

Weekly Science Report, NBP06-03: 4/16/06  
Paleohistory of the Larsen Ice Shelf, Phase II and  
Consortium on Oceans Role in Climate: AbRupt climate CHange  
Studies (CORC-ARCHES) Southern Ocean Modern Observations program

It has been five days since we departed Punta Arenas, Chile en route to the eastern side of the Antarctic Peninsula. We arrived early this morning to the great expanse of the Weddell Sea, as the Palmer exited the Prince Gustav Channel. The sun and blue sky greeted us and, along with the remarkable lack of wind, have provided all on board with a grand vista of the James Ross Island archipelago and high peaks of the Antarctic Peninsula. The first geographic goal for the third, and final, year of our project is the region of the former Larsen B ice shelf, where last year we deployed five instrumented sediment trap moorings from the LM Gould. For the first time in the project we will utilize the impressive capabilities of the NB Palmer to help us map the seafloor, to recover and redeploy our moorings, to sample the biota, and marine sediment record of the recently deglaciated embayment. After our work is completed in the Larsen region we will transit to the South Orkney Plateau where we will recover oceanographic instrumentation in support of CORC-ARCHES program (NOAA supported). On board are scientists and students from five countries (US, Italy, Spain, Canada, and Bulgaria) and PIs from Hamilton College (E. Domack), Colgate University (A. Leventer), Montclair State Univ. (S. Brachfeld), Lamont Doherty Earth Observatory (B. Huber) and the Geophysical Observatory at Trieste Italy (OGS) (M. Rebesco). Dr. Tom Wagner of the Office of Polar Programs is also on board to share in our endeavor. We exited PA in good fashion and the vessel, laboratory space, equipment, and supplies were prepared in excellent fashion by the Raytheon staff under the direction of MPC, Jim Holik and the Palmer's mates and crew, under the master of ship Mike Watson (Edison Chouest Offshore). The last day has seen some splendid icebreaking maneuvers in a variety of ice conditions that, while challenging, remain workable. At present we are breaking thin, new ice with a mix of first year to multiyear patches and icebergs some 60 nm NNE from our first station, near Jason Peninsula. All on board are eager to begin our operations and have been busy preparing all aspects of the interdisciplinary science observations we will be undertaking. If you wish to follow our voyage more closely please see:  
[www.hamilton.edu/news/exp/antarctica/2006/](http://www.hamilton.edu/news/exp/antarctica/2006/)

Respectfully yours,

Eugene Domack  
Chief Scientist, NBP06-03  
April 16, 2006

Weekly Science Report #2, NBP06-03:

Paleohistory of the Larsen Ice Shelf, Phase II and

Consortium on Oceans Role in Climate: AbRUpt climate CHangE Studies (CORC-ARCHES) Southern Ocean Modern Observations program

The last week brought to all of us here on this tiny boat in the Weddell Sea the full spectrum of human emotion. We were all shocked, saddened, and distraught at the loss of one our own, when the word from the LM Gould reached us about the loss of Joshua Spillane. To grapple with such a tragedy while afloat in the environ of the incident was difficult beyond measure, but all aboard the NB Palmer sympathize with the family and relatives of Joshua, who must deal with far greater sadness than we can imagine. But as everywhere, one must move forward from such events and the realities of where we are, by necessity, compel us to do so. We hope that in some way our continued struggle to explore the icy waste of Antarctica, to learn from secrets it gives up so grudgingly (and at times with such great cost) can be a tribute to Mr Spillane who worked so hard in the service of science.

At present we are in the fjord of Crane Glacier, making observations in a place which was recently in the heart of the huge Larsen Ice Shelf, but which is now laid out before us to examine and hopefully understand its role in a changing planet.

All on board are well and remain respectful of the place and persons with whom we work.

If you wish to follow our voyage more closely please see:

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Respectfully submitted,

Eugene Domack

Chief Scientist, NBP06-03

April 23, 2006

Weekly Science Report #3, NBP06-03:  
Paleohistory of the Larsen Ice Shelf, Phase II and  
Consortium on Oceans Role in Climate: AbRupt climate CHange  
Studies (CORC-ARCHES) Southern Ocean Modern Observations program

Our last core station for G-096 took place 24 hours prior to this report being written, in the Northern Prince Gustav Channel. The last week has been trying, partially rewarding, and grueling in particular the last 4 days of icebreaking out of the Larsen region. Scientifically we can report on only partial success, which includes mapping the trough of the Crane Glacier, seismically imaging its basin fill, and mapping its paleo grounding zone or confluence with the former Larsen B Ice Shelf. The depth of the trough and the remarkable sediment infill, within it, help to constrain the glacial dynamics for how tributary and ice shelf systems interact; our observations challenge the current understanding of the linkage. We were also able to map the seafloor beneath the recently receded SCAR inlet portion of the Larsen B which revealed some unique seafloor features, some of which may be related to large scale ice berg calving events which took place across the SCAR inlet just a few months ago. Four sediment cores from across the Larsen B region have helped constrain the history of the ice shelf system and have posed new questions regarding the existence of subglacial lakes beneath the larger tributary glaciers during the existence of the Larsen B ice shelf. Nothing we have observed however yet refutes the hypothesis that the recent demise of the Larsen B system is unprecedented. Over 150 km of high resolution seismic data were collected across the southern extent of Larsen B embayment, at times under ideal conditions of limited wind and good ice clearance behind the stern; resulting in good signal to noise ratio. We are continuing to process and evaluate these lines but the first impression is that the structure and stratigraphy are far more complex than previously thought. Ice limited our ability to complete complimentary strike and dip lines and this will plague our ability to fully interpret the data we did collect. Our seafloor mapping did extend across the region of the newly discovered cold seep (found last year on LMG05-02) however we were unable to deploy the sidescan and bottom video cameras, due to deteriorating ice conditions. One core was collected near the discovery but some distance from the observed vents. No additional bottom imagery was acquired across the seep region this season other than the multibeam coverage, due to ice and time limitations. Oceanographic data were collected systematically down the axis of the Crane Glacier fjord and demonstrate the localized production of ice shelf water that must be generated in the cavity beneath the Crane Glacier.

Equipment Loss, Failure, and Survey Efficiency

Ice extent dictated our ability to complete our studies but to a far great degree than we had anticipated. The largest

disappointment was in the performance of the Simrad multibeam system which is unable to generate any useful data in even the lightest of ice conditions. Thin new ice, grease ice, and even slushy pancake ice degrade the data quality to zero. Most times we had to back track through our cut channel, repeating the trackline in 1-2 mile leapfrogs, degrading the efficiency of our bottom surveys by at least 60-75%. The old Seabeam system was able to collect data in such conditions and thus the current status of the Palmer's multibeam system must be considered as a step backward for working in light ice. The ship's hull mounted chirp system (the Bathy 2000W) was on line and worked fine in 2001 early 2002. However in the succeeding years a strange symbiotic relationship has developed between this system and the operating system of the old Bathy 2000. Constant toggling between the two systems was at times counterproductive to good data collection but necessary because of how the two systems have been cross-integrated. Chirp data quality is degraded completely by even the lightest of ice conditions; this has always been the case.

We failed to retrieve two of our moorings most likely because of the large calving of iceberg A-54 from the Larsen B in SCAR inlet and the oscillating behavior of iceberg A-43F up against the Larsen C. We have three moorings still in place and were unable to turn them around due to ice cover and time constraints. We have an agreement with the chief scientist of the Polarstern to recover and redeploy these moorings next season as one of their core projects in the Larsen region in December and January. We were unable to deploy the JPC due to time limitations and ice cover over the primary targets. We were also unable to continue collecting bottom photographs due to the loss of the benthos camera. This took place when the Crane Glacier calved, which induced a moderate roll in the ship while the camera was being deployed. Underway water filtration for diatoms was accomplished and we did collect one last core in the Vega Drift. This core was taken for pore water studies in order to understand widespread ikaite formation within sediments of the Erebus and Terror Gulf. Microbial sampling of the cold seep system, as part of an SGER project to Mike McCormick, was not attempted because ice prevented access across the basin and we ran out of time. All scientific personnel are extremely grateful for the chance to utilize the unique capabilities of the RV Palmer in our third and last field season. We accomplished a great deal in less than one week of science time. Our unfulfilled goals await further opportunities aboard other vessels or through pending support in IPY.

At present we continue on a, east to northeast course in order to complete the CORC-ARCHES portion of this cruise.

If you wish to follow our voyage more closely please see:  
[www.hamilton.edu/news/exp/antarctica/2006/](http://www.hamilton.edu/news/exp/antarctica/2006/)

Respectfully submitted,

Eugene Domack  
Chief Scientist, NBP06-03  
April 30, 2006