nonlocal exchange process, estimated rates average 6 d-1 and are occasionally as large as 20 d-1 for the upper 5 cm of the sandy shelf sediments. Conversely, when exchange is represented as a diffusional process, rates within the upper 5 cm must average 80 times molecular diffusion and occasionally exceed 300 times molecular diffusive rates.

OS41B HC: Hall III Thursday 0830h

Synthesis of Pacific Ocean Carbon Cycle Research III

Presiding: **M Lamb,** NOAA/PMEL**; C Cosca,** University of Washington

OS41B-06 0830h POSTER

Dynamics of Dissolved Trace Metals During the Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study (SEEDS)

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During the first iron-enrichment experiment in the subarctic Pacific (SEEDS) in 2001, the dynamics of dissolved trace metals were studied. Iron was released in a patch of water (80 km^2) with a mixed layer depth of 10 m. Seawater samples were collected from the upper water column (5-70 m) of In- and Out- patch stations. Immediately after the collection, a portion of seawater was filtered with a 0.2 μm filter and acidified with HCl. In our laboratory, dissolved trace metals (Fe, Co, Ni, Cu, Zn, etc.) were concentrated using a chelating column technique and determined by ICP-MS.

At the In-patch station, the concentration of dissolved Fe in the surface layer was 0.8-0.9 nM on day 2-4 after the iron release and decreased exponentially to < 0.15 nM (the detection limit) on day 11. The dissolved concentration of Co, Cu and Zn in the surface layer on day 2 was 0.040, 1.7 and 2.2 nM, respectively. They also decreased exponentially to 0.014, 1.2 and 0.86 nM on day 13. The concentration of Ni was 5.0 nM and did not show significant decrease. The mole ratio in the concentration difference between days 2 and 13 was SiO_4 : NO_3 : PO_4 : Zn : Fe : Cu : Co = 27 : 16 : 1 : 1.2 $\times$ 10^{-3} : 6.5 $\times$ 10^{-4} : 4.3 $\times$ 10^{-4} : 2.6 $\times$ 10^{-5}. These are the first data showing that the mesoscale iron fertilization affects the dynamics of dissolved Zn, Cu and Co.

OS41B-07 0830h POSTER

Biological Processes During the Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study (SEEDS)

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The first iron-enrichment experiment was carried out in the Western Subarctic Gyre (48.5°N, 165°E) during the summer of 2001. Iron and SF6 were added in a patch of water (8 x 10 km) with a mixed layer depth of 10 m. As a result, surface dissolved iron concentration was 1.9 nM after 1 day from the enrichment (D1). The first biological response to the iron enrichment was the increase in photochemical quantum efficiency (*Fv/Fm*) of algal photosystem II on D3. Chlorophyll-a increased from D6 and reached 20 mg m^{-3} on D10. The maximum differences between outside and inside of iron patch were 19.5 mg m^{-3} in chlorophyll-a, and 13.5 μM in nitrate during the experiment. Dominant phytoplankton species before the fertilization and outside of the patch was pennate diatom Pseudoniztschia pungens, but rapidly increased phytoplankton in the iron-patch was large-sized (>10 μm) centric diatoms, mainly Chaetoceros debilis. The growth rate of C. debilis was much faster (>1.9 d^{-1}) than the other phytoplankton from D4 to D7. From D11 to the end of our observation on D14, *Fv/Fm* decreased, but chlorophyll-a concentrations kept rather constant. Nitrate did not deplete until D14, and shallower euphotic layer depth than the mixed layer observed on D12 suggested that phytoplankton was stressed by light at the end of the experiment. Gut-pigment contents of dominant copepods (*Neocalanus* spp. *Eucalanus bungii* and *Metridia pacifica*) increased 4—18.4 times in the patch and the maximum value was observed on D11. Abundance of salmons and small squids collected using trawl, did not change between inside and outside of the iron patch, but northern mackerels were abundant in the iron patch. These biological responses showed that the western subarctic Pacific might be the most sensitive to iron enrichment in the world HNLC regions.

OS41B-08 0830h POSTER

Variation in Iron(III) Solubility and Iron Concentration in the Northwestern North Pacific Ocean

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Vertical distributions of Fe(III) hydroxide solubilities (<0.025 μm) and dissolved Fe (<0.2 μm) concentrations at 0-250 m depth were studied inside (HP) and outside (LP) a high production (phytoplankyon bloom) patch area in the northwestern North Pacific Ocean during May 1999. In the surface mixed layer, the Fe(III) solubility values at HP were much higer (2-4 nM) than those (0.3-0.9 nM) at LP, and strongly correlated with chlorophyll *a* and nutrient concentrations. The high Fe(III) solubility observed in the surface mixed layer was probably due to a higher concentration or stronger affinity of natural organic Fe(III) chelators. In the surface waters, the dissolved Fe concentrations were generally lower than the Fe(III) solubility values, resulting from the active biological removal of dissolved Fe and excess concentration of Fe-binding organic ligands. The Fe(III) solubility minima (0.2-0.4 nM) were present in a narrow depth range (40-125 m) below the surface mixed layer at all stations. The subsequent Fe(III) solubility levels appeared to increase up to 0.6-0.8 nM with depth at 100-250 m in association with the increase in nutrient concentrations. The strong linear correlations between Fe(III) solubility values and nutrient concentrations in middepth waters suggest that the formation of organic Fe(III) chelators may be related to microbial decomposition of sinking biogenic organic matter. In middepth waters, the dissolved Fe concentrations were generally higher than the Fe(III) solubility values, suggesting that the small colloidal iron phases may be present in the dissolved Fe (<0.2 μm) fraction.

OS41B-09 0830h POSTER

The effect of boundary scavenging and circulation on the distribution of 230Th and 231Pa in the North West Pacific

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230Th and 231Pa are natural radionuclides produced uniformly throughout the water column from the decay of dissolved U. Both are particle-reactive and removed from the water column to the underlying sediment by adsorption on settling particles, a process also known as scavenging. 231Pa is less particle-reactive than 230Th and has a longer residence time in the water column (100-200 y vs 20-40y). As a result, 231Pa is more effectively transported to regions of high particle flux where it is preferentially removed, a process called "boundary scavenging". In addition, because adsorption on settling particles is a reversible process, large-scale upwelling and downwelling also affect the vertical distribution of 230Th and 231Pa, producing convex and concave profiles, respectively, which can be interpreted in terms of deep-water circulation patterns. We have measured dissolved and particulate 230Th and 231Pa concentration profiles at two stations off the Kamchatka Peninsula in the N. W. Pacific, an area characterized by very high opal fluxes. We combine these data with earlier profiles obtained further south to quantify boundary scavenging in the N.W. Pacific and to document the impact of intermediate water formation and deep-water upwelling on the radionuclide profiles.

OS41B-10 0830h POSTER

Carbon Fluxes from the Sepik River into the Bismark Sea and the New Guinea Coastal Undercurrent

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The Sepik River is a major contributor of water, sediment and associated organic loads to the coastal waters of northern New Guinea. We compare dissolved and particulate organic carbon data from September 1997 during an extremely dry year with that from 1999/2000 during wet season discharges. Estimated source flux of DOC is 32 x 10^9 to 101 x 10^9 moles/yr and POC is 13 x 10^9 to 38 x 10^9 moles/yr. The Sepik DOC flux is equal to that from all four major rivers combined that enter the Gulf of Papua on the south coast of PNG. The Sepik inorganic PIC flux is low (0.2 x 10^9 moles/yr) as the river does not drain carbonate soils. With a narrow continental shelf, and strong coastal currents, much of this exported material is available for long distance transport into the Bismarck Sea and beyond.

CTD casts and associated instrument data showed that the river signature was visible in optical measurements in deep profiles taken in the Sepik Canyon. Pulses of suspended sediments are carried offshore in the water column at the interface between density layers. At depths where the 25-cm path-length transmissometer and optical backscatter sensor instruments showed significant deflections, discrete water samples were taken in clean Niskin bottles for organic analysis. Additional high volume samples for lipid classes were taken with Infiltrex samplers deployed on a floating mooring along with two sediment trap arrays set at 100 and 260 m depths. The Infiltrex samplers were set at 55, 180, 200 and 220 m depth in an effort to target the surface layers and those of westward flowing water in the New Guinea Coastal Undercurrent (NGCUC) which tracks along the coast at a depth of 200 m and at a speed of 0.5 m sec-1 (Cresswell, 2000).

Analyses of lignin phenols, hydrocarbons, fatty acids, sterols and n-alcohols in these samples were used to estimate the degradation and dispersion of this organic input to the coastal waters and possible entrainment in the NGCUC.

Cresswell, G. R. 2000. Coastal currents of northern Papua New Guniea, and the Sepik River outflow. Marine and Freshwater Research 51, 553-564.

URL: http://www.aims.gov.au/pages/research/projects/project05/tropics.html

OS41B-11 0830h POSTER

Time Series of pCO2 off the Central California Coast: 1993-2001

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High carbon fluxes are associated with coastal upwelling ecosystems. The spatial and temporal heterogeneity found in these regions necessitates a concerted sampling scheme. The MBARI time series cruises and moorings on the central California coast address some of the scales of variability that have to be resolved to properly estimate air-sea carbon fluxes in coastal waters. In 1993, test deployments of a mooring based system to measure the air-sea difference of pCO2 (delta pCO2) were accompanied by the start of a ship based time series of sea surface pCO2. A hydrographic line that extends from the coast at 36° 48' N to 60 km offshore is sampled monthly. Less frequent sampling is accomplished along a 400 km extension of this line. Since 1993 there have been more than 100 cruises with sea surface pCO2 measurements in this coastal region. In recent years deployment of delta pCO2 measuring systems on moorings located 20 and 55 km offshore have become routine and several years of hourly delta pCO2 data is now available. These data have been examined for seasonal and interannual variability. During the upwelling seasons, sea surface pCO2 ranges from less than 200 to more than 700 micro atmospheres and can not be easily predicted from physical parameters due to high biological uptake rates. Ocean to atmosphere carbon flux estimates for the 1997-1999 El Nino/La Nina cycle suggest values of -1.1 and 1.85 moles per square meter per year respectively during these extreme years.

OS41B-12 0830h POSTER

Estimating fCO_2 from Temperature, Salinity, Nitrate, and Chlorophyll in the Equatorial Pacific

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In order to utilize satellite data to determine high resolution variations of CO_2 distributions in the equatorial Pacific, we have employed several multiple linear regression analyses to chemical and hydrographic data collected from this region. The underway fCO_2 and ancillary data were gathered onboard the NOAA ships *Baldridge*, *Discoverer*, *Ka'imimoana*, and *Ron Brown* from 1992 through 2001 as a companion project to the biannual deployment of the TAO moorings. The cruises during the 9-year period included 94 crossings of the eastern equatorial Pacific from 10°S to 10°N and spanned two major El Niño events (1992-94 and 1997-98). Data were collected during the warm spring season (February through June) and during the cooler fall season (July through December) of each year making it possible to examine the interannual and seasonal variability of the fCO_2-SST relationships. A linear fit through all of the data sets yields an inverse correlation between SST and fCO_2, with an R^2 of 0.574 and an RMS of 27.8 μatm. When separated, there is an apparent difference between the regression lines for El Niño, non-El Niño, and La Niña data sets. During non-El Niño periods, we also observed seasonal differences in the fCO_2-temperature relationship. The regression lines through the spring and autumn data sets have higher R^2 and lower RMS values than the composite non-El Niño regression line, and the slopes are significantly different at the 95% confidence level. The slope for the autumn season is less negative than during spring, suggesting higher biological productivity occurred during the autumn non-El Niño seasons. The regression line for the composite El Niño data, which shows no significant seasonal variability, has a slope very similar to the non-El Niño spring slope indicating less influence by biological processes. In addition to estimating fCO_2 from sea surface temperature, we also employed a step-wise regression analysis using shipboard temperature, nitrate, chlorophyll and salinity data. This analysis yields an RMS of 10.9 μatm and R^2 of 0.904, suggesting that the addition of nutrient and salinity data significantly improves the predictive capability of this method.

OS41B-13 0830h POSTER

Variations of Dissolved Inorganic Carbon in the Equatorial Pacific during El Niño and non-El Niño Conditions

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The Equatorial Pacific has long been a focal point for chemical and physical studies because it has a major influence on climate variability through the ENSO cycle. The questions about mesoscale CO_2 dynamics in this region relate to biological versus physical controls, and remote versus local influences. NOAA's Office of Global Programs has sponsored two process studies in the Equatorial Pacific within the last decade to address these questions. The EqPac92 expedition, conducted during both spring and fall in 1992, investigated the unique role of equatorial processes on CO_2 cycling during and following the 1991-92 El Niño event. The second study, GasEx-2001 occurred in spring of 2001 in the eastern Equatorial Pacific. It's focus was on the kinetics of air-sea gas exchange, as well as the determination of physical, chemical, and biological factors controlling carbon species in the surface water, and occurred during 'normal' conditions several years after the major El Niño of 1997-98. In the 10 years separating these studies, carbon measurements have been made on a number of cruises in this region. This study will examine the variability of dissolved inorganic carbon (DIC) in the eastern Equatorial Pacific over the past decade, including El Niño and non-El Niño periods.

Our results show concentrations of DIC on isopycnal surfaces along zonal sections near 125°W and 140°W were approximately 1980 μmol kg^{-1} during the 1991-92 El Niño. The source of low-DIC water was the lower density warm water north and south of the equator. In the fall of 1992, DIC concentrations at the equator at 125°W were 50 μmol kg^{-1} higher than in the spring, indicative of upwelling of higher density, colder, higher DIC water. Upwelling conditions at 135°W during the spring of 2001 were similar to those found in the fall of 1992 at 125°W with density surfaces >23.5 outcropping at about 1°N of the equator. Equatorial DIC values were also similar on these cruises. The changes observed in surface DIC at the equator appear to be dominated by upwelling processes. North of the equator, surface DIC reaches a minimum at ∼8°N which may be attributed to either advection or biology.

URL: http://www.pmel.noaa.gov/co2/co2-home.html

OS41B-14 0830h POSTER

The Influence of Mixing on the Ventilation of the North Pacific Thermocline

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A two-dimensional diagnostic advection-diffusion model is used to simulate the spreading of chlorofluorocarbons (CFCs) along isopycnals in the North Pacific thermocline. The model results show that isopycnal mixing — in addition to advection — is necessary to explain the observed CFC distributions. While the mixing redistributes tracer and reduces cross-streamline tracer gradients in the ocean interior, it also causes a net transport of CFCs from the outcrops onto isopycnals that contain shadow zones in the western portion of the subtropical gyre. The increases in the CFC-12 inventories due to the inclusion of this diffusive pathway range from 9–10% at $\sigma_\theta = 25.6$ kg m^{-3} to 35–50% at $\sigma_\theta = 26.2$–26.6 kg m^{-3}. The increased inventories explain why subduction rates based on tracer budgets overestimate subduction rates based on Ekman pumping and lateral induction which are purely advective processes. While the advective rates correspond to the net mass flux into the thermocline, the larger tracer-derived rates can be used to describe the fluxes of not only CFCs but also of other tracers including anthropogenic carbon dioxide and oxygen.

Isopycnal mixing also affects the densities of the subsurface CFC maxima, and it causes CFC-derived ventilation ages to evolve over time. These processes have been investigated using the model, effectively explaining major features of the observed CFC changes in time. Remaining changes are likely to be an indication of interannual variability, and possible causes are discussed. Though diapycnal processes are thought to be second order, the importance of vertical diffusion is also considered.

OS41B-15 0830h POSTER

A Construction of Inventory of CO_2 Related Data in the North Pacific

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As an interest to the greenhouse gases has increased, oceanic CO_2 observations have been actively done during many projects in the world, and lots of data analysis have suggested air-sea CO_2 exchange in various temporal and spatial scales. There are some difficulties of data exchange, however, not only for CO_2 data but also for other chemical oceanographic data. To share and fully open the data, an effective data management method has become much important.

For more active and free data exchange, Japanese scientist group has established "Inventory for Chemical oceanographic Data (IJCD)" since 2000. Main purpose of IJCD is to rescue scattered data in the institutes and to establish the inventory database system in order to encourage the exchange of the data among researchers, who interests in chemical oceanographic research. It is also important activity of IJCD to consult on the development of the data format of the chemical oceanographic data with meta-data, which contains items used for inventory. For efficient collection of data inventory, IJCD cooperates with national and international activities concerned. IJCD data inventory will be public via web site, and will be linked with real data which can be fully opened.

On the other hand, the integration of CO_2 data in PICES countries (Canada, China, Korea, Japan, Russia, and USA) has been constructed as a product of PICES WG13/TCODE. It was recommended that PICES WG13 and TCODE work together with the data centers (JODC, NODC, CDIAC, etc.) to compile an international North Pacific data inventory for CO_2 and CO_2-related data at PICES CO_2 data integration test workshop in 2001. Following this recommendation, a data inventory, which is named as "PICES CO_2 Related Data Integration for the North Pacific (PICNIC)", has been prepared. PICNIC data inventory is currently constructed by lists of cruises in the North Pacific, which are originaly compiled by IJCD, CDIAC and IOS. PICNIC data inventory is still expanding, and is going to be fully opened via web site.

OS41B-16 0830h POSTER

Synthesis of the POC field in the Pacific based on historic WOCE transmissometer data.

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Transmissometer data collected during 17 WOCE expeditions (1991-1994) were analyzed and the relationship between in-situ POC concentration and beam attenuation was established. This relationship was used for basin-wide POC assessment. The POC distribution was analyzed for the entire water column as well

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as for the upper 500 m. The El-Nio (1990-1995) events can be clearly seen in the POC sections, characterized by low values of POC in the upper ocean layer.

OS41B-17 0830h POSTER

Using preformed nitrate to infer recent changes in DOM remineralization in the upper thermocline of the subtropical North Pacific

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The preformed nitrate distribution in the subtropical North Pacific is characterized by a negative anomaly between the winter mixed layer and 25.4 σ_Θ. Its presence indicates that nitrogen remineralization in the upper thermocline deviates significantly from Redfield stoichiometry. It has been suggested that this anomaly is created during nitrate uptake by vertically migrating diatom mats, nitrate uptake by respiring bacteria, or degradation of nitrogen-poor dissolved organic matter (DOM). Here we present quantitative evidence that degradation of DOM with a high C:N ratio is primarily responsible for this feature. We develop a simple isopycnal model to predict preformed nitrate using apparent oxygen utilization (AOU), dissolved organic carbon (DOC), and dissolved organic nitrogen (DON) data. Model results agree well with the actual preformed nitrate distribution and show that the intensity of the anomaly is proportional to the magnitude of DOC remineralization and the DOC:DON remineralization ratio. From historical records of preformed nitrate along a common transect in the subtropical North Pacific, we infer that either the magnitude or the C:N ratio of DOC remineralization in the upper thermocline has increased by a factor of three in the last few decades.

OS41C HC: Hall III Thursday 0830h

Physics and Biology of Antarctic Continental Shelf Waters I

Presiding: **E E Hofmann,** Old Dominion University**; E J Murphy,** British Antarctic Survey

OS41C-18 0830h POSTER

Wave-Ice Interaction during Ice Growth: The Formation of Pancake Ice

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Field investigations of Antarctic sea ice have shown, by its fine grained frazil ice structure and surface topography features, that ice growth in the presence of waves accounts for a major fraction of the initial ice cover in the Antarctic regions. Pancake ice has been observed to grow in the presence of waves, on the few cruises that have been in the vicinity of the ice edge when the ice growth is occurring. Modeling of ice cover growth and correct parameterization of ice cover thickness, therefore mandates better understanding and quantification of the wave and ice interaction during ice growth in the presence of waves. However, the timing of cruises, to make appropriate wave and ice measurements to coincide with rapid ice cover growth and expansion (over hours to a day or two), is difficult and perhaps prohibitively risky when the success probability is small. To better understand the phenomenology of wave-ice interaction and provide some basis for quantifying the joint effects of waves and ice growth, we have undertaken laboratory studies of the growth of ice in wave fields and how the presence of ice subsequently dampens the wave field. The laboratory experiments, conducted under controlled thermal and wave conditions have allowed us to control the wave parameters and observe the ice growth from initial crystal formation to the final presence of a solid sheet of ice.

Two laboratory campaigns were conducted, both at the Cold Regions Laboratory in Hanover, NH, USA. The first experiments were in an outdoor basin (20m x8m x2m) using salt water in ambient winter conditions. The second experiments were conducted in a 35 m x 1.3m x 0.6m hydraulic flume in a cold room at the same facility. The flume used urea doped water which, when frozen gives a sea ice simulant of slightly different mechanical properties (more brittle) when frozen into a thin sheet. A paddle driven by an electric motor was used to generate a wave field in both facilities. We found that pancake ice formed in the two facilities were similar in most important respects. Ice growth into pancakes formed by the initial packing of frazil crystals into larger discs by aggregation of crystals and subsequently into larger pancakes by the fusing together of the initial pancakes. The onset of disc and pancake formation as well as the subsequent size of the pancakes were highly dependent on the wave frequency and amplitude, along with an apparently critical cooling rate necessary to allow surface freezing and hardening of the pancakes so that they could survive collisions with other floes in the wave field. Initial comparisons with a numerical model developed using interparticle interactions with a discrete element simulation were qualitatively similar. Parameters relating the growth of the pancake ice to initial wave frequency and amplitude and subsequent ice effects on wave decay were both determined.

OS41C-19 0830h POSTER

Circulation and Mixing on the Western Antarctic Peninsula Shelf: A Component of Southern Ocean GLOBEC

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The Southern Ocean Global Ecosystem Dynamics (S.O. GLOBEC) program is studying the continental shelf region in the vicinity of Marguerite Bay, on the western side of the Antarctic Peninsula, to determine the factors that contribute to Antarctic krill survival over winter. So far, 5 research cruises have collected data from the survey region between March and September 2001. We will use data from the vessel-mounted acoustic Doppler current profilers (ADCPs) on each cruise to describe the mean, mesoscale and tidal velocity fields of this region. We find a strong (~15-25 cm/s) coastal current flowing southward along Adelaide Island and into Marguerite Bay, then continuing southward along Alexander and Charcot Islands. The ADCP data also indicates strong currents at the continental shelf break, with speeds up to 40 cm/s. However, their magnitude and direction vary significantly, possibly in response to incursions of the Antarctic Circumpolar Current or diurnal tidal topographic vorticity waves that are predicted in this region. The ADCP data, combined with hydrographic data from CTD stations, is used to investigate the small-scale processes that drive the flux of heat from intrusions of upper circumpolar deep water into the surface mixed layer and to the sea surface or base of the sea ice. Strong velocity shears occur at the top of the permanent pycnocline in several locations. This shear often results in low gradient Richardson numbers, signifying that turbulent mixing is likely. We examine the spatial extent of the mixing and identify some of the probable sources.

URL: http://www.esr.org/globec_index.html

OS41C-20 0830h POSTER

Drifter Measurements of Near-Surface Flow over the West Antarctic Peninsula Shelf During Austral Summer – Fall, 2001

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As part of the U.S. Southern Ocean GLOBEC program, we deployed 14 satellite-tracked drifters near Marguerite Bay on the West Antarctic Peninsula shelf during March–May, 2001 to investigate the regional near-surface circulation. The drifters were WOCE SVP instruments with drogues centered at 15 m and equipped with cold weather batteries and ice strengthened buoy hulls since this area becomes ice covered in austral winter (June to December). The drifter tracks show (1) a moderate (10–20 cm/s) cyclonic circulation around Marguerite Bay with broad inflow in the northern side near Adelaide Island and a narrower outflow and greater variability in the southern side near Alexander Island, (2) weak (<10 cm/s) flow at midshelf, and (3) strong (>20 cm/s) alongshelf flow toward the northeast over the outer shelf and shelf break. The Marguerite Bay circulation was not closed; most drifters entering the bay left the bay, and a few apparently become stuck in the ice during August. Closed eddies were surprisingly absent in Marguerite Bay except for one instance of weak near-inertial oscillations that decayed within two days and small eddies (diameter ~10–20 km, rotation period ~3–5 days) near Rymill Bay. The weak mid-shelf surface drifter velocities were surprising due to the strong winds observed during the deployment cruises. The slow drifter speeds during large wind stress events may be due to the deep surface mixed layer (~50 m), resulting in quite weak Ekman currents. Lagrangian time and space scales of 1.8–3 days and 18–27 km were calculated from the autocorrelation functions for the drifter velocity components.

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Observations of Sea Ice Properties in the Marguerite Bay Region during Spring

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During the spring 2001 cruise of the South Globec experiment, we sampled ice physical and optical properties in the Marguerite Bay area of the Palmer Penisula. At 12 sites, ice thickness was measured every meter along 10- to 120-m-long survey lines. The combined mean ice thickness for these surveys was 62 cm, with a median of 43 cm and a maximum thickness of 280 cm. Snow depths ranged from 1 cm to 57 cm, averaging 16 cm. At 45 percent of the thickness holes, a combination of deep snow and thin ice resulted in negative freeboard. A stratigraphic analysis of ice thin sections showed that more than half of the ice cover was granular and that virtually all of the upper 20 cm of the ice was granular. There are indications that snow-ice formation at the surface contributed significantly to ice formation. At most sites the base of the snow cover was wet and saline. The average ice salinity was 7 psu, with the largest salinities, of approximately 10 psu, found near the surface. Ice temperatures were warm resulting in large brine volumes. The thicker ice showed evidence of extensive rafting and ridging. Visible albedos were in the 0.9-0.95 range for snow-covered ice and 0.5 - 0.6 range for bare ice. Maximum transmittances were between 400 and 500 nm. For 30-cm thick ice with 7 cm of snow, peak transmittances were only 2 to 3%. Removing the snowcover increased transmittance by an order of magnitude to almost 30%.

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Vertical Fine Structure Beneath the Ice of the Western Antarctic Peninsula Shelf in Austral Winter, 2001

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As part of the U.S. Southern Ocean GLOBEC program, a broad-scale CTD survey was conducted in Marguerite Bay and the adjacent West Antarctic Peninsula shelf during austral winter (July 22 to August 31, 2001). With sea-ice covering most of the study area and eliminating almost all surface wave motion, the R/VIB Nathaniel B. Palmer provided a very stable platform, allowing high-quality CTD data to be collected without significant wave-induced contamination. Many of