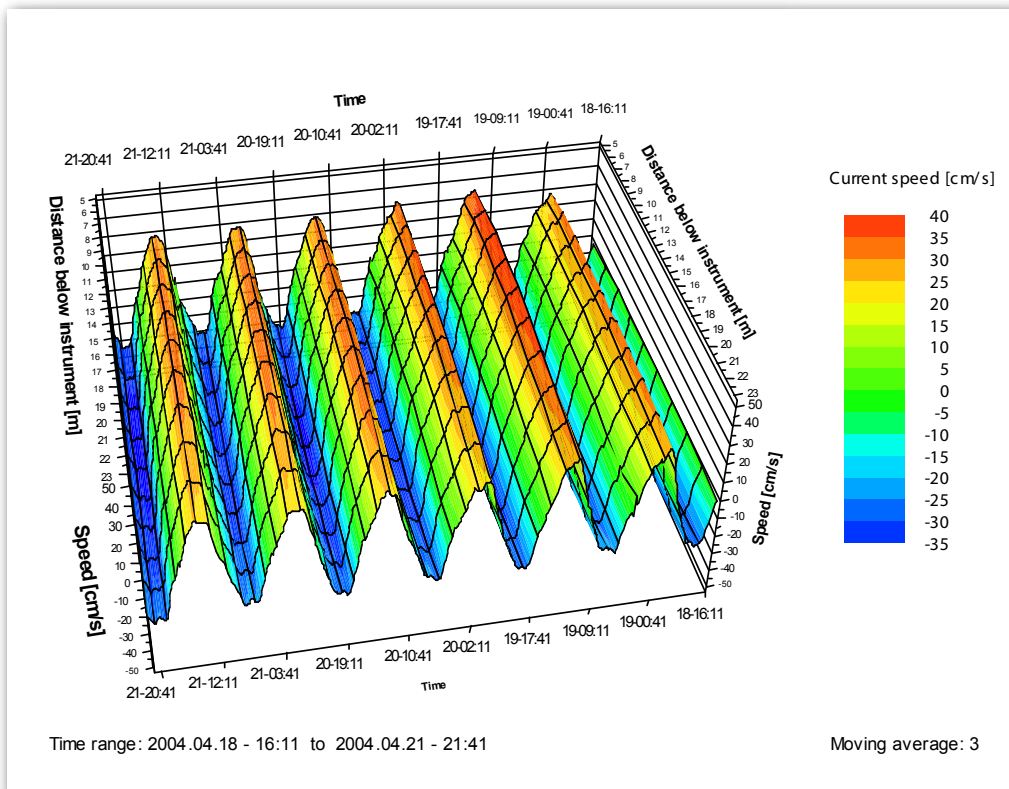
The instrument looks downward, so positive y-axis is from bottom and towards the surface (the ice).

We see that the tidal currents dominate the flow, and that the horizontal flow is rather uniform through the water column.

Note that measurements starts at 5 meters depth and that the data closest to the bottom had to be rejected due to too high standard deviation values (std >20cm/s).

The north component of the horizontal velocity. Positive velocity is towards north, negative velocity towards south.

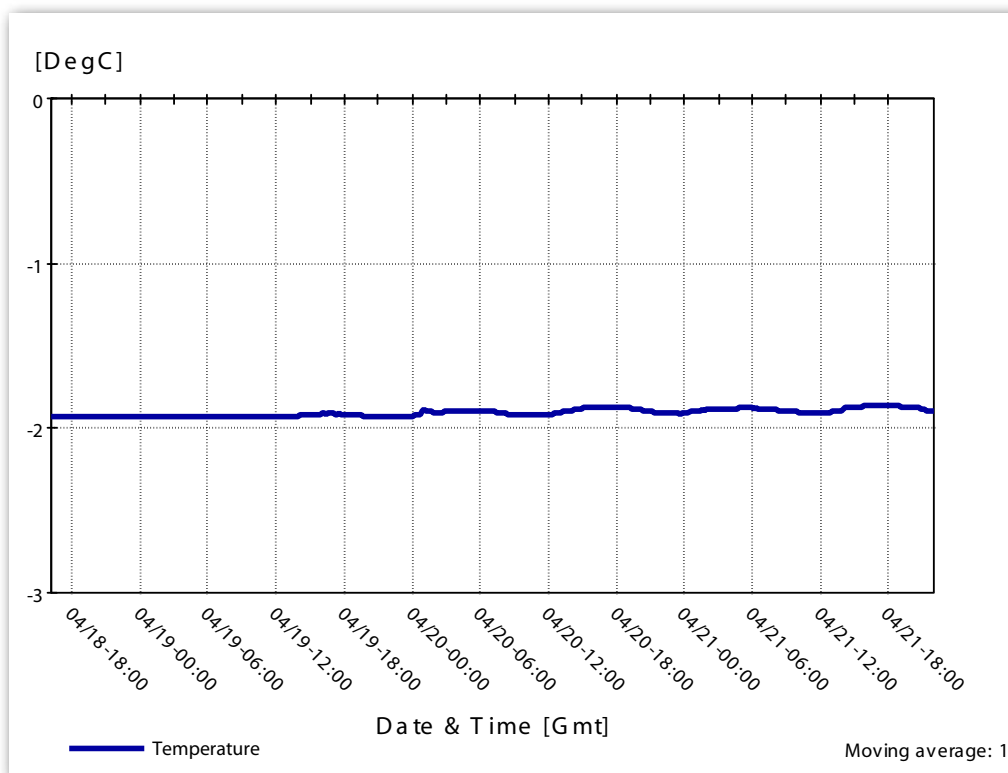
3D East Speed - Column1



The east component of the horizontal velocity. Positive velocity is towards east, negative velocity towards west.

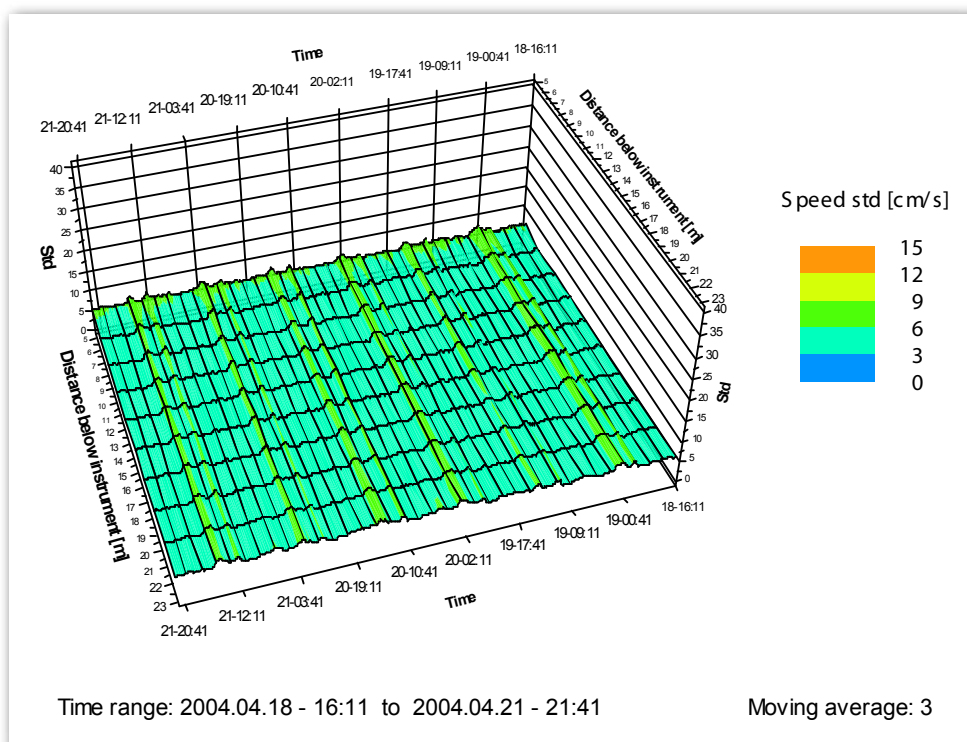
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Sea Temperature



The temperature is stable around -1.9 degrees Celsius.

Single ping standard deviation - Column1



Single ping standard deviation indicates the quality of the current measurement.

The single ping standard deviation must be divided by \sqrt{N} to get the standard deviation of the actual current measurement.

N is the number of pings in one current measurement ($N=300$ here).

The STD plot indicates that the quality of the data in the selected cells is very good.