OS21R-09 1050h

Interannual Variability in Labrador Sea Water Formation: How is it Related to the Atmospheric Forcing?

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Considerable interannual to decadal variability has been observed in the properties and volume of Labrador Sea Water (LSW) formed in the subpolar North Atlantic. So far, most attempts to explain this hypothesize a direct correlation to the atmospheric forcing and, in particular, the North Atlantic Oscillation (the dominant wintertime atmospheric mode of variability in the region). This assumes there are no feedbacks within the deep convection process that are able to modify the surface-imprinted variability. In principle a number of internal oceanic mechanisms can cause the convective response to be more complex. One likely feedback involves the preconditioning of the water column, whereby the remnant of convected waters from one year affects the amount of dense water formed the following year. We investigate the role of preconditioning in modulating the variability of convection by coupling two simple models. The first model, driven by realistic surfaces fluxes from 1950 to the present, relates the amount of dense water formed at a given site to the atmospheric forcing as well as the conditions prior to the onset of convection. The second model determines the subsequent spreading and export of LSW, which in turn represents the next input to the first model. The results of this coupled simulation show how preconditioning modifies the response of the convective process on timescales comparable to the basin's memory. Comparison to a timeseries of LSW properties in the Labrador basin shows substantial improvement in the prediction of the observed LSW variability.

OS21R-10 1105h

The Gulf Stream System and the North Atlantic Oscillation: A synergistic perspective with wind-driven and thermohaline responses

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The low-frequency impact of North Atlantic Oscillation on the Gulf Stream system is discussed from a multi-scale perspective. Specifically, the impact of NAO on the Gulf Stream system is described in terms of its basin-scale gyre-specific components: the azores high centered on the subtropical gyre; and the Islandic Low centered on the subpolar gyre.

The Gulf Stream system can be described as a four-component system: (i) the western boundary current regime; (ii) the separation regime (75-70w), (iii) the meandering northeastward flow regime (70-60W); and (iv) the freely flowing eastern regime (60-45W). Evidence presented herein suggests that the behavior of the Gulf Stream system can be described as a combination of responses of different segments to different components of NAO. Specifically, the boundary current and the separation regime is primarily driven by the integrated wind-stress forced baroclinic Rossby waves, whereas the eastern segments are more sensitive to Labrador Slope water influx into the Slope water region. It is thus possible that the wind-driven response from predominantly high-NAO periods during last 30 years (1966-96) was the primary contributor for the relatively northward position of the Gulf Stream System; while the predominantly low NAO periods might have forced the overall Gulf Stream System to maintain a southerly position prior to 1966 and after 1997 due to large scale advection of Labrador Sea and Slope water to the north of the Stream.

OS21R-11 1120h

Long-term Variability of the Deep North Atlantic Basin

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An assessment of the ocean's role in our global climate requires a determination of how climate signals, acquired at the sea surface, are expressed at depth in the ocean. Toward this end, historical hydrographic data from the National Oceanic Data Center are used to examine the pattern of climate change in the deep North Atlantic. Motivated by a recent study that has shown significant volume-averaged warming in the North Atlantic over the past fifty years, we will discuss the certainty with which we can identify climate changes and patterns on density surfaces that span the deep North Atlantic. Preliminary results indicate significant cooling and freshening of the isopycnals below the thermocline. Such changes are compatible with the previously reported volume-averaged warming since the subthermocline isopycnals also exhibit a long-term deepening. This basin-wide deepening, on the order of 1-2 meters/year over the past fifty years, is consistent with the changes noted from repeated hydrographic sections in the North Atlantic basin.

OS21R-12 1135h

Interannual-to-Interdecadal Variability of Temperature and Salinity in the Labrador Sea

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Observations obtained across the Labrador Sea during the 1990s reveal exceptionally high cooling of the upper 2000 m during the early part of the decade followed by steady warming. The major cause of the noted cooling was a series of extremely cold winters in the of the Labrador Sea, which led to year-to-year deepening of convective mixing and creation of very dense and cold version of the Labrador Sea Water (LSW) filling the basin down to 2300 m. During the milder years following 1994 most of this LSW was mixed into the boundary currents and slowly drained away from the Labrador Sea to other regions of the North Atlantic Ocean while the remaining portion increased in temperature (T) and salinity (S) as the higher T-S waters bordering the sea were mixed toward the centre. The loss of the LSW led to a restratification of the upper waters across the sea, expressed in significant increases in T and S as well as a decrease in density. This tendency was interrupted in 2000 when the relatively cold winter caused the convective mixing down to 1500 m. At the present time (2001), the newer and shallower and less dense formation of LSW (2000) co-resides in the Labrador Sea with the relics of the deep LSW (1994).

Examination of T and S time series over the past 53 years showed that the pattern of T and S variations noted in the LSW during the recent years were very similar to those observed in the 1950s and 1960s. However, the magnitudes of annual T and S changes associated with the build-up and decline of LSW in the 1990s are twice or more higher than the estimates for similar events in the 1950s and 1960s.

The time series of the Northeast Atlantic Deep Water (NEADW) and Denmark Strait Overflow Water (DSOW) show rapid increases of T and S in the early 1960s with slow declines into the 1990s except for 5-year oscillations in the DSOW over the past 15 years.

The noted changes led to significant variations in the steric heights over 5 decades with highest level in late 1960 and the lowest in 1994, with the difference between these decades greater than 10 cm.

OS21S HC: 317 A Tuesday 0830h

Coastal Circulation and Transport

Presiding: **J K Lewis,** Scientific Solutions, Inc.**; N Garfield,** San Francisco State University

OS21S-01 0830h

Kinematics of the Middle and Outer Shelf of the South Atlantic Bight: A Comparison of Moored Observations

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Moored instrumentation was deployed on the continental shelf at two sites in Onslow Bay, North Carolina. One site was mid-shelf and the other was at the shelf break. We report on one years data collection at mid-shelf and 3 months at the shelf break. The instrumentation measured water column profiles of current and temperature at two discrete depths. Detailed comparisons between the two moorings are made in terms of characteristics of the flow fields and temperature variability. The mid-shelf site was dominated by M2 tidal fluctuations in the velocity and seasonal variability in temperature. The shelf break site was dominated by synoptic scale events in the flow and 2-7 day fluctuations in temperature.

URL: http://www.fredbingham.com/cormp

OS21S-02 0845h

Spatial and Temporal Variability of Circulation Patterns at Offshore Shoals on the Eastern Florida Continental Shelf

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Circulation patterns were observed over a potential sand resource area on the inner continental shelf offshore Sebastian Inlet, Florida to document the physical processes potentially impacted by sand mining within identified borrow sites. ADCP surveys were conducted for a 26-hour period in spring and fall 2001. The survey transect lines were designed to capture the spatial variation of flow across Thomas shoal with a minimum water depth of 10 m. The survey pattern was repeated approximately every four hours, duplicating the center survey line every 2 hours. The data indicate flow regimes within the study area are dependent upon wind-forcing, water level elevations, and seafloor topography. Current magnitudes vary from less than 20 cm/s in the spring to more than 100 cm/s (2 knots) in the fall, primarily flowing along the axis of the shoal. Observations were combined with regional historical data to describe circulation patterns on the inner continental shelf between Port Canaveral and Sebastian Inlet, Florida, including major forcing influences, time scales of variability, and the magnitude of resulting currents. Measurements compiled and analyzed will be used to estimate sediment transport patterns adjacent to potential borrow sites. This information, combined with wave analysis and historical shoreline and bathymetric change data sets, provides estimates of potential alterations to sediment transport processes along the shoreline and in the nearshore as a result of dredging at these offshore borrow sites.

OS21S-03 0900h

Hydrography off Bodega, CA, During June 2000 and 2001 COoP/WEST Survey Cruises

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The NSF sponsored CoOP (Coastal Ocean Processes) WEST (Wind Events in Shelf Transport) experiment investigates the shelf upwelling paradox that while eastern boundary shelves are characterized by high productivity due to upward fluxes of nutrients into the euphotic zone, wind forcing also represents negative physical and biological controls via offshore transport and deep (light-limiting) mixing of primary producers. Specifically, upwelling ecosystems along mid-latitude eastern boundaries of the ocean are well-known for wind forcing and high productivity at lower trophic levels, with concomitant transport of near-surface plankton offshore.

This program has now has conducted two month-long spring cruises, June 2000 and June 2001, centered on the region west of Bodega, CA. Conditions could not have been more different for the two cruises. The June 2000 cruise period experienced abnormally calm

winds while the June 2001 cruise experienced abnormally windy conditions. We sampled the extremes represented by the paradox in upwelling systems.

This presentation will present preliminary hydrographic data to explore the differences between the two spring cruises. The data also allow examination of the short term changes observed during the month-long cruises. Both time-series data from along the main line extending offshore from Bodega (UCD Bodega Marine Lab) and maps of the horizontal and vertical distribution of oceanic parameters will be examined with the goal of setting the stage for interpretation of the differences in primary and secondary productivity.

OS21S-04 0915h

High-Frequency Observations of Wind-Forced Onshore Transport and Water Column Structure at a Coastal Site in Baja California

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A suite of physical observations were collected at Bahia Salsipuedes, Baja California, in July 1999. The main goal of our investigation was to assess the impact of high-frequency wind forcing on (1) the onshore transport of near-surface waters and associated material, especially larvae of coastal invertebrates, and (2) the structure of the water column.

Drifter-tracking experiments were carried out in order to observe the short-term response to wind forcing at the uppermost layers of the water column. The direction and speed of winds and surface currents in the area were measured every five minutes throughout the experiments and over a total time of ca. 2 weeks. During the same period, a high-frequency (0.025 Hz) time series of temperature and currents in the water column was gathered from an array of moorings located at a depth of 15 m. Temperature sensors in the moorings were located at 2, 5, 8, and 11 meters above the bottom (MAB) and at the surface of the water column. A bottom-mounted 1200 kHz ADCP was used to measure the structure of currents between 2 and 13 MAB.

The series of temperature data indicated high stratification in the water column during most part of the observation period. A peak in stratification was observed around July 13, with surface waters being up to 7°C warmer than bottom waters. A more homogeneous water column, with significantly lower temperatures at the surface, was observed towards the end of the experiment on July 22. These conditions were associated with stronger and longer-lasting wind episodes between July 19-22, whose occurrence was significantly correlated with a decrease in stratification. Conditions of high stratification coincided with a lack of coherence between wind and current directions measured at the surface and those observed throughout the water column.

The results obtained from drifter experiments indicated that the sporadic and strong winds prevailing at the study area can transport surface waters and suspended material onshore at velocities of up to 0.4 km h^{-1}. A hyperbolic functional relationship was observed between net onshore transport of the drifters and total wind stress during the experiments. Although the paths followed by drifters during the observation period were similar, the time it took for a drifter to be transported a similar distance onshore (1.6 km) decreased from 7.2 to 5.8 h between July 16 and July 22, respectively. This result is consistent with the observed increase in wind speeds towards the end of the observation period. Although no quantitative observations of larval abundance in surface waters were taken, barnacle and decapod larvae were observed to settle on drifters.

In conclusion, wind forcing at Bahia Salsipuedes seems to have an important effect on both the vertical structure of the water column and the onshore transport of surface waters. Sustained wind forcing with speeds > 6 m s^{-1} towards the end of the observation period was associated to (1) a decrease in the stratification and speed of horizontal currents in the water column, and (2) a more consistent pattern of onshore transport. These results have obvious implications for the study of larval supply to coastal locations and the frequencies at which observations are usually collected.

OS21S-05 0930h

Detection of California Upwelling Fronts from GOES-10

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Seasonal analysis of satellite-derived sea surface temperature (SST) fronts off the California coast is presented. Preferential locations of fronts, especially upwelling fronts, provide information regarding regions of convergent flow as well as potential sources/sinks for water mass transport in the vicinity of the California coast. These sources and sinks, as well as preferential frontal locations, may have important biological implications regarding the transport of heat, salt, and nutrients vital to zooplankton and larval fish development.

Operational SST derived from NOAA's Geostationary Operational Environmental Satellites (GOES) provides a temporal advantage over SST derived from polar-orbiting satellites, as each location is observed 24 times per day. Regions that have persistent clouds may benefit from increased observational frequency. One such region is coastal California, where marine stratus clouds often limit SST retrieval opportunities. Using hourly, cloud-cleared SST from GOES-10, a daily-averaged SST product is produced that provides a large spatial SST field for use by an edge-detection algorithm. The daily frontal products are then combined and analyzed to produce long-term (monthly/seasonally) composites, which indicate preferential frontal locations.

OS21S-06 0945h

Submarine Canyon Upwelling off the West Coast of Vancouver Island, Canada

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Submarine canyons are common bathymetric features that cut into the continental slope. These canyons often extend past the shelfbreak and incise the continental shelf, where they become regions of enhanced shelfbreak upwelling. An upwelling event in a submarine canyon will usually last for several days, but the amount of water upwelled is difficult to quantify due to the non-linear, three-dimensional nature of the flow through these steep-sided topographic features. Using a laboratory model, we have used differences in rates of flow evolution with and without a canyon present in the shelfbreak topography to quantify how much water is upwelled through a submarine canyon. It is found that the strength of upwelling is proportional to the spatial dimensions of the canyon and the quantity $U^{2.5} f^{0.5} N^{-1}$, where U is the velocity at the shelf-break, f is the Coriolis frequency, and N is the buoyancy frequency.

A scaling analysis is used to relate the findings determined in the laboratory to canyon upwelling in the real ocean, and upwelling fluxes through submarine canyons off the west coast of Vancouver Island are approximated. The upwelling flux through the canyons is compared to that expected due to wind-forced upwelling for the summers of 1997 and 1998. In both years, submarine canyons contribute significantly to mass exchange across the shelfbreak.

OS21S-07 1020h

Environmental Electromagnetic Fields in the Coastal Ocean

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Electromagnetic fields below 1 kHz in the coastal ocean are generated by various types of ocean flow but also include fields generated in the lower atmosphere (e.g. lightning) and ionosphere and magnetosphere which propagate into the ocean along various paths. Using theory and a recently developed numerical model, we explore this topic and present results primarily centered on describing the dominant sources and propagation paths. We also present estimates of the fluxes of electromagnetic energy and charged particles through the air/sea sediment/sea boundaries. The numerical model of ocean electrodynamics is a useful and logical addition to ocean modeling. We describe the model and its connection with ocean flow models such as ROMS.

OS21S-08 1035h

Error Analysis of HF Radar-derived Velocities Using Empirical Mode Decomposition

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Numerous recent comparisons of high frequency (HF) radar-derived velocities with various types of current meters have shown that the rms differences are typically 10 cm/s. Using empirical mode decomposition (EMD) of velocity time series into intrinsic mode functions (IMFs), we show that the highest frequency IMF accounts for nearly all the difference between the two measuring systems. EMD is both data-adaptive and uses local basis functions, unlike empirical orthogonal functions (EOFs) that are data adaptive but assume a global basis function set. We discuss the application of EMD and its interpretation with month-long comparisons made near Pt.Conception, California with several current meter moorings.

TUE

OS21S-09 1050h

Wind Speed Estimation From HF Radar Echo

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From the Doppler spectrum of HF radar, it is possible to extract parameters correlated to the wind speed. The first parameter is the commonly used frequency shift that allows surface current measurements. The wind-induced part of this surface current is extracted by filtering the tidal and higher frequencies components. Previous studies have shown that this wind-induced part composed of both wind-drift and Stokes-drift currents is strongly correlated with the wind speed. At high wind speed (over 8 m/s), a second parameter, the absolute backscatter power can also be related to the wind speed because of its significant decay as the wind increases. Before wind estimation, this decay is just corrected of the wind direction and shore orientation effects. Following these simple observations, two empirical models based respectively on the surface current and the absolute backscatter power have been developed. Merging the two individual models while taking the advantage of both, a compound model is suggested based on fuzzy logic. The dataset used for the model validation comes from University of Miami OSCR HF radar operated during an experiment at Duck, North Carolina in October 1994. Results are compared to a reference buoy wind measurement. Finally, potential consequences of measurement errors on wind estimation are discussed.

OS21S-10 1105h

A Theory for Oscillating Currents in Coastal-Shelf-Slope Regimes

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An analytical solution is developed for the cross-shelf variations of the amplitudes of oscillating currents over a depth-varying domain. Solutions at arbitrary frequency are presented for sea surface height and longshore and cross-shelf currents. The solutions show that oscillating currents can be interpreted as a form of inertial-gravity waves, and their offshore structure is related to an amplitude multiplier B = $(1-e^{-x/L})$ / H. The parameter L is a barotropic inertial-gravity radius of deformation, and H, the depth of the water

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 Arictic 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.

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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.