[2]CCAR/University of Colorado, Dept. of Aerospace Engineering Sciences, Boulder 80309-0431, United States

The Gulf of Mexico is a semi-enclosed sea with two connections: one with the Caribbean Sea trough the Yucatan Channel and the other with the Atlantic Ocean through the Florida Straits. There is a significant difference between the sill depths at both connections, 2040m and 730m respectively, which implies that the only entry or exit of waters deeper than 730m, should only take place through the Yucatan Channel. This characteristic permits a division of the waters from the Gulf of Mexico into two layers, with the lower layer from the bottom up to the Florida sill and the upper layer from that depth to the surface. Although the Gulf of Mexico water volume remains almost constant, the variations of the volume of each layer may be significant. These volume anomalies may be estimated using altimeter data because sea surface topography is a reduced mirror-image of the interface topography between water layers. On the other hand, changes in the water volume of the lower layer must be reflected in the deep transports through the Yucatan Channel. These transports were computed from the data of eight moorings of ADCPs, current meters and thermometers deployed across the Yucatan Channel from September 8th 1999 to June 17th 2000 (10 months). The correlation coefficient between the volume anomaly in the Gulf of Mexico (which is proportional to the lower and upper layer volume) and the deep transports in Yucatan is r=0.68 (0.34<r<0.86 at 80% of confidence). During the measurement period, the mean deep transport at the Yucatan Channel was approximately -0.8 Sv, which implies that the volume of the lower layer was reduced. The series suggest that fluctuations between the volumes of the layers also occur at very low frequencies, on the order of several months or years.

OS42G-174 1330h POSTER

Major Changes in the Mediterranean Surface Circulation From Seven Years of TOPEX-Poseidon and ERS1/2 Altimetry

Gilles Larnicol[1] (+33 5 61 39 47 53; gilles.larnicol@cls.fr)

Nadia K Ayoub[2] (+33 5 61 33 29 24; nadia.ayoub@cnes.fr)

Pierre-Yves Le Traon[1] (+33 5 61 39 47 58; Pierre-Yves.Letraon@cls.fr)

[1]CLS - Space Oceanography Division, 8-10 rue Hermes Parc Technologique du Canal, Ramonville 31526, France

[2]LEGOS/CNRS, 18 avenue Edouard Belin, Toulouse 31401, France

Combined maps of TOPEX/Poseidon and ERS1/2 altimeters data are used to describe the surface circulation variability in the Mediterranean Sea over the period 1993-1999. We focus on seasonal and interannual changes at basin and sub-basin scales. The strongest signals are found in the Eastern basin. In the Ionian Sea, an intensification of the cyclonic circulation in the northern and central regions is observed since 1997. In the Cretan Sea, the Ierapetra anticyclone exhibits a clear seasonal cycle with an intensification in summer, between 1993 and 1995. After 1995, large anticyclones develop in the southern part of the Levantine basin whereas the Ierapetra eddy is not clearly detected. We suggest that the observed small-scale variability in the Levantine Sea is linked to the meandering path of the Mid-Mediterranean Jet while the cyclonic signal in the Ionian indicates a shift to the south of the Ionian Stream.

OS42G-175 1330h POSTER

Numerical Study of Interanual Climatic Variability of H_2S zone in the Black Sea

Dimitur I Trukhchev[1] (359-52-774183; truhi@io-bas.bg)

Detelina P Ivanova[2] (831- 656 3226; dpivanov@nps.navy.mil)

Denis V Ivanov[1]

[1]Department of Marine Physics, Institute of Oceanology, Bulgarian Academy of Sciences, P.O. Box 152, Varna 9000, Bulgaria

[2]Department of Oceanography, Naval Postgraduate School, 833 Dyer Road, Monterey, CA 93943, United States

A 3-D coupled hydrodynamical and chemical model are implemented to study the interanual climatic variability of Oxic/Anoxic layers in the Black Sea. The hydrodynamical model consists of 3-DPE of ocean hydrothermo-dynamics and uses Richardson number dependent parameterization of vertical turbulent mixing and nonlinear horizontal mixing. A 3-D two-component chemical model including both oxygen and hydrogen sulfide is considered for investigation. The interaction between O_2 and H_2S is parameterized with a kinetic reaction of second order. Two historical climatic data archives comprising a significant number of observations from 30-ies (O_2) and 60-ies (H_2S) till 1986 are used for model initialization and validation. The main aim of the study is to achieve better understanding of the role of physical mechanisms as basin circulation from different scales, specifics of the stratification, termohaline structure, vertical mixing on the dynamics of the anoxic zone. Numerical simulations are conducted to examine various kind of hypotheses about H_2S production and origin. The results reveal strong seasonal variability of the oxygen and hydrogen sulphide distributions.

OS42G-176 1330h POSTER

Generation of translating Somali Current rings during the southwest monsoon

David M Fratantoni[1] (508-289-2908; dfratantoni@whoi.edu)

Deborah A Glickson[1] (508-289-3636; dglickson@whoi.edu)

Amy S Bower[1] (508-289-2781; abower@whoi.edu)

[1]Woods Hole Oceanographic Institution, Physical Oceanography Dept, MS21, Woods Hole, MA 02543, United States

During the southwest monsoon a portion of the Somali Current accelerates as it squeezes through the 1000 m deep passage between the Socotra shelf and the Somali peninsula. Recent observations using SeaWiFS ocean color imagery and TOPEX/Poseidon altimetry indicate the occasional formation of westward-translating anticyclonic current rings from this accelerated offshoot of the Somali Current. The rings are comparable in overall diameter to the width of the Gulf of Aden (220 km) and move westward into the Gulf following formation. Southwestward-traveling cyclonic features are evident along the Omani coast north of the Gulf of Aden during the same period. We will summarize four years of remote observations of mesoscale features near the mouth of the Gulf of Aden and contrast them with rings observed using a similar methodology in the western low-latitude Atlantic.

OS42H HC: Hall III Thursday 1330h

Phytoplankton Distribution and Physiology

Presiding: **V Franck,** Marine Science Institute

OS42H-177 1330h POSTER

Non-indigenous phytoplankton in the Great Lakes: NOBOBs ships as potential vectors

Gary Fahnenstiel[1] (231-759-7824; fahnenstiel@glerl.noaa.gov); Ying Hong[1] (231-759-7824; hong@glerl.noaa.gov); Dave reid[2] (734-741-2235; reid@glerl.noaa.gov); Tom Johengen[3] (johengen@umich.edu); Hugh MacIsaac[4] (hughm@uw.ca); Fred Dobbs[5] (dobbs@glerl.noaa.gov); Greg Ruiz[6] (ruiz@serc.si.edu)

[1]LMFS/GLERL/NOAA, 1431 Beach St, Muskegon, MI 49441, United States

[2]GLERL, NOAA, Ann Arbor, MI 48105, United States

[3]CILER, Univ. Michigan, Ann Arbor, MI 48109, United States

[4]Dept. Biology, Univ. Windsor, Windsor, On, Canada

[5]Dept. Biol., Univ. Windsor, Norfolk, VA, United States

[6]Smithsonian Environmental Research Center, Smithsonian Institute, Edgewater, MA, United States

The discharge of ballast water from ships entering the Great Lakes has been a significant source of non-indigenous species to the Great Lakes. In the past few years the majority of ships entering the Great Lakes have been in the NOBOB (no ballast water on board) status. During this past year 17 international ships in NOBOB status were sampled at ports in the Great Lakes. Sampling consisted of collected water and sediment (if possible) from empty tanks on each ship. These water/sediment samples were then analyzed for presence of live phytoplankton and resting stages (cysts, spores, etc.). Also, germination experiments were conducted. These germination experiments consisted of small water/sediment inocula placed in five different types of growth media; Guillard's seawater media, Guillard's freshwater media, modified WC freshwater media, filtered Lake Michigan water and filtered Grand River water . In all 17 ships, phytoplankton resting stages were found in water/sediment samples. Moreover, in all 17 ships phytoplankton were able to germinate and grow from at least one experimental treatment. These results suggest that NOBOBs ships are a potential vector for the introduction of non-indigenous species into the Great Lakes.

OS42H-178 1330h POSTER

The Effects of Hypersaline Conditions on Phytoplankton Primary Productivity, Biomass, and Community Composition in a Semi-tropical Coastal Wetland

Elizabeth M Fejes[1] ((979)847-9328; fejese@neo.tamu.edu); Yesim Buyukates[1] (y0b0855@labs.tamu.edu); Justin Murdock[1] (jmurdock@neo.tamu.edu); James L Heilman[2] (j-heilman@tamu.edu); Kevin McInnes[2] (k-mcinnes@tamu.edu); Daniel L Roelke[1] (droelke@tamu.edu)

[1]Wildlife and Fisheries Sciences , 2258 TAMUS, College Station, TX 77843-2258, United States

[2]Soil and Crop Sciences, 2474 TAMUS, College Station, TX 77843-2474, United States

In the light of increasing atmospheric CO_2 concentrations, it is necessary to improve our understanding of the role of wetlands in the global carbon cycle, e.g., how carbon source-sink relationships and primary productivity are altered in response to environmental change. The upper Nueces Delta, northwest of Corpus Christi, Texas, frequently experiences wet winters where salt concentrations in the wetlands are diluted. Summers are hot and often suffer from drought that leads to hypersaline conditions. Preliminary results from three sampling trips (30 May, 6 June, and 13 June 2001) indicate that water column primary productivity and standing biomass were drastically reduced after a critical salinity concentration was reached, negatively affecting the ability of the wetland's phytoplankton to produce labile organic carbon. Salinities during these trips were 190 ppt, 220 ppt, and 300 ppt respectively, and mid-day water temperatures ranged from 35°C to 39°C. A traditional light-dark bottle method was used to measure water column primary productivity at eight stations within the wetland. Average gross water column primary productivity among the stations was 122 mg-C m^{-3} hr^{-1} on 30 May, but was undetectable for 6 June and 13 June. Chlorophyll *a* data, averaging 15 mg L^{-1} for 30 May, 1.2 mg L^{-1} for 6 June, and 0.96 mg L^{-1} for 13 June, also showed a notable reduction after 30 May. The community composition, initially dominated by large diatoms, cyanobacteria filaments, and picoplankton, gave way to a community dominated by picoplankton, then dominated by cyanobacteria filaments. Inorganic nutrients generally showed a non-conservative increase in concentration suggesting a source from the dying phytoplankton. Preliminary examination showed a zooplankton community comprised mainly of the protozoa. Bacteria concentrations increased from 30 May to 6 June, potentially following a phytoplankton die-off that might have released a large pulse of labile organic carbon, and then dramatically decreased from 6 June to 13 June. Higher trophic levels including fish and invertebrates are virtually absent from this system. Future studies will include quantification of total CO_2 exchange at the ecosystem level, and benthic and emergent plant primary productivity.

OS42H-179 1330h POSTER

Phytoplankton Spatial Distribution Across a Tortugas Eddy, May 1999.

Gary Hitchcock[1] (ghitchcock@rsmas.miami.edu)

Tom Lee[1] (tlee@rsmas.miami.edu)

Peter Ortner[2] (Peter.Ortner@noaa.gov)

Christopher Kelble[1] (ckelble@rsmas.miami.edu)

[1]University of Miami/RSMAS, 4600 Rickenbacker Cswy., Miami, FL 33149, United States

[2]NOAA/AOML/OCD, 4301 Rickenbacker Cswy., Miami, FL 33149, United States

Large cyclonic eddies are dominant mesoscale features in the Florida Current system that play an important role in larval recruitment to the Florida Reef Track. Mesoscale cyclonic eddies, such as the Tortugas eddies, also influence phytoplankton productivity through eddy pumping and thereby potentially affect

pelagic ecosystem structure in surface waters of the Florida Current. In May 1999 we surveyed phytoplankton chlorophyll and inorganic nutrient distributions in relation to the density structure of a large Tortugas eddy as it translated east through the Southern Straits of Florida. The 20° isotherm shoaled from a depth of ca. 100 meters at the seaward edge of the eddy to 70 meters at the eddy center. This isotherm structure also defined the eddy dimensions at 110 km in the alongshore direction (NE-SW) and 50 km offshore (NW-SE). Concurrent SST imagery, in contrast, depicted a thermal front extending over > 200 km along the coast. Chlorophyll *a* profiles along a transect crossing eddy center show surface pigments were typically low for Florida Current waters (< 0.1 mg m^{-3}), with a distinct subsurface maximum (SCM). The SCM was dominated by the picoplankton size fraction, and shoaled from > 90 meters at the eddy edge to 70 meters at the eddy center. The SCM coincided with the upper pycnocline-nutricline, which shoaled into the lower euphotic zone at the eddy center. Although chlorophyll concentrations in the SCM increased from 0.4 to 1.0 mg m^{-3} between the nearshore edge and center of the eddy, the depth integrated pigment biomass over the upper 100 meters varied by less than 2-fold (18 to 30 mg m^{-2}). The eddy dynamics likely influenced the water column primary production through the shoaling of the nutrilcine, and through an increase in chlorophyll a concentration within the SCM.

OS42H-180 1330h POSTER

Optical properties and size scaling of phytoplankton under a diel cycle

Nobuaki Ohi[1] (+81-426-91-8045; nooi@edu.t.soka.ac.jp)

Yuki Ishiwata[1] (+81-426-91-8045; yishiwat@hotmail.com)

Satoru Taguchi[1] (+81-426-91-8045; staguchi@t.soka.ac.jp)

[1]Soka University, 1-236 Tangi-cho, Hatiouji 192-8577, Japan

The exponential relationship between growth rate and cell volume of Isochrysis galbana was determined under diel cycle of two different light regimes. Significant but two distinctly different relations were obtained for each light regime. Model for growth rate based on quantum yield, chlorophyll a: carbon ratio, chlorophyll a specific absorption coefficient, and irradiance was tested to interpret those different relations. Significantly different relations were obtained due to variation in both chlorophyll a specific absorption coefficient and cell volume caused by light levels. Consequently diel variability in growth rate could be explained by chlorophyll a specific absorption coefficient and cell volume.

OS42H-181 1330h POSTER

A Comparison of Variable Fluorescence Measurements by a Fast Repetition Rate Fluorometer and a Pulse Amplitude Modulated Fluorometer

Jessica K Nolan[1] (jnolan@ucsd.edu)

Elizabeth R Frame[1] (eframe@ucsd.edu)

B Greg Mitchell[1] (gmitchell@ucsd.edu)

[1]Scripps Institution of Oceanography, 9500 Gilman Drive, Mail Code 0218, La Jolla, CA 92039-0218, United States

The use of variable fluorescence techniques in phytoplankton research has recently increased. Commercial instruments have become available that allow oceanographers to non-invasively estimate the maximum quantum yield for photosystem II (Fv/Fm). These instruments monitor changes in phytoplankton fluorescence in response to saturating flashes of actinic light. Two commonly used instruments, a Chelsea Fastracka Fast Repetition Rate Fluorometer (FRRF) and a Walz Pulse Amplitude Modulated (PAM) Fluorometer, employ different illumination protocols to measure variable fluorescence. The FRRF utilizes a single turnover protocol with saturating flashes lasting on the order of microseconds, while the PAM fluorometer utilizes a multiple turnover protocol with flashes lasting on the order of milliseconds.

The purpose of this poster is to compare measurements of Fv/Fm obtained using a Fastracka FRRF and a Xenon-PAM fluorometer and to discuss issues with both variable fluorescence protocols. Results from a number of phytoplankton taxa will be presented, including cyanobacteria, dinoflagellates, diatoms, prymnesiophytes, chlorophytes, and pelagophytes. For several species, the environmental factors under which the phytoplankton were grown were varied. Comparisons such as these are essential to successfully interpret variable fluorescence data collected with different protocols.

OS42H-182 1330h POSTER

Size-Fractionated Silicon and Nitrate Uptake Rates from Low- and High-Iron Regions

Valerie Franck[1] (805-893-7061; franck@lifesci.ucsb.edu)

Geoffrey Smith[2] (831-459-2682; geosmit@cats.ucsc.edu)

Ken Bruland[2] (831-459-4587; bruland@cats.ucsc.edu)

Mark Brzezinski[1] (805-893-8605; brzezins@lifesci.ucsb.edu)

[1]Marine Science Institute, University of California Santa Barbara, Santa Barbara, CA 93106, United States

[2]Institute of Marine Sciences, University of California Santa Cruz, 1156 High St., Santa Cruz, CA 95064, United States

Here we compare silicon and nitrate uptake rates in the in the 0.7-5 μm and >5 μm size fractions from two upwelling regions: a high-Fe region in Monterey Bay off the coast of California (USA) Bay, and low-Fe regions in the eastern equatorial Pacific off the coasts of Costa Rica and Peru. Uptake rates were measured in surface waters using the tracers ^{15}N and ^{32}Si. As far as we know, this is the first study to document size-fractionated silicon uptake rates in marine waters.

In the Monterey Bay study, silicon and nitrate uptake rates were measured at 11-13 locations in April 2000. At all but one of these locations, cells in the >5 μm fraction were responsible for 82-97% of total silicon uptake; at the remaining station, cells in the larger fraction were responsible for 42% of total silicon uptake. Nitrate uptake in cells >5 μm varied from 75-89% of total nitrate uptake at all locations in this study. In the eastern equatorial Pacific, uptake rates were measured at three locations in August 2000, both before and after Fe addition. Silicon uptake in the >5 μm size fraction varied from 97-98% total silicon uptake and this proportion did not change after a 2nM Fe addition.

OS42H-183 1330h POSTER

Short-term iron acquisition rates among group-specific phytoplankton: studies in HNLC waters of the subtropical Pacific Ocean and the laboratory

Charles G Trick[1] (519-661-3899; trick@uwo.ca)

Rich Weaver[2] (rweaver@udel.edu)

Dave Hutchins[2] (dahutch@udel.edu)

Steve Wilhelm[3] (wilhelm@utk.edu)

[1]The University of Western Ontario, Department of Plant Sciences, London, ON N6A 5B7, Canada

[2]University of Delaware, School of Marine Science, Lewes, DE, United States

[3]University of Tennessee, Department of Microbiology, Knoxville, TN, United States

Studies in HNLC waters of the Equatorial Pacific suggest that increased Fe availability results in an increase in phytoplankton biomass. To more closely examine this, we monitored the response of individual groups of phytoplankton (large eukaryotes, picoeukaryotes and cyanobacteria) to small additions and reductions in available Fe (+0.5 to +2.5 nM Fe, and -1.0 to -5.0 nM Fe via addition of the fungal siderophore desferrioxamine-B) in regions along the coast of Peru where Fe concentrations are less than 100 pM. While bulk measurements of chlorophyll demonstrated an increase in biomass in +Fe treatments, flow cytometric analysis demonstrated that this was due to increases in the abundance of iron-starved large eukaryotes (to ca 180% ambient). In contrast, picoeukaryotes increased cell abundance with decreasing Fe availability (ca 167%), although chlorophyll per cell responded in an inverse manner. In a series of short-term iron uptake experiments we examined whether the increase in biomass is consistent with, and possibly predicted from, short-term iron uptake rates or whether the resulting community develops due to a change in the iron chemistry, and a modified iron availability, during the short-term (3-day) grow out experiments.

OS42H-184 1330h POSTER

Nonlinear Modelling of the Coupling Between Carbon and Nitrogen Pathway During Phytoplankton Growth. Validation With Chemostat Experiments on Rhodomonas Salina

Lionel Pawlowski[1] (33-4-93-76-38-50; pawlowski@obs-vlfr.fr)

Olivier Bernard[2] (33-4-92-38-77-85; obernard@inria.sophia.fr)

Emilie Le Floc'h[1] (33-4-93-76-38-50; lefloch@obs-vlfr.fr)

Antoine Sciandra[1] (33-4-93-76-38-19; sciandra@obs-vlfr.fr)

[1]LOV, CNRS/UPMC/OSU, UMR7093, Station Zoologique, La Darse, B.P. 28, Villefranche sur mer 06230, France

[2]INRIA, Projet COMORE, 2004, route des Lucioles, B.P. 93, Sophia-Antipolis 06902, France

We propose a nonlinear model to describe the light- and nitrate-limited phytoplankton growth. The model incorporates the nonlinear coupling between carbon and nitrogen metabolic pathways. Its complexity (4 variables and 8 parameters) remains compatible with mesoscale carbon flux computations, and guarantees that it can be incorporated in 3-D NPZ models.

The model, based on mass balances, has been validated in two steps. First its qualitative behaviour has been studied independently from the parameter values. Then, the qualitative responses of computed steady states to an increase of light and/or dilution rate have been compared to experimental observations. The study has also been reinforced by the trend analysis for ratios between nitrogen, carbon and chlorophyll. The model revealed to be qualitatively in agreement with the data. The parameter values have then been identified by subsets, on the basis of the experimental steady input-output behaviour which provides linear regressions. In a last step the model has been quantitatively validated using dynamical chemostat experiments performed with Rhodomonas salina simultaneously limited by light and nitrate in a computer controlled culturing device.

OS42H-185 1330h POSTER

Exocytosis in Phaeocystis: the Role of the Secretory Granule in Signal Transduction.

Ivan Quesada[1] (206 - 543-1484; ivanq@u.washington.edu)

Wei-Chun Chin[2] (850-410-6578; wchin@eng.fsu.edu)

Pedro Verdugo[1] (206 - 543-1484; verdugo@u.washington.edu)

[1]University of Washington, Biocomplexity Program Friday Harbor Labs, Box 351812, Friday Harbor, WA 98250, United States

[2]Florida State University, Department of Chemical Enviromental Engineering, Tallahassee, FL 32310, United States

Half of the total photosynthetic activity of our planet takes place in the ocean. Phytoplankton plays a major role as a sink of atmospheric CO2. Phytoplankton yields massive releases of dissolved polymers and polymer-gels (mucilage), which are the main sources of organic carbon in seawater. The Prymnesiophyte Phaeocystis ranks as one of the most active photosynthetic agent. However, despite the critical role of Phaeocystis as a sink of atmospheric CO2, the cellular mechanism whereby this massive amount of material is released to the seawater remains poorly understood. Previous studies show that Phaeocystis functions as a typical secretory cell: Its secretory material is stored in condensed phase inside membrane bound vesicles, and product release takes place via a classic exocytic process. Exocytosis is triggered by blue light stimulation and is coupled by a characteristic intracellular Ca2+ signal. However, the signal transduction process that control exocytosis in Phaeocystis remains unknown. Here we demonstrate that Phaeocystis secretory granules can function as intracellular Ca2+ oscillators. Oscillations and release of Ca2+ from the granule to the cytosol is triggered by the intracellular messenger IP3. Ca2+ release results in the transport and docking of granules to the cell membrane, and the exocytic release of granular content to the seawater. (Supported by NSF Bioengineering Biocomplexity Program)

OS42H-186 1330h POSTER

The Distribution and Abundance of Mycosporine-Like Amino Acids in Coastal and Open Ocean Environments off Central California

Jill J. Baltan[1] (1-510-763-4906; jillbaltan@hotmail.com)

Nicholas A. Welschmeyer[1] (1-831-632-4439; Welschmeyer@mlml.calstate.edu)

[1]Moss Landing Marine Laboratories, 8272 Moss Landing Rd., Moss Landing, CA 95039, United States

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Mycosporine-like amino acid (MAA) distributions associated with phytoplankton communities in temperate and subtropical environments were studied in the eastern Pacific Ocean. One winter cruise (Navo 1, February 1997) and two summer cruises (Navo 10, September 1997 and GRZ, September 1998) were conducted along a transect that originated in Monterey Bay, California. Two cruises extended 280 km offshore (NAVO 1 and NAVO 10) and the other extended 3800 km offshore (GRZ). The relationship between particulate ultraviolet (UV) light absorption and MAA concentrations was examined, and physical and biological data were correlated with the MAAs to assess what factors may determine MAA distribution and abundance. Results showed that MAAs accounted for approximately 67% of the variability in particulate UV absorption in the upper mixed layer, where detrital particles were low relative to phytoplankton biomass. The relationship between MAA and UV absorption deteriorated below the mixed layer, where UV absorbance by detrital material increased. There was a high conservation in MAA content, both in the occurrence of individual MAAs and in their proportions. Mycosporine-glycine, shinorine and porphyra 334 comprised 75% of the total MAA standing crop at 20 of 26 sites. Mycosporine glycine was consistently the most abundant MAA, constituting at least 50% of the total MAAs at 75% of the sites sampled. MAA concentrations were highest within the upper mixed layer at all stations and decreased below the limit of detection below the mixed layer. The lowest MAA concentrations were observed during the winter cruise, where reduced irradiance and deepened mixed layers presumably reduced MAA synthesis. At most sites (19 of 26 stations) MAA distributions revealed vertical concentration gradients through the mixed layer even though chlorophyll was vertically homogenous and temperature was isothermal. Thus, the field data suggest that MAA synthesis and/or degradation rates potentially meet or exceed the vertical mixing rate. The results support the notion that MAAs provide a protective function for phytoplankton in the upper ocean.

OS42H-187 1330h POSTER

The Dynamic Green Ocean Model, Phase 1: Coccolithophorids in an Ocean Global Circulation Model.

Erik T Buitenhuis[1] (+49-3641-686735; martinburo@email.com)

Olivier Aumont[2] (+33-1-44275012; aumont@lodyc.jussieu.fr)

Corinne Le Quéré[1] (+49-3641-686722; cquere@bgc-jena.mpg.de)

[1]Max Planck Institute for Biogeochemistry, PO box 100164, Jena D 07745, Germany

[2]Laboratoire d'Oceanographie Dynamique et de Climatologie, T26-E6, Universite Paris VI 4 Place Jussieu, Paris cedex 05 75252, France

The recently started Dynamic Green Ocean Project aims at representing the complexity of biogeochemical fluxes from 5 major phytoplankton groups into a General Circulation Model. This project is analogous to the inclusion of plant functional types in models of land biology. The Dynamic Green Ocean Model is developed in collaboration with a group of scientists worldwide (http://www.bgc-jena.mpg.de/bgc_prentice/projects/green_ocean/start.html). The basis for this project is the PISCES ocean biogeochemistry model (Aumont et al. in preparation), which includes the potentially limiting nutrients PO_4^{3-}, Fe and SiO_3^-, in colimitation with light. Current plankton groups are diatoms, nanophytoplankton, micro- and mesozooplankton. Here, we report on preliminary results of introducing coccolithophorids as a third phytoplankton group. We present results of coccolithophorid specific behaviour, and a sensitivity analysis of those factors that are generally considered to favour coccolithophorids. We compare our results to observations of the mean, and of the seasonal and interannual variability of coccolithophorid abundance, and to open ocean alkalinity budgets.

OS42H-188 1330h POSTER

Si Cycle in the North Eastern Atlantic During the POMME Experiment (March-April 2001), Evidences of Co-Limitation of Phytoplankton Growth by the Availibility of Silicon, Iron and Other Nutrients.

Karine LEBLANC[1] (33-4-91-82-92-05; leblanc@com.univ-mrs.fr)

Bernard QUEGUINER[1]

Stéphane BLAIN[2]

Cécile GUIEU[3]

[1]LOB UMR CNRS 6535, Campus de Luminy, Case 901, Marseille 13288, France

[2]LEMAR UMR CNRS 6539, Place Nicolas Copernic, Plouzané 29280, France

[3]LOV CNRS UMR 7093, Observatoire Océanologique de Villefranche-sur-mer, B.P.08, Villefranche-sur-mer 06238, France

Phytoplankton Si uptake rates have been measured in March and April 2001 in the northeastern Atlantic as part of the POMME (Progamme Océean Multidisciplinaire Méso Echelle) project which addressed the mesoscale phytoplankton dynamics between the Azores Islands and Portugal (39-44°N, 17-21°W) during two cruises conducted in March and April 2001. At 4 long-term stations, Si uptake rates (ρSi) were measured by *in situ* ^{32}Si incubations and kinetic parameters (potential maximum specific uptake rate (V_{max})and half-saturation constant (K_S)) were estimated from on-deck ^{32}Si incubations. The impacts of Fe, Si, N, P and Saharan dust addition on Si uptake rates and siliceous biomass evolution were also assessed by differentially enriched microcosm experiments. At each study site, two kinetic experiments were realized with samples collected at 20 and 40 m depth. 3 kinetics out of 16 could not be fitted by using a Michaelis-Menten relation and exhibited a linear increase of the specific Si uptake rates (VSi) with increasing $Si(OH)_4$ concentrations. V_{max} were always higher at 20 m than at 40 m and ranged between 0.14-0.65 d^{-1} which corresponded to doubling times ranging between 0.2-0.7 doubl.d^{-1}. During the March cruise, under pre-bloom conditions, K_S ranged between 1.8-5.9 μM. In April, during the onset of the spring bloom, K_S were lower, ranging between 0.6 to 1.5 μM. Although falling within the usual range of values found in the literature, K_S were often higher than ambient $Si(OH)_4$ concentrations which is indicative of a potential Si limitation. The potential role of iron availability on Si kinetics was investigated at the southern site. Seawater samples were incubated under clean conditions during 6 days in large volume tanks treated with different iron additions (control, +0.15 nM Fe, +2.5 nM Fe). Addition of iron alone did not significantly modify the K_S values although a slight increase in V_{max} was observed after 4 days under pre-bloom conditions (March cruise). The apparent lack of relationship between iron availability and Si kinetics could however have resulted from the limitation by another essential nutrient. In the second enrichment experiment, large volume samples were incubated for 6 days and received various treatments: addition of iron alone (+Fe), macronutrients (nitrate, phosphate, silicic acid: +N+P+Si), iron and macronutrients (+Fe+N+P+Si), Saharan dust, or deferoxamine mesylate (+DFOB, iron-complexing molecule). We observed different patterns between the study sites but +Fe or +N+P+Si treatments usually resulted in lowered VSi as well as lowered biogenic silica crops as compared to +Fe+N+P+Si or Saharan dust treatments. At one site, addition of Saharan dust resulted in a 16-fold increase of VSi as compared to the control whereas the +Fe+N+P+Si treatment only resulted in a 9-fold increase. Results are indicative of the co-limitation of siliceous phytoplankton by the availability of iron and major nutrients, including silicic acid. Results also confirm the role of Saharan dust events and their potential impact on the phytoplanktonic community structure via fertilization of surface waters with iron and also possibly with other nutrients.

OS42I HC: 323 A Thursday 1330h

Mediation of Benthic-Pelagic Coupling by Life-Cycle Patterns and Vertical Migration

Presiding: **N H Marcus,** Florida State University**; M H Bundy,** Academy of Natural Sciences Estuarine Research Center

OS42I-01 1330h INVITED

Multi-Channel Benthic-Pelagic Coupling in Rocky Intertidal Habitats: Consequences and Generality

Bruce A Menge (541-737-5358; mengeb@bcc.orst.edu)

Oregon State University, Department of Zoology Cordley Hall 3029, Corvallis, OR 97331-2914

Rocky intertidal communities have long served as "model" ecological communities, generating numerous insights and concepts that have enjoyed wide applicability to other aquatic and terrestrial communities. In recent years, our ideas on how such systems are structured has shifted from a predominantly "top-down" perspective, where consumer-prey interactions were emphasized as the primary determinants of structure, to a coupled "top-down/bottom-up" perspective, where top-down effects are considered a consequence of variation in processes operating at the base of the food chain, such as nutrients, production, and the supply of propagules. This shift in perspective was a response to efforts to examine the dynamics of rocky intertidal communities at larger spatial scales, and to the realization that significant "meso-scale" (10's to 100's of km) variation in oceanographic conditions in the inner shelf was likely to have major ecological consequences. Oceanographic processes impact coastal communities through several "channels," by delivering: nutrients for primary producers, particulates (phytoplankton, zooplankton, detritus) for filter-feeding invertebrates, and propagules ("recruitment") for macrophyte, invertebrate, and fish populations. Earlier research highlighted the potentially important effects of larval transport on populations and communities, and work in the past decade has begun to reveal that nutrient and particulate transport can have striking impacts as well, leading to a "multi-channel model of benthic-pelagic coupling" for shallow hard-bottom marine ecosystems. Current research occurs mostly in upwelling-dominated marine ecosystems and is focused on several issues: determination of the relevant oceanographic transport mechanisms and the differential responses of propagules, particulates and nutrients; evaluation of the relative impacts on community structure of the different channels; identification of the scales of dispersal and the degree of connectedness among communities; determination of the generality of the multi-channel model of benthic-pelagic coupling in space and time; and the application of new insights to issues of human concern, such as the consequences of global climate change, conservation of marine resources, mitigation of habitat destruction, and restoration of exploited marine populations. Future issues include evaluation of the applicability of this model to other marine habitats, such as soft-sediment and subtidal communities; and to non-upwelling ecosystems.

OS42I-02 1400h

Sequential Resuspension of Protists by Accelerating Tidal Flow; Implications for Community Structure in the Benthic Boundary Layer

Jeff Shimeta[1] (717-291-4117; j_shimeta@fandm.edu)

Carl L Amos[2] (Carl.L.Amos@soc.soton.ac.uk)

Stace E Beaulieu[3] (stace@whoi.edu)

Oladipo M Ashiru[1] (om_ashiru@fandm.edu)

[1]Franklin and Marshall College, Box 3003, Lancaster, PA 17604, United States

[2]Southampton Oceanography Centre, Empress Dock, Southampton S014 3ZH, United Kingdom

[3]Woods Hole Oceanographic Institution, Woods Hole Rd, Woods Hole, MA 02543, United States

In-situ flumes and near-bed sampling during tidal flow were used to determine resuspension thresholds of protists and bacteria at a silty, subtidal coastal site. Heterotrophic nanoflagellates, oligotrich ciliates, the diatom Navicula distans, and bacteria resuspended in weak flow (friction velocity $<$ 0.6 cm/s), likely associated with a surficial fluff layer of sediment. Hypotrich ciliates and scuticociliates resuspended in moderate flow (0.8 cm/s), independent of sediment erosion thresholds. Furthermore, cultures of a hypotrich and two scuticociliates isolated from the site displayed species-specific resuspension thresholds in the field. Pigmented nanoflagellates and several other diatoms had the strongest thesholds (0.9-1.6 cm/s), with the diatoms mostly coinciding with bulk sediment erosion. Taxon-specificity of resuspension thresholds may be due to cell size/density, cell behavior, and/or association with sedimentary particles. During acceleration from slack tide to a peak flow of friction velocity 1.3 cm/s, near-bottom cell concentrations were enhanced by factors ranging from 2 to 16, differing among taxa and therefore influencing community structure. During acceleration, the total oligotrichs, hypotrichs, and scuticociliates changed from 75 to 96% of individuals in the ciliate community, and the resuspending diatom taxa changed from 37 to 63% of the pennate cells. Cells deposited again at slack tide, and the zone of this cyclical exchange was approximately from 0.2 cm below to 100 cm above the sediment-water interface. Sequential resuspension suggests that the species makeup of the assemblage exchanging with the water column depends on the maximal bed shear stress occurring during a resuspension event, and thus it should vary with the spring-neap cycle as well as with atmospheric forcing and geographic differences in hydrography.

OS42I-03 1415h

Influence of Turbulence on Settlement of Bivalve Larvae

Iris E. Hendriks[1] (31-113-577491; hendriks@cemo.nioo.knaw.nl)