

2/10/2007

OPP et al,

Cruise NBP07-02 departed McMurdo as scheduled on 03 February and headed north to address the first-season objectives of the Cape Adare Long-term Monitoring (CALM) project, Bruce Huber and Arnold Gordon, PIs. That work follows up on time series measurements of Antarctic Bottom Water production initiated during the 2003-04 AnSlope project in the NW Ross Sea. Enroute to the Cape, a test CTD station was occupied in northern McM Sound, and a second CTD cast was made near the deep end of the Drygalski Trough in Terra Nova Bay. Stations at or near those locations typically find the densest High Salinity Shelf Water (HSSW) in the Ross Sea, recharged by sea ice formation during the previous austral winter. At the outer shelf a short XBT transect was made across the Antarctic Slope Front, a sharp oceanic boundary between shelf and deep waters. On this crossing the front was encountered several km landward of the shelf break.

The CALM objectives were to recover and redeploy a 2004 mooring on the continental slope, deploy a second mooring downslope, and reoccupy an AnSlope CTD/LADCP/tracer section across the two sites. While the 2004 mooring was located and release was confirmed, it did not rise from its bottom anchor. Grappling plans were deferred to occupy the CTD section, but the rapid approach of severe weather led us to deploy the new mooring after completion of only 3 stations. Sea state and wind then increased to the point where over the side operations were judged to be unsafe, increasingly foul weather was predicted for the next 36 hours, and a reluctant decision was made to depart that study area. Heading SSE in worsening seas, we roughly swathmapped the NE side of a 200-250m submarine bank upon which giant icebergs exiting the Ross Sea have frequently run aground and broken up (Martin, Davey, MacAyeal et al, ms in prep). More might have also have been accomplished there in fair weather, and if the shoal had not been occupied by several smaller icebergs, but better than us.

Beating southward into the wind and sea, the NBP reached the vicinity of Ross Island nearly two days later. We then commenced a CTD/XBT transect along the front of the Ross Ice Shelf (RIS), and had crossed the dateline by the end of the first week of this cruise. While this track is not the shortest route from Cape Adare to the primary 0702 destination, working south of the residual summer pack may provide access, via an intermittent coastal lead, to rarely visited ice shelf fronts east of ~160W. In addition, it allows us to lengthen the RIS time series of ocean thermohaline and chemical tracer measurements, some extending back to the IGY. In that regard, a repeat station near Ross Island revealed fresher HSSW than on all but the last transect (Feb 2000), and the upper water column was the freshest yet observed at that location. The shallow freshening could result in part from the late summer date of this year's profile, in combination with a lengthy open water period and the continued input of copious volumes of meltwater upstream (to the east).

During NBP07-02 we will undertake several new measurements, support a few auxiliary projects and experiment with alternate ways of utilizing available information. For example, the NBP's TeraScan receiver provides weather and sea ice information in near-real time, but not the higher quality ice data from the newer AMSR satellite sensors. However, Andy Archer at RPSC Denver has agreed to download the AMSR measurements from daily postings by the remote sensing group at the University of Bremen. These will be subsampled for our study area and posted to the NBP every few days, in reasonably sized georeferenced files. Here Frank Nitsche will overlay the sea ice concentrations on our increasingly accurate sea floor bathymetry, with transparent grid cells in lieu of open water. This should help to identify areas where we can access the continental shelf break and deep inner shelf troughs of the Amundsen Sea.

Other activities during the first week of 0702 included the usual round of orientation and safety meetings, fire and boat drills, pingedit training and initial science talks and discussion. Support from RPSC and ECO crews has been very good, minor equipment malfunctions rectified, and the several new hands are learning sampling procedures and other techniques from seasoned pros like Bruce Huber, Raul Guerrero, Amy Leventer and Mike Schroeder. We might have departed McMurdo a few days early, except for the planned turnover of Raytheon personnel, as bunkering was completed on 29 January and the science party was accommodated aboard on the 30th. But the full-length port call allowed time for stowing and testing gear while idling in the turning basin, hikes for some along the Castle Rock Trail, and missing bolts to be scrounged from McM stores. The first Radarsat image, scheduled to facilitate navigation in the CALM region, arrived a few days after we had departed that scene, where sea ice turned out to be the least of our problems.

Sailing for Science, as they say at RPSC,  
Stan Jacobs et al

2/18/2007  
OPP et al,

During the 2nd week of NBP07-02, a CTD/XBT transect was completed along the front of the Ross Ice Shelf (RIS), and several troughs were profiled and sampled on the narrow continental shelf east of Cape Colbeck. This work took advantage of the opportunity to investigate ocean-ice shelf interactions enroute to the Amundsen Sea, where the initial objective of this cruise was to send the UK 'Autosub' into ice shelf cavities. As most readers will know, the first Autosub took up permanent residence under the Fimbul Ice Shelf in 2005, and its backup vessel, still undergoing sea trials, will not be ready for Amundsen work for another year or two. That delay may be a blessing in disguise, in the sense that the sea ice conditions ahead could again preclude NBP access to the calving front of the Pine Island Glacier.

That is also getting a bit ahead of our story, one aspect of which is the salinity

change reported earlier near Ross Island, since confirmed by general freshening along much of the RIS transect. But unless the next winter is unusually severe, the saltier High Salinity Shelf Water (HSSW) may soon resume its downward trend toward lower salinities, since the fresher near-surface waters will be incorporated into the mix that determines its properties next summer. Seasonal aliasing could also be a factor, with the strongest signal in the upper 150m, also warmer than the 2000 section which was occupied a week later in February.

Other observations along the RIS included small-scale attrition, which 'nibbles away' (a Chris Doake term?) at the ice front between major calving events, at an annual rate that still remains to be determined. And thermohaline steps were often apparent, although not as strong as recorded near the Erebus Glacier Tongue in 1979. One CTD station was located ~6 nm inside an open rift that extends ESE along the calving front of Doug MacAyeal's 'Nascent Iceberg.' MacRift walls displayed evidence of the recent presence of 'ice melange,' an agglomeration of sea ice, brash debris from ice walls, marine ice and blowing snow deposits. Melange removal may have been facilitated by a strong westerly wind event and/or rift widening.

In a related study of windblown snow transport near and from the continental ice, Katie Leonard has a borrowed photoelectric particle counter mounted on the NBP ice tower. This may be the first ship-based use of such a device for measuring blowing snow near the coastline, providing a high resolution transport record that can be correlated with shipboard meteorological data. Previous studies of antarctic snow drift with such counters have been made at a few coastal research stations, aiding the development and calibration of numerical models of mass transport as a function of wind speed and other atmospheric conditions.

This year's RIS transect also provided a comparison between temperatures measured by the CTD and by XBT casts between the CTD stations. Gridding and subtracting the two, Bruce Huber was able to demonstrate a positive bias of ~0.14C in the XBT data, with a 2X larger standard deviation. While not entirely unexpected, this preliminary result extends similar earlier studies to the low end of the XBT temperature range. It also underlines the point that caution is needed in the use of XBT data to assess ocean warming, as Koltermann and Gouretski have noted in a recent GRL paper.

Least expected so far on this cruise has been the finding of 'warm' Circumpolar Deep Water (CDW) below 500m in a 1350m-deep trough extending NW from the small Richter Glacier near 155.5W. This water is warmer and saltier than anything seen heretofore west of greater Pine Island Bay (~105W). CDW may enter this trough because its sill depth lies beneath the adjacent CDW temperature maximum, at a point where the continental slope trends sharply to the right, looking downstream in the shelf break current. Its proximity to the

larger, shallower Little America Basin seaward of the eastern RIS raises the question of whether relatively minor changes in the regional ocean circulation could allow CDW under that large ice shelf, substantially increasing its basal melt rates.

Surface water samples for diatom analyses are being collected every 4 hours from the ship's uncontaminated seawater system, and in the mixed layer at every CTD station. The primary objective of this work, by Amy Leventer and Stephanie McClellan, is to evaluate the distribution and variability of diatom species and major phytoplankton groups in a relatively under-sampled and little studied coastal region. As the data are being collected in concert with a suite of physical and chemical oceanographic measurements, this may lead to a better understanding of observed distribution patterns, and aid the interpretation of floral records in Antarctic continental margin marine sediment cores. So far 90 samples have been preserved, filtered and mounted for light microscopy. Qualitative shipboard analyses have documented variable diatom assemblages and the changing dominance of diatoms, prymnesiophytes and silicoflagellates. Quantitative diatom counts and morphologic analyses will be completed on these samples back in the US.

Education and training activities have continued with a presentation by Mike Schroeder on the 'ISPOL' ice drift experiment in the Weddell Sea, along with a short film demonstrating the techniques of making CTD stations with portable equipment supported by helicopters working from the Polarstern. Karl Newyear has recruited and indoctrinated a veritable pack of sea ice observers, who now maintain an underway hourly log of ice thickness, type and other properties, via ASPeCt (Antarctic Sea ice Processes and Climate) protocols. And George Aukon has shown us some very impressive historical footage of his white water rafting expeditions in Siberia.

RPSC and ECO support remains rock steady, from keeping the CTD from colliding with the ice to unstopping clogged shower drains. Fuel usage to date is within reasonable bounds, and we are currently headed east on the north side of the Amundsen sea ice field, with a pending request for strong and persistent southerlies.

Optimistically yours,  
SS Jacobs et al

2/25/2007  
OPP et al,

Over the past several days the NB Palmer skirted the northern side of heavy pack ice in the eastern Ross, entered the central Amundsen continental shelf

near 125W, and commenced water column profiling and related work. One striking impression during the eastward transit was the nearly continuous presence of icebergs of varied shapes and sizes (NIC's "bergy water"), leading to an addendum on the sea ice logs noting the number of bergs within a 6nm radius of the ship. Another was the sea ice cover on the outer shelf, at substantially higher concentrations than inferred from satellite imagery. Recalling past discussions about the difficulty of interpreting satellite passive microwave data in this region, our experience seems consistent with extensive flooding at the snow-ice interface. That is caused by a high precipitation rate, which depresses the sea ice freeboard, as observed. This forms 'snow ice' in winter, but in summer the satellite sensors may be seeing brightness temperatures in the open water range.

Seventy CTD/rosette/LADCP casts have now been completed, with the Amundsen focus so far on the relatively open south-central sector. Profiles that have been compared with earlier data are slightly warmer at depth than in 2000 or 1994, similar to last summer's measurements from the JC Ross and Polarstern. However, three recovered 'Bottom Landers' set a year ago by Frank Nitsche and Raul Guerrero from the latter vessel revealed surprising thermohaline variability near the sea floor here. These are the first year-long time series of near bottom conditions in the 'warm', salty Circumpolar Deep Water (CDW) that intrudes onto the Amundsen continental shelf and into its ice shelf cavities. Successful hardware and data recoveries have also validated the Bruce Huber design of what one colleague has referred to as our 'wallmart moorings.'

CTD sampling includes a suite of geochemical tracers for water mass formation and mixing. Brice Loose and Chris Little are drawing samples for noble gas, transient tracers (SF6/CFC) and stable isotopes, including helium 4, neon and oxygen-18, all strong proxies of glacial melt, and helium 3 which is high in Circumpolar Deep Water (CDW). That combination should be ideal for this region, where the warm CDW signal appears relatively unmodified prior to interactions with the ice shelves. The measurements, on samples returned to the Lamont Earth Observatory, will be used to constrain cross-shelf fluxes of heat and freshwater, and provide an additional dataset for the validation of numerical models of the continental shelf and sub-ice shelf circulations. The water catchers are also sampling for nutrients, which are being processed aboard under the direction of Bettina Sohst. Silicate, nitrate and phosphorus may prove useful in multiparameter mixing analyses, and supplement the on-station and underway sampling of three ship of opportunity projects.

On some stations a camera and strobe mounted near the bottom of the CTD are obtaining interesting photos of the sea floor. This setup required experimentation by Greg Watson et al with mounting separation and angles, camera controls, strobe power settings and approach to bottom, but we are now able to see

reasonable detail from 7.5m off. These pictures are from locations well south of earlier (Eltanin) bottom photography, and reveal a variety of seafloor and water column life, ice rafted debris, sediment type and sorting by currents, etc. On the longer term, thought might be given to a simpler camera that does not have to be removed from the frame and pressure housing for charging batteries or reprogramming, a stronger strobe, and activation by the rosette bottle trip mechanism. At shelf stations that do not require 24 sample levels to define the water column, there should be ample opportunities to acquire complementary data on many CTD/rosette casts.

Education and communications have continued with a presentation by Amy Leventer on Antarctic Marine Diatoms, a travelogue on Mongolia by Lily Glass and work by Bobby Acha and Jennifer Ayers to circumvent the local Inmarsat coverage gap, our primary email link to Denver and beyond. Their solution has been to transfer zipped email files via a secure shell session on the Iridium phone. Sounds easy, but the transfer rate is more than 50 times slower and large mail transfers are much harder to complete. So brevity is valued; returned messages and unnecessary attachments are not. We thank Vernon Asper and Insight Pacific for the camera loan and assistance with same, Stian Alesandrini et al for repair of the CTD cable damaged after a recent station, the AMSR/Bremen remote sensing group for improving their landmask in the Amundsen sector, and the powers that be for several days of fair weather.

East of the Bear, west of the PIG,

SS Jacobs et al

3/4/2007

OPP et al,

Work during the past week focused mainly on the Pine Island Bay (PIB) region, which proved accessible via the southern route around the end of giant iceberg B-22, formerly the seaward end of Thwaites Glacier Tongue (TGT). By traveling south as far as ice conditions allowed along the west side of that feature, we reached and profiled what is likely the northern part of a deep trough extending NE from Smith Glacier, under the Crosson Ice Shelf. Within PIB, CTD sections were occupied toward the Pine Island Glacier (PIG), across its outer trough and NE of the Bear Peninsula. Most of this work was accomplished in open water, but that did not extend all the way to the PIG, which was blocked some 25 km from its snout by fast ice and two or more large icebergs.

New sea ice hampered but did not prevent recovery of the fourth 'bottom lander', deployed nearly a year ago in PIB from Polarstern. Each of these moorings

consists of a lightweight acoustic release, braided polypro line, plastic trawl floats and one or two instruments to log temperature, pressure, salinity and/or ocean current. This simple, low-cost shallow water (<1000m) design facilitates deployment and recovery, with the acoustic releases doubling as relocation transponders which can be sounded from the ship via hard-wired or portable 12kHz transducers. All instruments have returned complete records at 12-minute intervals, with the deep microcat on the PIB mooring showing increasing temperatures over the past year. Minimal corrosion and wear of the hardware and the robust state of the batteries indicate that the releases should function properly for two years or more in this environment.

An Alfred Wegener Institute buoy to track sea ice motion, surface pressure and temperature was deployed by Mike Schroeder et al on a large floe near 73 30S, 107W. This is one component of an NBP sea ice drift cruise scheduled in this sector later this year. Departing PIB late in the week, gaps were filled in our central Amundsen transect, the southern portion of which was newly covered by sea ice. We then headed toward the west Getz Ice Shelf fronts, finding the western half of the Carney - Siple opening to be heavily impacted by ice of all kinds. However, its underlying trough was found to extend substantially farther north than inferred from prior work, and its deep temperatures were in agreement with the previously observed westward decrease from PIB to Siple Island.

Notable findings have included lower salinity this year on repeated ice shelf front sections, coastal surface waters supersaturated in carbon dioxide and sea floor characteristics that influence TGT calving. The high pCO<sub>2</sub> levels, also flagged by a routine monitoring of data transmitted to Lamont, are accompanied by low dissolved oxygen and biological productivity, consistent with recent deep water upwelling driven by melting under the local ice shelves. Bigberg fans may have noted that B-22 is now grounded at the same cockeyed angle to the TWG as its predecessor (B-10?), once hypothesized to have drifted over from the PIG. It now appears that bigbergs calved from TGT result from grounding on its NW corner, leading to E-W shear far down its eastern flank, with the resulting fracture filled with smaller bergs, fast ice and the copious snowfall in this region.

Planning ship tracks on the Amundsen shelf is a continual compromise between moving between ocean stations in the shortest time possible and swath mapping uncharted areas of the sea floor. The latter is greatly facilitated by open water, frequently unavailable in this region even when sea ice is at its annual minimum extent. But the ship's multibeam system runs nearly continuously, charting a swath of the sea floor roughly 4 times the water depth. The incoming data, now over 12.5 Gbytes and ~4000 nautical miles on this cruise, are laboriously 'pingedited' by volunteers working under the direction of MB guru Kathleen Gavahan, and merged with data from previous cruises. The resulting information is used for navigation and to study the shelf geology, paleo-ice sheet behavior

and present-day ocean circulation. A new bathymetric map of the Amundsen Sea (Nitsche et al, in prep) is nearing completion, with significant additions from NBP07-02. And while learning about the seafloor sampling and survey techniques, undergrad Rose Vail will use some of the collected bathymetry and sub-bottom data for a term paper on Antarctic geology.

Thanks to Capt Mike, Frank N and Rachel M for the careful ship handling and sharp eyes on the bridge during mooring recoveries. We also appreciate the JC Ross and Polarstern multibeam data provided by Rob Larter and Karsten Gohl for cruise planning, and earlier work by Tom Kellogg and Suzanne O'Hara on Amundsen bathymetry. Frank Nitsche gave a talk about MB-delineated features on the Antarctic continental shelves, and Matthew Lazzara provided B-22 information.

Now into the heavy ice,  
SS Jacobs  
72 30S 127 30W

3/12/2007  
OPP et al,

Over the past eight days, one of them experienced twice, the NB Palmer completed a circuit of the Wrigley Gulf west of Siple Island. This consisted mainly of repeat 'CTD stations' along the western Getz Ice Shelf openings, and at wider intervals along a slower return track in previously unmapped territory near the continental shelf break. On 07 March a second AWI/MetOcean sea ice buoy was set by Mike Schroeder et al on a 1.8 x 1.8 nm floe in 450m of water near 73 48 S, 134 24 W. Working in winds of 25 knots and an atypical windchill of -29C, they found 40-60 cm snow on up to 1.5 m of what passes for ice in this sector. The deployment was again accompanied by the acquisition of cores for analyses of phytoplankton content and ignoble gases, work that revealed more snow and flooding than hard ice, perhaps typical of the frosting on the sea here at this time of year.

Highlights of this week in the Amundsen Sea have included finding generally warmer waters west of the Getz Ice Shelf than were observed there previously, depressions in the outer continental shelf where the deep water may gain access to the inner shelf troughs, an ice front advance north of the DeVicq Glacier - the fastest-flowing ice stream entering the Getz, and a large odd-shaped ridge extending NW from the continental shelf north of Siple Island. Several hours were devoted to mapping the western part of that feature, leaving the rest for some future expedition. At the dimmer end of the spectrum, one of the lowered acoustic doppler current profilers (LADCPs) and the bottom camera have been retired from action after shipping water inside their pressure cases.

Central to the work on NBP07-02 are the CTD stations, more than 130 of which have now been completed. A descendant of the early 'STD' (an unfortunate acronym long since abandoned), the conductivity-temperature-depth (actually pressure, so CTP might be more correct) instrument package has grown substantially over the years (Guerrero picture attached). On this cruise the basic SeaBird Electronics (SBE) 911+ CTD is fitted with 2 sets of ducted conductivity-temperature sensors, dual pumps and two SBE 43 dissolved oxygen sensors. Added to this system are a 24-bottle 'Niskin' or 'rosette' sampler, LADCPs with battery pack, sensors that measure light transmission and fluorescence, a pinger to gauge distance above the sea floor along with a small bottom contact sampler and, on many casts, a camera.

Some CTD sensors are calibrated pre- and post-cruise, and sensor/bottle performance is monitored by routine sampling and analyses for salinity and dissolved oxygen. Salinities calculated from CTD measurements have been compared with >750 samples drawn from the rosette and processed by Raul & Rich on laboratory salinometers that also measure seawater conductivity, relative to an international standard. Results indicate the CTD conductivity sensors may require corrections of 0.000 to 0.001 +/- 0.003 in salinity, well within the range of instrument accuracy and observed interannual change. Oxygen samples are carefully drawn by Ali & Katie in glass flasks from several of the 10-liter Niskins at each station and immediately pickled with  $MnCl_2$  and  $NaI/NaOH$ . Once the precipitate has settled, they process the samples for dissolved oxygen content using a Langdon amperometric titrator. Minimal sensor drift and significant SBE 43 biases have thus been documented for subsequent application, with the titrations consistently falling between the two oxygen sensor values.

The CTD operations directly involve a majority of the science complement and several RPSC and ECO personnel, from those responsible for the console operation, the CTD/rosette maintenance and setup prior to each cast, the launch and recovery and seawater samplers to the winch drivers and ship handlers. We thank all who assist 24/7 in this demanding work, and in particular James, Leslie and Ric at the winch controls, and Sebastian, Rachele and John on the bridge.

Sampling of the sea floor surface by Amy & Frank is being accomplished using a Smith-McIntyre Grab at a limited number of locations, and an Alesandrini 'mini-corer' hung beneath the CTD and doubling as the bottom sensor noted above. Fourteen grab samples have retrieved up to 15cm each of the sediment column, and 59 mini-cores have returned up to 3 cm each of sediment. In a study of relationships between living and fossil groups, diatom analyses of the resulting material will be compared to the surface water diatom assemblages in samples from the uncontaminated seawater system. Photographs, descriptions and short subcores from of the grab samples will be curated at the FSU Antarctic Marine

Geology Research Facility and made available to interested researchers.

Graduate students Brice Loose and Chris Little gave talks and led discussions this week on the use of geochemical tracers and on ocean modeling. Both presentations were in keeping with the overall context of this cruise, to achieve a better understanding of ocean-ice shelf interactions in a region where both show substantial variability and change.

Edging eastward along the shelf break,  
SS Jacobs



3/19/2007  
OPP et al,

During week #6 of NBP07-02, the NB Palmer completed a circuit of the Amundsen Sea continental shelf, occupying stations along the continental shelf

break between Siple and Thurston Islands. Or nearly so, as heavy ice in off Cape Flying Fish, adverse weather and the waning time available for science operations precluded a full closure of the box along the western Abbot Ice Shelf front. Much of the outer shelf limit had been roughly defined on NBP00-01, so this year's transect added detail to the bathymetry and provided repeat water column data needed to evaluate interannual variability. At various points along the section, CTD stations were occupied on the deep side of the shelf break and XBT transects made along and across the break. As the week ended we were battling the sea ice back toward bottom lander site #5, where the first attempt to raise that mooring was terminated by communication problems and heavy fog.

One of the more interesting observations this week has been a broad outer shelf depression north of the western end of Thurston Island. Its southwest extent was nicely swathmapped from Polarstern a year ago, but our data now show the deep area extending eastward over a wide region that lacked prior ship tracks, well south of an anomalously deep and poorly defined continental shelf break. The ice cover prevented solid multibeam work, but CTD casts suggested this is an important route for deep water access to the shelf region. On the outer shelf in one area we mapped what initially appeared to be a terminal moraine, but it also had characteristics in common with shelf break features observed seaward of estimated grounding lines in the Ross Sea.

Another common attribute of the eastern Amundsen outer shelf and slope region is a large and apparently resident iceberg population. This is not a new finding, having been observed on prior cruises in recent decades, and further north on earlier expeditions. However, it is a sobering experience when these vast fields of glacial ice occupy the full 360° horizon, with more than 120 of them within 6 nm of the ship. Perhaps Dr Poulter really did count 8000 bergs in a 24 hour period slightly north of our study area (Byrd, 1935). Several potential explanations for such iceberg concentrations have been offered, but the true cause and related implications remain to be demonstrated.

Underway measurements have continued at a regular pace, with samples for Total CO<sub>2</sub> and nutrients taken every 12 hours from the uncontaminated seawater system. The carbon dioxide samples will be analyzed at the Lamont Earth Observatory in conjunction with the ongoing pCO<sub>2</sub> surface observation project. The nutrient samples are processed on board ship for silicate, phosphate nitrate, nitrite and ammonia, complementing the routine recording of sea surface temperature, salinity and fluorescence. In addition, 1-3 seawater samples from depths above 100m are drawn for pigment analysis at nearly every CTD station. The samples are filtered through glass microfibre filters which are stored at -80°C for later analysis by WO Smith to evaluate concentration and composition of the phytoplankton community.

Throughout the cruise a team of volunteers has been making hourly underway observations of local sea ice conditions using a protocol devised by a SCAR working group, and supplemented by iceberg counts within 6 miles of the ship. A generally bimodal distribution between thick first year floes (>100 cm) and brash/open water has been evident, along with limited ridging and rafting and deep snow on older ice. The snow submerges the ice freeboard, leading to a slushy layer discolored by algae at the waterline, and probable 'snow ice' formation under winter conditions (which we have been experiencing in recent days). The bottoms of many floes are honeycombed, consistent with near-surface seawater temperatures above the melting point. These 'rotten' floes present few obstacles to the NBP, but travel through the ice is slowed when the snow cover is thick, the floes large, open water limited and air temperatures very cold. Given the large amount of thick first year ice observed at the end of the summer, the low proportion of multi-year ice is puzzling. The deployment of ice-tracking buoys during this cruise may help to explain the apparent short residence time of sea ice in the Amundsen Sea.

Prior to NBP07-02 we were approached by a number of media folk who expressed interest in direct involvement in this cruise. That did not come to pass, perhaps due our lower than expected profile, and inability to offer a means to 'fly out to the ship, just for a few days.' One result has been lower-key 'outreach' carried on at the initiative of several individuals 'blogging' or maintaining websites about cruise activities. In addition to family and friends, the communications we are aware of are known to be reaching an elementary school in Philadelphia, where a follow-up visit will be scheduled, another in Argentina, the Ocean Climates and Physics site at Lamont and a specific cruise website at Earth & Space Research, Corvallis ([http://www.esr.org/wais07\\_index.html](http://www.esr.org/wais07_index.html)). The latter is said to be supplemented by maps, weather and other science links, and the approach has been informal accounts of life aboard ship interleaved with discussions of the ongoing science activities.

In related activities here at sea, Mike Schroeder held a seminar on Structural Changes in the Warm Water inflow to the Weddell Sea, Ali Criscitiello showed excellent pictures of her mountaineering and glacier mass balance work in Alaska and Washington, and Commissioner Guerrero kept the ping-pong tournament bouncing along. Amy, Karl, Rachael, Chris and Rich provided helpful contributions to this week's report.

Weekly score: Sea Ice 2, Oceanography 1  
SS Jacobs