column, represents an added mass effect. Due to cross-shelf variations in the controlling length scale parameter L, the dispersion relationship is highly non-linear, allowing mathematically for the possibility of freely oscillating currents at both super-inertial and sub-inertial frequencies. The dispersion relationship for a special class of super-inertial solutions shows that L (and its associated frequency) can take on only certain values depending on location across a depth-varying domain. For near-inertial frequencies, L approaches infinity near the shoreline. Moreover, the cross-shelf structure of the amplitudes for this family of solutions reproduces observations in which the amplitudes of the current oscillations increase moving offshore from the coastline but then decrease out over the shelf break/slope region.

OS21S-11 1120h

Surface Gravity Wave-Wave Interactions in Coastal Region

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Wave-wave interactions are the major mechanism determining growth rates and properties of surface gravity waves. Phillips [1960] pointed out that at least four gravity waves could interact resonantly in deep water. Which wave-wave interactions dominate in shallow water remains unclear. Frelich and Guza [1984] suggested that three-wave interactions dominate in shallow water. Lin and Perrie [1997] pointed out that at least four gravity wave interactions are required to satisfy the resonance conditions for all water depths. However, in extremely shallow water, the four-comparable gravity wave interactions do not satisfy resonance conditions. The resonant conditions in shallow water require one long wave interacting with three local wind waves, with the long wave corresponding to swell, an edge wave, a bottom topography wave, etc. The three-wave interaction theory neglects low frequency waves. The three-wave and four-wave theories lead to entirely different coastal dynamics. If three wave interactions dominate, the surface waves should remain high frequency waves with small wave amplitudes. However, when three local wind waves interact with one long wave, the long wave can grow steeper and faster in the coastal region than in deep water because the nonlinear wave-wave interaction rate increases rapidly with decreasing water depth.

Unfortunately, the nonlinear wave-wave interactions are hard to measure because it is difficult to separate the nonlinear wave-wave interactions from the effects of wind stress, wave breaking, dissipation, and currents on surface waves. Existing nonlinear wave-wave interaction models cannot answer the above questions because they are based on resonant theories. To address this issue, we develop a finite-amplitude wave-wave interaction model for arbitrary water depth that employs pseudo-spectral methods. The model includes resonant and non-resonant wave-wave interactions, such as 2-, 3-, 4-, N-wave interactions, where N is the truncation level of the model. Our numerical results show that in shallow water, the nonlinear transfer rates due to one long wave interacting with 3-local wind waves are much greater than those due to all other wave-wave interactions summed together, including the quasi-resonant three-wave interactions, five-wave interactions, etc. Therefore, the dominant nonlinear wave-wave interactions should be one long wave interacting with three local wind waves. When a long wave comes into the coastal region, it absorbs energy from short waves through wave-wave interactions and grows steeper and faster than in deep water.

OS21S-12 1135h

Modeling of Orographic Effects in the Coastal Ocean

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A large-eddy simulation (LES) model is used to simulate the interaction of stratified flow with bottom orography in the coastal environment. Flow over a simple ridge is examined using parameters consistent with conditions along the west coast of the US. Experiments are performed for water velocities ranging from 0.1 to 0.4 m/s, with a constant stratification. Results with a smooth lower boundary show that these conditions promote mode 1 and 2 resonant internal lee waves, which force significant form drag on the water velocity. The strength of these waves is determined by the height of the obstacle relative to the depth of the water column and the value of the internal Froude number. Imposing a rough lower boundary disrupts the modal structure by forming a turbulent boundary layer. The net effect is a decrease in the overall drag because of the reduction in pressure drag produced by the internal wave response.

OS21T HC: 316 A Tuesday 0830h

Arctic System Studies II

Presiding: **E E Prepas,** Department of Biological Sciences**; J Yang,** Woods Hole Oceanographic Inst.

OS21T-01 0830h

The Variation of Temperature and Salinity Within Aarictic Leads During the Summer

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Temperature and salinity were measured within Arctic leads during a two-month period during the summer of 1998 as part of the SHEBA field experiment. Underway measurements at a depth of 15 cm were made with a CTD mounted on the bow of a 3-m skiff. In addition, profiles of temperature, salinity and optical properties were made with a second CTD on sections across the lead. Daily measurements were made primarily in the same lead, but on several occasions temperature and salinity profiles were also measured in several leads with a CTD lowered from a helicopter. When the melt season began, a fresh layer with very low salinity (2 psu) and temperature well above freezing (2 C) formed at the surface of the lead. This layer persisted and grew to a depth of over 1 m until it was mixed into the upper ocean by the action of a passing storm in late July. The focus of this paper is on the horizontal variation of temperature and salinity within the lead and the relationship of the variability to distance from the lead edge, wind speed, and wind direction. The helicopter measurements in multiple leads illustrate the effect of lead age (time since opening) on temperature and salinity.

OS21T-02 0845h

A Potential Mechanism for the Formation of Arctic Halocline Water

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The Arctic halocline water is near freezing and considerably saltier than that in the mixed layer. This layer is sandwiched between the thermocline and the mixed layer. Previous studies indicate that the halocline water is formed in coastal polynyas where brine rejection is high in winter. In this study we will examine the vertical mixing driven by storms as a potential mechanism that may have contributed to the formation of halocline water. Our study is motivated by buoy observations which show that vertical mixing could reach the depth of the halocline and even the thermocline in various regions in the Arctic Ocean. These mixing events were mechanically forced by intense storms moving across the buoy sites. The mixing between the surface and thermocline waters could result in a new water mass hydrographically similar to the halocline water. This mechanism will be examined by using observations and tested by a simple model.

OS21T-03 0900h

Did The Northern Hemisphere Sea-Ice Deduction Trend Trigger The Quasi-Decadal Arctic Sea-Ice Oscillations?

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The nature of the reduction trend and quasi-decadal oscillations in northern hemisphere sea-ice extent is investigated. The trend and oscillations, which seem to be two separate phenomena, were found in data. This study proposes a hypothesis/theory that the Arctic sea ice reduction trend in the last three decades triggered the quasi-decadal Arctic sea ice oscillation (ASIO), based on both a conceptual model and data analysis. The theory predicts that the quasi-decadal oscillations are triggered by thinning in sea-ice, leading to the ASIO being driven by a strong positive feedback between the atmosphere and ocean. Such oscillations between the Arctic Basin and GIN seas are predicted to be out of phase with the phase difference being 3pi/4. The wavelet analysis of the data reveals that the quasi-decadal ASIO did occur actively since 1970s following the trend (i.e., as sea ice became thinner and thinner), although the atmosphere experienced quasi-decadal oscillations in much of the last century. The analysis also confirms the out-of-phase prediction between these two regions, which varied from 0.62pi in 1960 to 0.25pi in 1995.

OS21T-04 0915h

Sea Ice Porosity's Impact on Bottom Ice Melt Rate

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Pressure ridge keels modify locally the boundary layer flow pattern. They were shown to be associated with the development of a stable melt layer along their sheltered side ie. downstream of the keel. Data collected during our field work were used to validate a simulation in which we compute eddy diffusivity coefficient as a function of the distance to the ridge. Our experiment was conducted during the 2000 spring melt onset in the Hudson Bay, Canada. High-resolution salinity records sampled at 0+, 25 and 50 cm from the ice-water interface were analyzed at 3 stations positioned close and away from the sheltering influence of a pressure ridge. Also, thermistors were installed in the ice and at the ice water interface at and between the 3 stations. Our results show a two order gradient in eddy diffusivity magnitude between sheltered areas and non-sheltered ones. More importantly, we observed a flux of melt water in the bottom ice from areas where the ice-water interf! ace is lower to areas where this interface is at a higher elevation. As shown on ice cores, this buoyantly induced flux produces a volume melt of the bottom ice layer. Also, our data show a melt rate in the ridge vicinity station 3 times higher than what our simulation and in situ bottom ice ablation measurements would give.

OS21T-05 0930h

Assessing the Role of Aerosols, Ice Cover, and Cloud on Radiative Flux Parameterizations in the North Water, 1999.

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Previous parameterizations of shortwave and longwave fluxes in the Arctic have attempted to capture a varied landscape in one equation. Differences in surface types and sky cover have been distilled into a single variable, be it albedo, surface vapor pressure, or cloud fraction so that polynyas utilize the same schemes as ice floes, glaciers, and snow drifts. Recent evaluations of radiative flux parameterizations by Hanesiak et al (2000), Hanafin and Minnett (2001), and Ananasso et al (2001), underline the need to optimize each parameterization scheme to fit the target environment.

So far, adjustments to known schemes have performed reasonably well in modeling the surface radiation at terrestrial and fast-ice locations. Marginal ice zones and marine environments prove to be more complex, partly due to their dynamic nature but also as a result of poor sampling in these areas. In September of 1999, during the height of the melt cycle and just prior to fall re-freeze, the Canadian Coast Guard ice-breaker Pierre Radisson conducted an extensive field study of the North Water Polynya in northern Baffin Bay. Shipboard observations include aerosol content, cloud type and cover, and ice type and cover in addition to meteorological, radiative, and radiometric data. These in situ measurements will be used to assess the sensitivity and applicability of radiative flux parameterizations to fluctuations in the Arctic marine environment.

OS21T-06 0945h

Application of a Highly Accurate Advection Algorithm to Sea-Ice Modeling

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Numerical sea ice models have employed increasingly detailed parameterizations to describe ice internal dynamics and thermodynamics. However, nearly all such models have treated ice advection using either the upstream method, which is very diffusive, or centered differences, which tend to create artificial extrema and may lead to negative ice concentrations and thicknesses unless additional artificial diffusion is employed.

We describe application to sea-ice advection of the second-order moment (SOM) method of Prather (1986). This method, which has been used primarily in atmospheric chemistry models, maintains positivity while exhibiting very low numerical diffusion and dispersion. In a series of numerical tests we demonstrate that (i) SOM is more accurate than the flux-corrected transport method; (ii) SOM can maintain relatively sharp ice edges without introducing negative values and spurious extrema; (iii) SOM leads to greater ice thicknesses and volumes than either upstream or centered differences when employed in a climatologically-forced Arctic Ocean model.

Relative merits of SOM and the particle-in-cell method as described by Flato (1993) are briefly discussed.

Prather, M.J., Numerical advection by conservation of second-order moments, Journal of Geophysical Research, 91, 6671-6681, 1986.

Flato, G.M., A particle-in-cell sea-ice model, Atmosphere-Ocean, 31, 339-358, 1993.

OS21T-07 1020h

Biogeochemical Markers of Carbon Source and Transport in the Western Arctic Ocean

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Lipid biomarkers in sediments from the Chukchi and Beaufort Seas were examined to compare sources of organic carbon and its transport from shelves to basins of the western Arctic Ocean. Biomarker distribution reflected differences between the two regions. Sediment from the Chukchi Shelf contained a large proportion of sterols indicative of diatoms (24-methylcholesta-5,24(28)-dienol and 24-ethylcholesta-5,24(28)Z-dienol) together with algal polyunsaturated fatty acids (18:4, 20:5 and 22:6) and high phytol concentrations (280μg/g OC), suggesting that phytoplankton production strongly influences carbon dynamics on the shelf. Despite a large influx of terrestrial carbon from the Mackenzie River, algal polyunsaturated fatty acids (PUFAs) in Beaufort Shelf surface sediments still comprised a significant fraction of the total acids. Transects of surface sediment from shelf to basin in both regions show a decrease in the fraction of algal PUFAs accompanied by an increase in the fraction of long-chain vascular-plant derived fatty acids. Core profiles were also analyzed to examine historical trends in carbon production and preservation between shelf regimes. Cores from comparable water depths on the two shelves were dissimilar in both biomarker concentration and distribution. Chukchi Shelf and Slope sediments contained significant, but variable, amounts of algal biomarkers throughout while in Beaufort Shelf and Slope sediments distinct algal fatty acids decreased rapidly downcore. Sterol profiles also differed between Chukchi and Beaufort sediment, highlighting the abundance of algal sterols in the Chukchi Sea and the enrichment of vascular plant material in the Beaufort Sea. Such differences suggest that transport of organic material to sediments varies substantially between the two shelves and has also varied over time, reflecting the rapid response of the Arctic continental shelves to climatic change.

URL: http://cbl.umces.edu/~harvey/SBI

OS21T-08 1035h

Sea Ice as a Transport Agent of Radionuclides to the Fram Strait

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The drifting of sea ice in the Arctic Ocean provides a unique transport mechanism both for sediments and associated elements incorporated into sea ice at formation areas, as well as for atmospherically supplied species intercepted during transit. Fluxes of sediment and particle-reactive chemical species might thus be enhanced in ablation areas such as the Fram Strait and the Barents Sea through melting of the ice. Here we present a study based on the measurement of the activities of several radionuclides, both natural (^{7}Be, ^{210}Pb, ^{226}Ra) and anthropogenic (^{137}Cs, ^{239}Pu and ^{240}Pu), in sea-ice sediments collected from the western part of the Fram Strait. The distribution of ^{210}Pb and the Pu isotopes in bottom sediments retrieved from different locations and depths across the Fram Strait were also investigated. Sea ice intercepts and transports atmospherically-supplied radionuclides such as ^{7}Be (half-life = 53 d) and ^{210}Pb (half-life = 22.3 y), and entrained sea-ice sediments are able to scavenge a significant fraction of these radionuclides from the ice during transport. Based on their activity ranges and the correlation between them it was observed that all the ^{7}Be and most of the excess ^{210}Pb in sea-ice sediments are added to the ice while in transit. The ^{7}Be/^{210}Pb$_{ex}$ ratio of sea-ice sediments was used as a chronometer to estimate transit times of sea ice from origin areas to the western Fram Strait to be about 3-5 years. Activities of ^{239,240}Pu and ^{137}Cs and ^{240}Pu/^{239}Pu atomic ratios (all but one sample $\sim$ 0.18) in sea-ice sediments point to atmospheric fallout as the main source of these anthropogenic radionuclides reaching the western Fram Strait at the time of sampling (1999). The lack of correlation with ^{7}Be and ^{210}Pb suggests that atmospheric input of artificial radionuclides onto sea ice is presently negligible. Based on these results and together with mineralogical data, ^{7}Be and ^{210}Pb distributions and calculated back trajectories, the investigated sea ice floes could have originated on the western continental shelves of Siberia. ^{240}Pu/^{239}Pu atomic ratios lower than the global fallout value of 0.18 were measured in bottom sediments in the deep areas of the Fram Strait and also in selected regions from the Northeast Water (NEW) Polynya. This finding provides evidence that plutonium from a source other than atmospheric fallout has reached the area. Likely sources of this Pu include tropospheric fallout from atomic weapons testing of the former Soviet Union or Pu released from nuclear reprocessing facilities. The linkage of the plutonium and ^{210}Pb distributions in bottom sediments with the location of the extent of sea-ice and thus the influence of sediment release from sea ice is discussed, together with the two other main aspects affecting the sedimentation in the Fram Strait, namely the transport of particulate material by near-bottom currents and the biological productivity and subsequent downward particle export.

Acknowledgements: This work was funded by the US National Science Foundation. PM expresses his gratitude to the Government of Spain and the Fulbright Commission for the concession of a postdoctoral fellowship. K.O. Buesseler, S.M. Pike and L. Ball are thanked for their guidance on the Pu analyses by ICP-MS at the WHOI facility.

OS21T-09 1050h

Distribution of thorium and protoactinium in the water column of the deep Canada Basin, Arctic Ocean

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Distribution of ^{231}Pa and thorium isotopes (mainly ^{230}Th) in the water column have been utilized as powerful tracers to investigate the geochemical pathways of particle-reactive material in the ocean. Although both of these nuclides have short residence times in the ocean, they become chemically fractionated during their removal onto suspended particulate matter. From earlier studies, it appears that the removal rates of these nuclides in certain regions of the deep Canada Basin is slow while in other regions the removal is comparable to other major ocean basins. To understand what factor(s) control the scavenging of these particle-reactive radionuclides, we collected a suite a samples from this region. We collected two vertical profiles in the deep Canada Basin (75° 13'N, 149° 54'W; 73° 50'N, 152° 55'W), one profile in the slope (73° 15'N, 155° 06'W), and two profiles in the shelf regions (71° 40'N, 154° 46'W; 71° 44'N, 153° 56'W).

The concentrations of ^{231}Pa, ^{230}Th and ^{228}Th varied between 0.05 dpm m^{-3} and 0.2 dpm m^{-3}, 1.3 dpm m^{-3} and 12.4 dpm m^{-3},and 0.21 dpm m^{-3} and 0.64 dpm m^{-3}, respectively. The first order residence time for ^{228}Th varied between 0.4 and 1.9 years, which is comparable to other major ocean basins. The scavenging efficiency of these nuclides appears to be similar to other major oceanic regimes. The suspended particle concentration and inventory in the deep basin is also considerably higher than those reported for the Alpha Ridge Station (Bacon et al., 1989 - EPSL 95, 15-22). The relative cycling of thorium isotopes in the surface and deep waters of the Canada Basin will be discussed using a reversible exchange model.

T U E

OS21T-10 1105h

Factors Influencing the Timing and Magnitude of the Sinking Export of ice Algae During the Spring and Summer, in the High Arctic

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From 8 May to 9 July 2001, seasonal trends in the biomass of ice algae, under-ice phytoplankton, and under-ice sedimentation were followed at a first-year landfast ice station in McDougall Sound (Canadian High Arctic). Biomass measurements, including chlorophyll *a* (chl *a*), particulate organic carbon and nitrogen, and biogenic silica, were carried out every third day for two ice algal sites (high and low snow cover thickness), four water column depths (2.5, 5, 10, and 25 m) and three sediment trap depths (2.5, 5 and 25 m). Concomitantly, climatic and oceanographic variables including air and under-ice temperatures, surface and under-ice PAR, were continuously monitored. The average bottom ice chl *a* concentration was maximum in mid-May (ca. 80 mg m^{-2}) and showed a consistently decreasing trend during June. Under-ice sedimentation generally mirrored the changes in ice algal biomass. On average, chl *a* sedimentation was $<$ 1 mg m^{-2} d^{-1} in May and increased 5-fold during June. In the water column, large punctual increases in biomass were observed at the surface before mid-June, likely reflecting input of ice algae into the water column. Under-ice PAR did not increase before the end of June, also supporting that biomass increases in the water column were from the input of ice algae rather than phytoplankton growth. Strong correlations were observed between sinking fluxes measured at 2.5 m and those at 10 and 25 m, suggesting that ice algae were exported to depth. Regression slopes indicated that, for chl *a*, there was a loss of ca. 10% from the surface to 25 m. These results are interpreted in view of forcing factors that influence the timing of the release of ice algae into the water column and their subsequent sinking export to the pelagic and benthic compartments.

OS21T-11 1120h

Mesoscale Physical and Biological Fields on the Northern Norwegian Shelf Region

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The shelf of northern Norway is a highly productive area where the circulation is complicated by the North Atlantic Current and fresh water runoff. To study the zooplankton advection by both the North Atlantic current and Norwegian coastal current, and the role of mesoscale eddies in ecosystem dynamics, a mesoscale physical and biological survey was carried out in late June 2000 on the R/V Jan Mayen. Cross shelf transects with high-resolution measurements of CTDF fields and zooplankton distribution were conducted using a towed instrument package including an Optical Plankton Counter (OPC), CTD , and fluorometer. The survey covers the region from 68°N 70°N in latitude and from onshore to 150 km offshore. The OPC data showed a high concentration of abundance in the top layer of the water body. This layer changes gradually from 50 m on higher latitude (70°N) to 10m on the lower latitude (68°N). The zooplankton distribution is fairly even across the shelf except in the deep canyon area, where the zooplankton abundance is distinctively concentrated. The co-occurrences of a warm temperature layer, Chl-a maximum, and high zooplankton abundance imply that the temperature is critical to the phytoplankton and zooplankton distribution. The convergence of the circulation is further investigated to understand the maxima of zooplankton and subduction of phytoplankton into a greater depth.

OS21T-12 1135h

Effects of Wildfire on Discharge and Phosphorus Export from an Upland Watershed on the Western Boreal Plain: a Component of the FORWARD Study

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Water and nutrient export during the peakflow season (May to July) were affected by a wildfire in early summer 1998, which burned 90% of an upland watershed on the Boreal Plain of western Canada. Water export increased after fire (1999 to 2000) relative to a prefire study year (1983) and compared to a reference system ($P = 0.01$). The increase in particulate phosphorus (PP) export after fire was also greater in the burned than the reference watershed ($P = 0.05$). Whereas PP comprised a similar proportion of total phosphorus export in the burned stream before fire and in the reference stream (65%), it comprised a higher proportion after fire (77%, $P < 0.02$). Changes in phosphorus export were most evident during peakflow and were largely restricted to the particulate fraction. This suggests that even in this low relief region, removal of vegetation enhances overland flow during and after storm events such that particulates are readily flushed from the watershed. This study is a component of the Forest Watershed and Riparian Disturbance (FORWARD) study, which links water quality and watershed disturbance indicators with management on the Boreal Plain of western Canada.

OS21U HC: 323 C Tuesday 0830h

Primary Production and Plankton Distributions

Presiding: **M P Lizotte,** Bigelow Laboratory for Ocean Sciences**; K J Edwards,** Woods Hole Oceanographic Institution

OS21U-01 0830h

Chemoautotrophic Primary Production in Lake Kinneret, Israel

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Intensive chemosynthetic microbial activity fueled by H_2S oxidation was measured by ^{14}C fixation in the dark and in presence of DCMU in Lake Kinneret waters. This process occurred in water collected below the photic zone (20 m) at the chemocline in the late autumn (Nov-Jan), and close to the sediment water interface in May when the chemocline starts to form. Averaged depth-integrated chemoautotrophic primary production at the chemocline was 16% and 24% of the photosynthetic primary production in May and during autumn, respectively. The $\delta^{13}C$ of particulate organic matter at the chemocline ranged between - 27$^o/_{oo}$and - 39$^o/_{oo}$, the latter being associated with intensive chemosynthesis. These ^{13}C values support our earlier hypothesis that chemoautotrophic bacteria constitute, directly or indirectly (through the microbial loop), a ^{13}C -depleted food source for the zooplankton in the lake during autumn and early winter. Mass and isotopic balance of carbon and H_2S suggest that chemosynthetic productivity may constitute 20 to 25% of the primary production in Lake Kinneret annually.

OS21U-02 0845h

Seasonal Distribution of Magnetotactic Bacteria in a Chemically Stratified Coastal Pond

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Magnetotactic Bacteria (MB) are a diverse group of prokaryotes that precipitate the mineral magnetite (Fe3O4) or greigite (Fe3S4) intracellularly. MB exhibit magnetotaxis along the Earth's geomagnetic field lines in dysaerobic and anaerobic water columns and sediments. While these bacteria play distinct roles in biogeochemical cycling of Fe, S, C, and N, little is known about their abundance and distribution, nor have the factors that control their occurrence been elucidated. Consequently, it is not possible to ascertain their absolute or relative biogeochemical roles, or understand the ecological role they play in sub-oxic microbial communities. We are conducting studies to understand the occurrence, distribution, and diversity of MB in the environment, using a chemically stratified salt pond in Massachusetts as a model system. Preliminary results of our studies will be presented on: 1) seasonal evolution of water column chemistry in Salt Pond, MA; 2) phylogenetic diversity of MB; 3) electron and light microscopic studies of MB. Results show distinct stratification of dominant MB populations with depth that correlates with trends in O2 and Fe. Studies reveal unprecedented dominance of greigite-MB in both anoxic and dysaerobic portions of the water column; this is surprising as most studies to date have focused on the magnetite-MB, which appear to be less abundant. Results also show an evolution in the species diversity over the summer season, which correlates with the degree of water column stratification (less early in season; more later). These studies demonstrate the need for molecular quantitative assessments of MB populations, so that they may be put into biogeochemical context in the environment.

OS21U-03 0900h

Chaotic Attractors in a Semi-Tropical, Polymictic Lake?

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Numerical models, laboratory experiments, and field exercises have shown that external disturbances, e.g., episodic flushing and nutrient loading events, can have a profound effect on phytoplankton succession patterns and resulting biodiversity. Well accepted conceptual models, such as Connell's Intermediate Disturbance Hypothesis, have provided a framework where controlling mechanisms that shape phytoplankton community structure are described, which often involve synergism between external disturbances and internal processes. More recently, numerical models have shown that in some cases internal processes alone, e.g., competition for multiple limiting resources, can explain succession patterns and resulting biodiversity. In such cases it is assumed that the role of external disturbances is inconsequential. In addition, some of these models have shown chaotic behavior where the succession pattern and resulting biodiversity is influenced by chaotic attractors, and is highly sensitive to the initial community composition.

Chaotic phytoplankton succession patterns have not yet been demonstrated in the natural environment. In this research, an 11-year phytoplankton record from a semi-tropical, polymictic lake, where seasonal disturbances are small, was analyzed. Findings from cluster and discriminant analyses indicated that when diatoms of the Genus *Melosira* dominated winter assemblages, summer assemblages were either dominated by euglenoids of the Genus *Trachelomonas*, or cyanophytes of the Genus *Psuedoanabaena*, *Synechococcus*, or *Cylindrospermum*. There was no apparent trend observed between the hydrology and nutrient loading records, or the in-situ water quality records, with community composition. However, the historical data does not include other parameters known to influence phytoplankton succession patterns, e.g., grazer community structure. So, it is impossible to determine what processes might have influenced phytoplankton succession patterns and resulting biodiversity over this period. Forces of chaos might have been at play, however, as indicated by the strongly bipolar summer community composition following *Melosira*-dominated winters, which is consistent with chaotic modeling simulations. In this case chaotic attractors might have pulled phytoplankton succession towards a community dominated by either *Trachelomonas* or a Genera of cyanophyte.

OS21U-04 0915h

Contrasts Between Temporal Patterns of Primary Production and Plankton Biomass: Results of a Long-Term Study of the Trophic Evolution of a Northern Reservoir Following Impoundment

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Cat Arm Reservoir is a deep (18 m mean depth), dystrophic (2m euphotic zone) lake surrounded by boreal forest on the Great Northern Peninsula of insular Newfoundland. Measurements of primary production and plankton biomass between 1983 and 1998 reveal only a weak linkage between production and biomass within growing seasons and a trend towards negative correspondence across years.

Impoundment produced an immediate sharp increase in seasonal mean zooplankton biomass, attributable to reduced flushing, and a 45 % drop in phytoplankton biomass for an overall total plankton biomass increase of only 30 %. Total plankton biomass increased further during the second year of filling but once normal reservoir operation was established seasonal mean biomass dropped to a relatively stable level slightly less than initial conditions and with a nearly even balance between phytoplankton and zooplankton.

Mean primary production exhibited a distinctly different temporal pattern, dropping during the two years