

CCGS Louis S St-Laurent
IOS Cruise Number 2008-29 and 2008-30
Lowered Acoustic Doppler Current Profiler
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During the C30 cruises of CCGS Louis S. St-Laurent in summer 2008, Lowered Acoustic Current Profiler (LADCP) measurements were performed. LADCP allows measurements of currents during standard CTD casts. Ocean currents are measured in vertical cells, at whole profile, from surface to the bottom. Device transmits sound burst and receives echoes from particles carried by the water currents. Movement towards and out of the device produce the Doppler shift. The final ocean velocity profile is obtained during complicated data processing.

Data

In the Arctic Ocean, especially in the deep layers measurements by LADCP are difficult, because of low amount of particles in the water (weak backscattering). Therefore during the 2008 cruises two LADCP devices were used, both RDI 300 kHz WHS300. In the basic configuration devices were synchronized: upper (slave) and down looking (master) LADCPs were connected by RDI Star-cable. Sampling rate was 1 s, 1 ping/assemble, 20 bins, 10 m thick each. Because of problems with equipment, configuration has been changed during the 2008-30 cruise and later the measurements were carried by means of one, down looking LADCP. Measurements were carried at 13 stations during the LSL 2008-29 and 65 stations during the LSL 2008-30 cruise. Processing of raw data were done by means of LDEO IX software for Matlab. Profiles were averaged every 20m. Because of the very weak signal and increased error, filtration and smoothing of data were much higher than usually. CTD and GPS data were used in LADCP processing. Finally the theoretical velocity error is less than 5 cm/s.

Results

The quasi-synoptic picture of in situ currents were obtained for both cruises (Fig 1, Fig 2). In some regions currents very good fit to our knowledge about circulation, in other are too high. Better understanding of the currents may be obtained by analyzing it together with the water mass properties (Fig.3). The warmer and less saline region occupies centre of the Beaufort Sea. It suggests anticyclonic circulation in this region. Measured LADCP currents well follow the salinity isolines. Calculated baroclinic currents are more complicated. In generally, both calculated and measured currents show southward inflow in the northern part, and anticyclonic circulation in the centre. Measured in the northern part currents are much higher than calculated. Also over shelves and slopes currents are modified.

Presented results are preliminary, works are continued.

Remarks.

LADCP results from the Canadian Archipelago are precise. Measurements in the Canada Basin are much complicated and results are still less accurate. The causes are mostly low backscattering in deep layers and high magnetic compasses errors. Besides the nature of oceanic currents in this region (low Rossby radius of deformation) do not allow to obtain precise circulation pattern from scattered, low horizontal resolution measurements. However during the cruise valuable data were collected. All obtained data will be compared with data collected during the 2004 and 2005 LSL cruises. This possibility of data comparison is very important. To investigate climate, ocean hydrology and dynamics changes, we need time series of all properties.

Results will be also analyzed and compared with the high resolution Ice - Ocean coupled model.

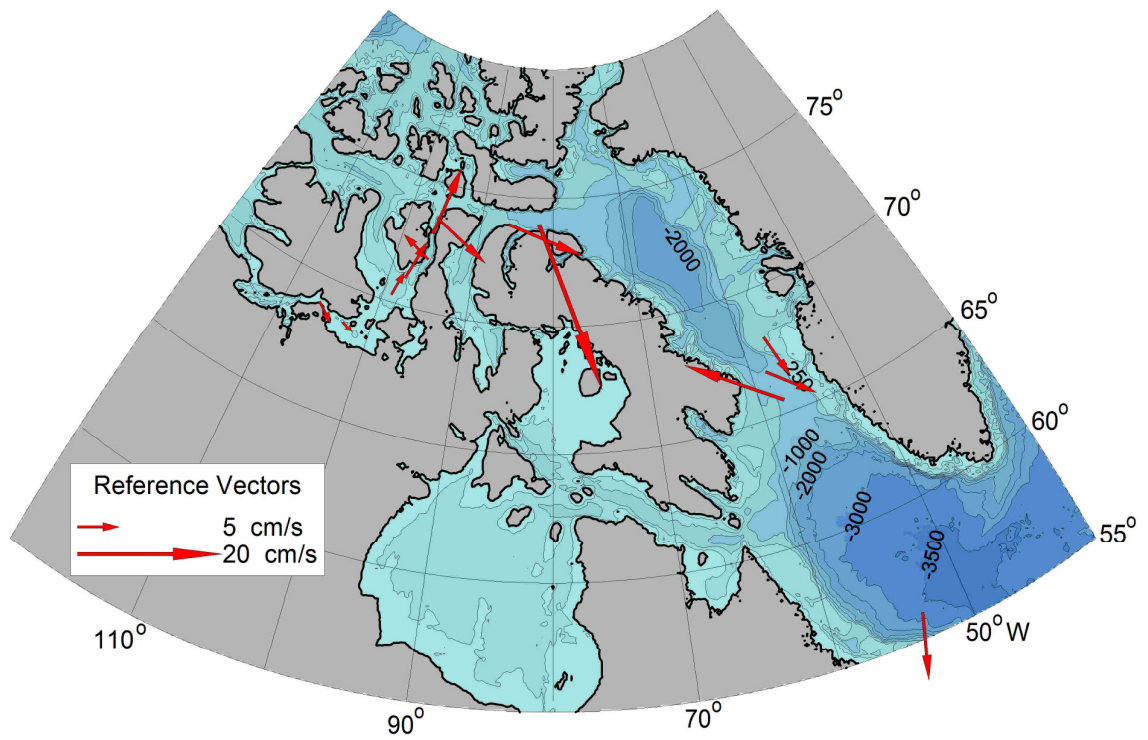


Fig. 1. Cruise LSL 2008-29, LADCP current vectors at level 100 dBar.

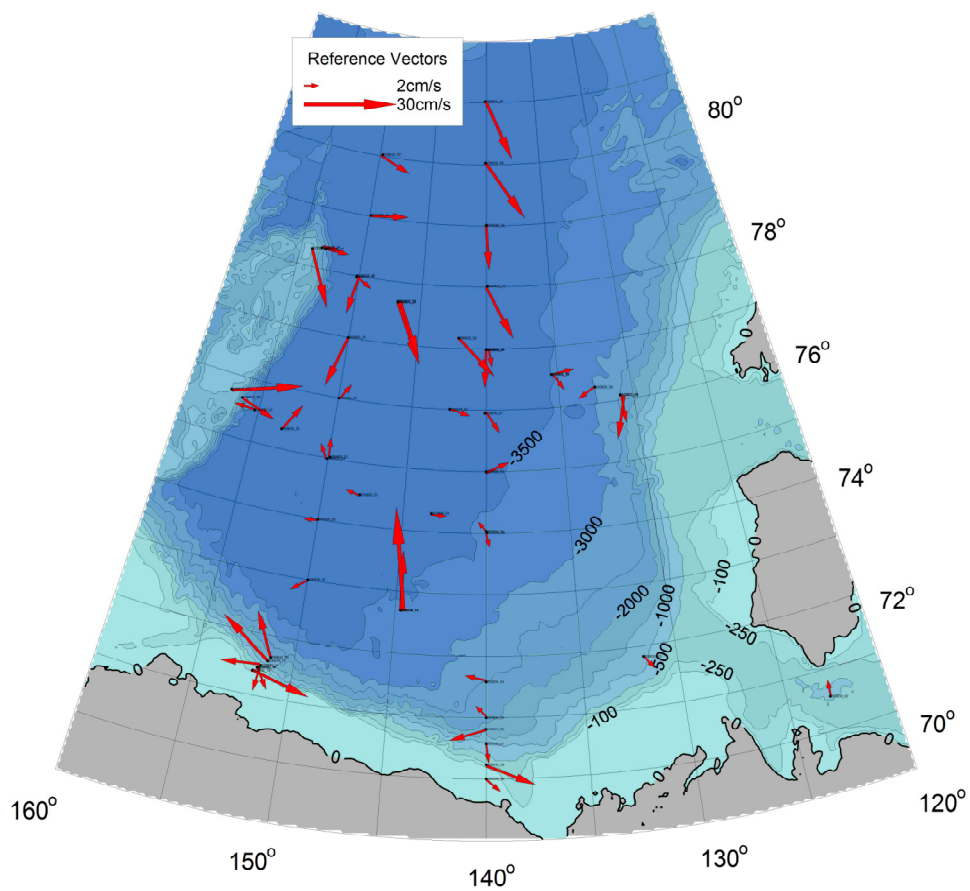


Fig. 2. Cruise LSL 2008-30, LADCP current vectors at level 100 dBar.

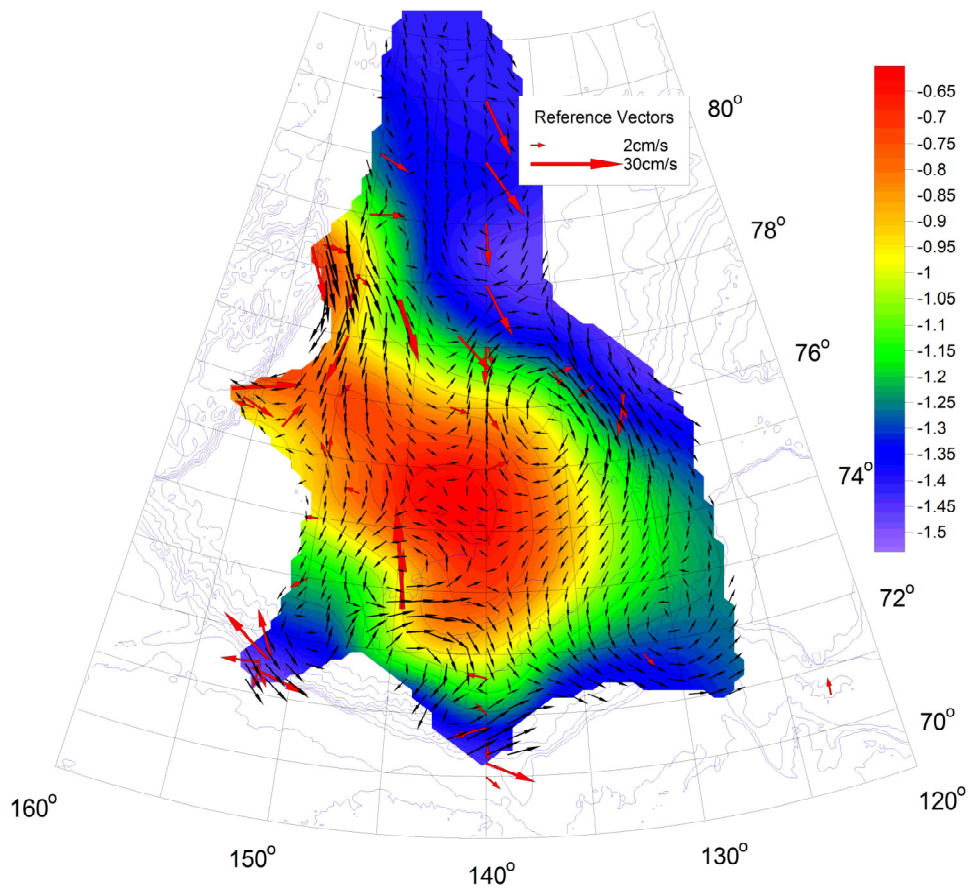


Fig 3. LSL 2008-30. Temperature (colour scale), baroclinic currents (black arrows) and LADCP currents (red arrows) at 100 dBar.