

Aggregation processes in the ocean cascade from the nano to micro-scale, primarily by gel particle formation from high-molecular-weight organic polymers, and subsequent entanglement of mineral particles, phytoplankton and fecal pellets. We tested the hypothesis that gel particle production increases with ocean acidification, thus increasing aggregation. Chemostat experiments with *Emiliania huxleyi* were conducted at 180, 380, and 750 ppm CO₂ and natural low phytoplankton abundances. Flow rate was set at a low growth rate simulating non-bloom conditions, and pH, DIC and total alkalinity were determined. Cell numbers and Chl were similar in each of the chemostats since phytoplankton abundance is determined by nutrient levels, which were identical. However, TEP should be higher in experiments with higher CO₂ based on past studies. It was not. POC should increase in experiments with higher CO₂ as more gels are formed, and PIC should decrease as calcification slowed down. It did not. Because of higher phytoplankton exudation, DOC should be higher in experiments with higher CO₂, but decrease once gel formation begins. It was not. We will discuss possible reasons for these differences. (Abstract ID 11361)

Lee, C. S., National Taiwan University, Taipei, Taiwan ROC, r95241403@ntu.edu.tw
Wang, C. K., National Taiwan University, Taipei, Taiwan ROC, r95241403@ntu.edu.tw
Wen, L. S., National Taiwan University, Taipei, Taiwan ROC, lswen@ntu.edu.tw

DISTRIBUTION AND PERTURBATION OF DISSOLVED SILVER IN WESTERN PACIFIC MARGINAL SEAS: FROM HEAD WATERS TO THE OPEN OCEAN

Due to its photochemical reactivity, Ag is considered one of the more toxic elements and an ideal urban pollution indicator. A series of waters from headwaters, tributaries, estuaries and coastal waters subjected to varying levels of anthropogenic pressures, as well as waters of Taiwan Strait, East China Sea, South China Sea, and West Philippine Sea were collected and analyzed. The concentrations of Ag showed wide range (0.5–350 pM) from the headwaters to the estuaries, strong correlations were found between the Ag concentration and the watershed population, and the estimated average flux from island Formosa to the ocean was about 118 tons/yr, implying the anthropogenic input is now an important source to the ocean. In surface waters from the East China Sea to the South China Sea, dissolved Ag distributions were characterized by decreasing long-shore southward and increasing near-shore with concentration gradients (0.1–75 pM), with the highest level near river inputs, correlated with population. Vertical profiles of dissolved Ag concentrations in East China Sea, South China Sea, and West Philippine Sea reconfirmed its nutrient-type distributions which significantly correlated with silicate concentrations. Although there were conspicuous indications of anthropogenic sources in the nearshore surface waters, it seemed to be local and only affect the surface waters rather than the deep waters, the large-scale contaminations of Ag in the open ocean waters were not observed. (Abstract ID 10136)

Lee, E. M., St. Mary's College of Maryland, St. Mary's City, MD, USA, emlee@smcm.edu
Bristow, L. A., SMAST, University of Massachusetts Dartmouth, New Bedford, MA, USA, lbristow@umassd.edu
Altabet, M. A., SMAST, University of Massachusetts Dartmouth, New Bedford, MA, USA, maltabet@umassd.edu
Charoenpong, C. N., SMAST, University of Massachusetts Dartmouth, New Bedford, MA, USA, ccharoenpong@umassd.edu
Larkum, J. A., SMAST, University of Massachusetts Dartmouth, New Bedford, MA, , jlarkum@umassd.edu
Pather, S., SMAST, University of Massachusetts Dartmouth, New Bedford, MA, USA, spather@umassd.edu

LONG-TERM STORAGE AND ANALYSIS OF NITRITE OXYGEN ISOTOPES IN SEAWATER

Nitrite is an important intermediate in major biological transformations of the nitrogen cycle. Decoupling of its production and consumption processes, can cause nitrite to accumulate such as in the primary nitrite maximum at the base of the euphotic zone and the secondary nitrite maximum in oxygen minimum zones. Isotopic analysis of this pool is critical for the full interpretation of microbial processes occurring in these regions of the water column. Analysis of δ¹⁸O-NO₂⁻ is still in its infancy due to the lack of widely available references materials and problems with storage and analysis associated with the tendency of oxygen atoms to exchange between nitrite and water. Studies to date mainly conducted in freshwater have recommended storage at pH 12, with a suggested analysis method that requires near neutral conditions to be restored prior to analysis. We present here data from an 8 month storage test in seawater and a viable method for subsequent analysis, without any need to restore near neutral conditions prior to analysis. (Abstract ID 11771)

Lee, G., Inha University, Incheon, Republic Of Korea, ghlee@inha.ac.kr
Park, H. B., Inha University, Incheon, Republic Of Korea, hyobong0107@hotmail.com
Rhew, H., Inha University, Incheon, Republic Of Korea, rhew0503@daum.net

ESTIMATION OF SUSPENDED SEDIMENT MASS FLUX DURING SUMMER MONSOON USING ADCP IN THE DAMMED NAKDONG ESTUARY, KOREA

The Nakdong estuary has witnessed the acceleration in siltation of waterways and the growth

of deltaic barrier islands since the construction of estuary dam in 1987. The observation contradicted the initial expectation that the estuarine dam would starve sediment supply, but field assessment has been difficult due mainly to the lack of field data. This study aims to obtain field data during the summer monsoon to assess the temporal variation of suspended sediment mass flux in the Nakdong estuary. ADCP backscatter intensities, which were simultaneously observed at the downstream of the dam and the inlet of barrier islands, were calibrated with an improved inversion algorithm against measured suspended sediment concentrations. Acoustic estimates of suspended sediments in Nakdong Estuary showed in general good agreements with optically-derived and water sampled SSCs. The temporal variation of SSC profiles clearly exhibited the influence of estuary dam through intermittent freshwater discharge in the Nakdong Estuary. (Abstract ID 12010)

Lee, G., Inha University, Incheon, Republic Of Korea, ghlee@inha.ac.kr

ALTERED ESTUARIES: OVERVIEW

Estuaries provide habitats for living organisms and support high productivity. However, many estuaries over the world have been degraded due to alteration caused by various human activities. Efforts have been made in recent decades to understand the nature of altered estuaries and the natural response to these modifications, with the intention of restoration and/or best management practices of estuaries. This paper overviews various types of alteration, that many estuaries have undergone, and their consequences in physical and biogeochemical processes. Further, the direction for their restoration and adaptive management will be presented. (Abstract ID 10970)

Lee, H., Korea Maritime University, Busan, Republic Of Korea, hjlee@hhu.ac.kr
Hwang, B., Korea Maritime University, Busan, Republic Of Korea, bk8624@naver.com
Kwon, M., Korea Maritime University, Busan, Republic Of Korea, mofjqm@naver.com

A SEA ICE-OCEAN COUPLED MODELING OF THE OCEANIC CIRCULATION IN THE ARCTIC OCEAN

An ice-coupled Ocean General Circulation Model (OGCM) has been used to simulate the oceanic circulation in the Arctic Ocean. The OGCM used in this study is the Regional Ocean Model System (ROMS) version 3.4, which is a three dimensional, s-coordinate, primitive equation ocean model with a free surface. The model area covers the region 55°–90°N, 180W°–180°E with orthogonal curvilinear coordinates of 27–43km grid resolution. A total of 70 s-coordinate levels are adopted in the vertical direction with enhanced resolution near the surface. Daily ECMWF (European Center of Medium range Weather Forecasting) reanalysis data with 1.5° resolution during the period 1990-2009 are used to calculate heat and salt fluxes as well as wind stress at the sea surface. We used SODA (Simple Ocean Data Assimilation) Global 1/2° data for temperature and salinity along inflow open boundaries. To assess model performance, model results are compared with those of IPCC AR4. (Abstract ID 10811)

Lee, J., Pusan national university, Busan, Republic Of Korea, leejyoung@pusan.ac.kr
An, S., Pusan national university, Busan, Republic Of Korea, sman@pusan.ac.kr

EFFECT OF SUBMERGENCE AND SALINITY ON THE DISTRIBUTION OF *PHRAGMITES AUSTRALIS* IN TIDAL MARSHES OF THE REPUBLIC OF KOREA

We compared distribution of *Phragmites australis* in small estuaries with (Gosung) and without (Guman) a barrage. Through the comparison of two sites, we expected to see the controlling factor for the *P. australis* distribution. Distributions of *P. australis* and habitat characteristics such as flooding patterns and salinity exposure were measured for the study. *P. australis* seems to prefer low submergence time (average hydroperiod: 40.3%) in the relatively high places (over 150cm above mean sea level) in Guman estuaries. However, *P. australis* didn't appear in the marsh without freshwater influence even in high areas above 150cm. The diurnal salinity variation observed in the water column (2 highs and 2 lows in a day) was not observed in the porewater near *P. australis* roots. In the long term mooring measurements, however, overall ranges of the salinity variation in two sites were similar. We suggest that the porewater salinity that will directly influence *P. australis* is determined by the combinations of various hydrological factors such as tidal strength, drainage of sediment and freshwater input in the *P. australis* habitat. (Abstract ID 10950)

Lee, J., Korea Ocean Research and Development Institute, Ansan, Republic Of Korea, jhlee@kordi.re.kr
Ha, H., Korea Polar Research Institute, Incheon, Republic Of Korea, ha@kopri.re.kr
Hong, C., Korea Ocean Research and Development Institute, Ansan, Republic Of Korea, cshong@kordi.re.kr
Kim, T., Korea Polar Research Institute, Incheon, Republic Of Korea, twkim@kopri.re.kr
Lee, S., Korea Polar Research Institute, Incheon, Republic Of Korea, shlee@kopri.re.kr

A HYDROGRAPHIC SURVEY IN THE CENTRAL AMUNDSEN SEA SHELF IN 2010-2011

In December 2010 and January 2011, Korea Polar Research Institute conducted a hydrographic

survey in the central Amundsen Sea shelf near Gets and Dotson Ice Shelves using the new Korean IBRV Araon. The CTD data reveal that the near bottom intrusion of the Circumpolar Deep Water (CDW) into the shelf area is relatively weaker than the previous observations reported in various literatures. Vertical distributions of water properties on the cross (channel) section appear to incline slightly to the eastern flank of the channel suggesting that a physical process governs its synoptic circulation in the region. Possible physical processes for the CDW intrusion and synoptic circulation in the central Amundsen Sea shelf will be presented. (Abstract ID 9592)

Lee, K. E., Korea Maritime University, Busan, Republic Of Korea, kyung@hhu.ac.kr
 Lee, S., Korea Maritime University, Busan, Republic Of Korea
 Park, Y., Korea Maritime University, Busan, Republic Of Korea
 Harada, N., JAMSTEC, Yokosuka, Japan

SEASON AND DEPTH OF ALKENONE PRODUCTION IN THE EAST SEA/JAPAN SEA AND EAST CHINA SEA

Long chain (C37) alkenones can be used as a proxy of past sea surface temperature. To test the applicability of alkenones, this study investigated the season and depth of alkenone production in the NW Pacific marginal seas. Surface and subsurface seawater samples were collected from the southwestern part of the East Sea/Japan Sea and East China Sea during the cruise of National Fisheries Research and Development Institute of Korea in 2008-2010. Samples were filtered for suspended material at two-month interval from the East Sea and three-month interval from the East China Sea. Subsurface samples were collected at the water depths of 20, 50, 70, 100 m by CTD bottle casting. The results of alkenone analysis show that the concentration of total C37 alkenones is generally high in the surface mixed layer, and decreases with depth, indicating that alkenones seem to be produced at or close to the surface mixed layer. Seasonal variation in alkenone concentration shows that the concentration appears to be higher in summer compared to other season, but it is still present in any other season. (Abstract ID 12210)

Lee, K. R., Remote Sensing Center at the Naval Postgraduate School, Monterey, USA, krlee@nps.edu
 Olsen, R. C., Remote Sensing Center at the Naval Postgraduate School, Monterey, USA, olsen@nps.edu
 Kruse, F. A., Remote Sensing Center at the Naval Postgraduate School, Monterey, USA, fakruse@nps.edu

USING WORLDVIEW-2 IMAGERY ACQUIRED AT MULTIPLE ANGLES TO DETERMINE OCEAN DEPTH NEAR OAHU, HAWAII

Multispectral imaging (MSI) data acquired at different view angles provide an analyst with a unique view into shallow water. Observations from DigitalGlobe's WorldView-2 (WV-2) sensor, acquired in 39 images in one orbital pass on 30 July 2011, will be analyzed for bathymetry data taken from along the windward side of the Oahu coastline. Satellite azimuth and elevation range from 18.8 to 185.8 degrees and 24.9 to 77.8 degrees (respectively). WV-2's eight multispectral bands provide depth information (especially using the Blue, Green, and Yellow bands), bottom type, and surface glint (using the Red and NIR bands). Bathymetric analysis from the optical data are compared to LIDAR-derived bathymetry. This work should show the impact of varying view angle on inferred bathymetry. (Abstract ID 12345)

Lee, M. A., National Taiwan Ocean University, Keelung, Taiwan ROC, malee@mail.ntou.edu.tw
 Chen, W. Y., National Taiwan Ocean University, Keelung, Taiwan ROC
 Chen, Y. K., Taiwan Fishery Research Institute, Keelung, Taiwan ROC
 Lo, N., Southwest Fisheries Science Center, La Jolla, USA
 Liu, D. C., Taiwan Fishery Research Institute, Keelung, Taiwan ROC

THE SUMMER ASSEMBLAGE OF LARVAL FISHES IN THE WATERS OF EAST CHINA SEA SHELF AND TAIWAN IN 2007

This study investigates the assemblage of larval fish and its relationship with hydrographic features in the East China Sea and waters surrounding Taiwan in the summer 2007. The survey were conducted on 1-11 July 2007 by LORECS with 30 stations in the southern East China Sea and on 4-16 July 2007 by TaiCOFI (Taiwan Cooperative Oceanic and Fisheries Investigation) with 32 stations in the seas around Taiwan. A total of 12,670 larval fishes belonging to 94 families and 108 taxa were identified. Engraulidae, Gobiidae and Sillaginidae were the three most abundant families and accounted, respectively, for 56.82, 9.24 and 6.67% of the total specimens numerically. Among these taxa, *Engraulis japonicus* and *Sillago japonica* were the two most dominant species and accounted for 56.15 and 6.66 % of the total specimens in number, respectively. According to the dendrogram derived from cluster analysis of fish larvae and hydrographic features, the larval assemblages of 51 sampling stations were divided into three groups: A (Kuroshio assemblage), B (coastal assemblage, further divided into two subgroups B1 and B2), and C (Taiwan water current assemblage). The dominant species were *Diaphus* B group, *Bregmaceros* spp., and lutjanid species for group A, *Engraulis japonicus*, *Sillago japonica*, and *Cynoglossus* spp. for group B1, Gobiid Type 2 species, *Engraulis japonicus*,

and *Bregmaceros* spp. for group B2, and *Auxis* spp., sciaenid species, and gobiid Type 1 species for group C. (Abstract ID 9808)

Lee, R. E., Skidaway Institute of Oceanography, Savannah, USA, dick.lee@skio.usg.edu
 Paffenhoefer, G. A., Skidaway Institute of Oceanography, Savannah, USA, gustav.paffenhoefer@skio.usg.edu
 Koester, M., Skidaway Institute of Oceanography, Savannah, USA, koesterm@uni-grietswald.de

OIL DROPLETS IN FECAL PELLETS OF DOLIOLIDS AFTER UPTAKE OF DISPERSED OIL

After an oil spill off Nova Scotia, Conover (1971) found copepods with particulate oil and calculated that as much as 10% of the oil particulates were associated with copepods and their feces. In the present work we used light field and fluorescence microscopy to determine if oil droplets were in doliolids (*Doliolletta gegenbauri*) and their fecal pellets after exposure to dispersed oil droplets. The dispersed oil droplets, formed by mixing dispersant with crude oil, varied in size from 2 to 30 μm with exposure concentrations ranging from between 2000 to 35,000 droplets/ml. After exposure for 4 hours the stomach of the doliolids showed the presence of many oil droplets followed by discharge of fecal pellets with an abundance of oil droplets. Uptake of oil droplets only took place if food (mixture of diatoms and small flagellates) was available to the doliolids. Oil concentrations in the doliolids and their fecal pellets (based on droplet volumes, droplet counts and oil density) ranged from 0.08 to 0.20 $\mu\text{g/doliolid}$ and 0.1 to 0.15 $\mu\text{g/fecal pellet}$. (Abstract ID 9331)

Lee, T. S., Oregon State University, Newport, USA, leetim@onid.orst.edu
 Henkel, S. K., Oregon State University, Newport, USA, sarah.henkel@oregonstate.edu

FINDING APPROPRIATE ABIOTIC PARAMETERS TO EVALUATE BENTHIC MACROINVERTEBRATE ASSEMBLAGES IN TEMPERATE CONTINENTAL SHELF WATERS

Continental shelf waters of the northeastern Pacific host an array of benthic macroinvertebrates that are heterogeneously distributed across a diversity of habitats. Habitats of continental shelf waters can be described based on depth, relief, and grain size. Our objective was to characterize macroinvertebrate assemblages and their habitat associations in these shelf waters that have not been surveyed for benthic invertebrate communities. Video observations were made on the continental shelf margin using a submersible at three sites in the mid 1990s and an ROV at two sites in 2011. We performed Correspondence Analysis (CA) to map associations between 59 invertebrate species and 15 habitats along ordination planes with weighted scores. We also used Nonmetric Multidimensional Scaling (nMDS) to compare similarity among sampled sites and different habitats based on macroinvertebrate density patterns across different habitat substrata. Our CA and nMDS results showed that primary grain size was a stronger indicator of different macroinvertebrate assemblages than the amount of relief. Using Canonical Correspondence Analysis, we will evaluate correlations between changing invertebrate densities and other abiotic parameters after taking different geographic latitudes into consideration. (Abstract ID 9730)

Lee, T., Jet Propulsion Laboratory, Pasadena, USA, Tong.Lee@jpl.nasa.gov
 Boening, C., Jet Propulsion Laboratory, Pasadena, USA

EXTREME OCEANIC AND ATMOSPHERIC ANOMALIES IN THE SOUTH PACIFIC AND WESTERN ANTARCTICA ASSOCIATED WITH THE 2009-10 EL NINO

Satellite, in-situ measurements, and reanalysis products are used to document the evolution of extreme oceanic and atmospheric anomalies in the South Pacific and western Antarctica during late 2009 to early 2010. During this period, a record warming occurred in the mid-latitude South Pacific and western Antarctica. The South-Pacific warming, confined to the mixed layer, occupied an area the size of Australia with the sea surface temperature (SST) anomaly exceeding five times the standard deviation of SST variability in that area. It was also substantially larger than the tropical SST anomaly associated with the concurrent El Nino. A record increase in ocean bottom pressure (OBP) and sea level was also observed in the southeast Pacific. These anomalies were associated with an extremely strong and persistent anticyclone over the southeast Pacific and western Antarctica. A mixed-layer heat budget analysis and barotropic vorticity analysis were performed to explain the physical processes that cause the SST and OBP anomalies. Our analysis suggests that the extreme atmospheric and oceanic conditions in the South Pacific may have been amplified by the 2009-10 central-Pacific El Nino. (Abstract ID 10489)

Lee, Z., University of Massachusetts Boston, Boston, USA, zhongping.lee@umb.edu
 Arnone, R., Naval Research Laboratory, Stennis Space Center, USA, bob.arnone@nrlssc.navy.mil
 Ahn, Y., Korea Ocean Research & Development Institute, Ansan, Republic Of Korea, yhahn@kordi.re.kr
 Davis, C., Oregon State University, Corvallis, USA, cdavis@coas.oregonstate.edu
 Ma, R., Nanjing Institute of Geography and Limnology, Nanjing, USA, rhma@niglas.ac.cn