Important fatty acids common to both species include 16:0, 18:1ω9, 20:5ω3 and 22:6ω3.

In addition to several reproductive traits, lipid investment data from this study reflect the differing habitat niches and life styles of these two hyperbenthic species. Lipid storage patterns of reproductive females also provide evidence that these species are highly dependent on, and closely linked to, the seasonal phytoplankton flux from the pelagic region. In addition, the enormous reproductive investment, particularly in *A. malmgreni*, results in the introduction of lipid-rich juveniles (3 to 4 mg total lipid per juvenile; 80 to 220 juveniles per brood) into the hyperbenthos of Conception Bay during spawning events that span from December to May. These reproductive events potentially represent a significant food source for benthic and pelagic predators in Conception Bay.

OS32M-05 1445h

The Role of Copepods for Conservation of Carbon in Versus Export From the Photic Zone During a Spring Bloom in Disko Bay, Western Greenland

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The spring bloom in Arctic areas generally constitutes the greater part of the annual primary production and holds potential for export of material from the photic zone. Copepods can accelerate export of phytoplankton through production of faecal pellets, which leave the photic zone. In contrast sloppy feeding and leakage from faecal pellets will conserve energy in the photic zone, thereby being important for fueling the microbial food web.

A one month sampling was carried out during the spring bloom in Disko Bay Western Greenland, June 2001. Every third day in situ primary production, bacterial production, copepod biomass, grazing and egg and pellet production were measured. Vertical fluxes of chlorophyll, carbon, pellets and eggs were estimated from short time deployment of sediment traps. Rates of leaking of DOC from feacal pellets and from sloppy feeding for the dominating Calanus species were determined by laboratory experiments.

The data will be used to discuss the role of marine copepods for conservation of carbon in versus export from the photic zone during spring blooms.

OS32M-06 1500h

Benthic Faunal Biomass in the Western Arctic: Linkage to Overlying Water Column Processes

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The ultimate goal of our research is to link patterns of benthic community structure and biomass in the Chukchi and Beaufort seas to associated physical and biological processes that can be identified as key determinants of global change. Benthic organisms integrate elements in the adjacent water column and therefore can be used as indicators of long-term change. We used Geographical Information Systems (GIS) software as a tool to map the biomass and distribution of benthic organisms for comparison to other features (eg. ocean depth, seasonal ice extent, currents, water column chlorophyll, etc.). Benthic data were assembled in an Access relational database and analyzed with the GIS programs ArcView and Arc/Info. A Geostatistical Analyst extension to ArcMap was used to interpolate the data with kriging techniques to produce probability estimates of benthic biomass across the study area. Plotted benthic data reveal areas of high biomass (> 250 g/m^2) north of the Bering Strait in the Chukchi Sea and south of the Bering Strait in Gulf of Anadyr waters. In contrast, benthic biomass along the nearshore Alaskan Beaufort Sea shelf is less than 30 g/m^2 except along the regions of the western Beaufort and east of the Mackenzie River delta. The high benthic biomass in the Bering-Chukchi parallels the abundance of benthic feeding marine mammals in this region compared to the Beaufort Sea. We are conducting further studies to examine the linkages between chlorophyll standing stocks and the productivity of overlying shelf waters with the physical forcing processes that regulate the advection of carbon to these benthic communities.

OS32N HC: 323 B Wednesday 1330h

Biophysical Factors Affecting the Growth and Survival of Aquatic Organisms II

Presiding: **C Hurd,** University of Otago

OS32N-01 1330h INVITED

Seagrass-Induced Transport of Particulate Matter Into Permeable Sediments.

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Water flow plays a fundamental role in seagrass ecology. Most of the work on water flow in seagrass systems has focused on above-ground processes: flux of carbon and nutrients to the leaves, pollination of the flowers, dispersal of the seeds and attenuation of waves and currents by above ground biomass. Due to pressure gradients that develop around seagrass shoots exposed to unidirectional flow, seagrasses can also affect the flux of dissolved and particulate matter between the water column and the permeable sediments they colonize. In a flume experiment, the depth of particle penetration and the number of particles transported from the water column into the seagrass colonized sediments was inversely proportional to particle size. The deepest particle penetration was observed 4 cm upstream of the seagrass shoots where positive pressure causes particles as large as 10 micrometers to penetrate more than 45 mm into the sediment. Blade flapping may also generate pressure gradients that contribute to the transport of particles into the sediment. Seagrasses colonizing permeable sediments, thus, cause particles to be transported into the root zone. This process has the potential to affect the geochemistry of vegetated sediments as well as plant growth.

OS32N-02 1345h

The Role of Instantaneous Turbulent Processes on Broadcast Spawning

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Turbulent flows advect, disperse, and mix any dissolved or suspended quantities of mass (scalars) that are added to the fluid. Benthic invertebrates that utilize broadcast spawning as a reproductive strategy rely on these physical processes to bring released gametes together. This study examines the role of hydrodynamics in the efficiency of the broadcast spawning process (as measured by mean fertilization rates), with an emphasis on how the instantaneous spatial and temporal structure of turbulence might enhance the coalescence of gametes in the flow.

Traditionally, it has been assumed that turbulence acts to inhibit fertilization rates through the rapid dilution of released sperm and ova. This assumption is based on a time-averaged perspective of the turbulent mixing processes. Previous numerical models of broadcast spawning, based on time-averaged models of gamete plumes, result in predicted fertilization rates that are much smaller than those measured in the field. It appears likely that the failure of previous models stems from the fact that these models omit the role of instantaneous hydrodynamic processes.

The instantaneous structure of scalar plumes consists of thin, high-concentration filaments surrounded by regions where the concentration is essentially zero. In a time-averaged sense, this results in low mean concentrations. However, if filaments of sperm and ova should coalesce, high local rates of fertilization would result (based on the product of the overlapping instantaneous concentrations). The time-averaged fertilization rate is not, in general, equal to the product of the time-averaged concentrations. Instead, it is equal to the time-average of the product of the instantaneous concentrations.

This study presents preliminary results which suggest that predictions of mean fertilization rates based on instantaneous processes are significantly higher than those based on mean processes. Hydrodynamic processes that produce statistical coalescence of gamete filaments are identified. The new fertilization rate predictions are likely to be consistent with both the magnitude and temporal variability of the rates measured in the field. Plans for future numerical and experimental investigations of this problem will be discussed.

OS32N-03 1400h

In Situ 3-Dimensional Measurements of the Local Particle Distribution and Turbulence Surrounding Copepods in the Marine Environment

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A submersible holographic system attached to the Johnson Sea Link has recorded about 500 *in situ* holograms of marine particles and organisms in the open ocean (Gulf of Maine, Wilkinson Basin) as deep as 225 meters during horizontal transects and unpowered vertical ascents. The holograms were recorded across bioluminescent thin layers identified by measurements made prior to each dive with a HIDEX bathyphotometer and during each dive with intensified video camera recording of a transect screen. The one liter sample volume of each hologram was located about 1 m above the JSL, between two streamlined fins in order to minimize the disturbance to the sample particle field. The reconstructed field of each hologram provides images with resolution better than 10 microns throughout this volume (3 microns for cylindrical objects). Scanning of each reconstructed field using video microscopy provides the instantaneous three dimensional locations and shapes of the particles in the sample volume. Automated scanning and data analysis procedures have been developed, including methods for spatially filtering the data and eliminating the speckle noise. It takes about 4 hours to analyze a single hologram, a process that distills 35 Gb of image information. The results include focused images of the particles, and measurements of their size, exact location and orientation in space. Classification of the larger, less numerous particles, e.g. distinction between *Calanus finmarchicus* and *Metridia lucens* copepods, is performed manually based on specific features. Smaller particles are classified based on their characteristic shapes. In the holograms recorded during the present study, each reconstructed field typically contains several thousand particles. Analysis of these holograms, which is still in progress, focuses on the distributions of marine snow and fecal pellets, as well as on a comparison of the concentration of 10 - 50 micron particles within the estimated detection range of the calanoid and cyclopoid copepods to that in regions outside this range. Nearest neighbor distances within these classes of particles are derived to quantify the patchiness of the microenvironment. Analyzed double exposure holograms provide a first glimpse of the instantaneous turbulent velocity field surrounding these copepods and their behavior, i.e. swimming velocities and orientation in these fields.

The development of the holocamera and holographic data analysis procedure was sponsored by the National Science Foundation under the Oceanographic Technology Program managed by Larry Clark, under grant OCE-9909170. Funding for the deployment was provided by the Office of Naval Research under the Thin Layers Program managed by Jim Eckman, under contract N00014-00-1-0176.

URL: http://www.me.jhu.edu/~lefd/shc/shc.htm

WED

OS32N-04 1415h

Turbulence Effects on Cold Ocean Microbial Communities: an Enclosure Study

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Recent reports of the effects of small-scale turbulence on plankton communities raise concerns regarding the design of enclosure studies as well as the interpretation and application of their results. Small-scale turbulence has been reported to affect small-scale patchiness, predator-prey encounter rate, rates of particle aggregation/disaggregation and species-specific growth. However, most studies of small-scale turbulence have been conducted under temperate conditions. Cold ocean communities experience much higher viscosity and thus may respond differently than their temperate counterparts. We hypothesize that even at low temperatures turbulence can cause shifts in food-web interactions by promoting grazing on larger organisms within a microbial community, and thus reducing predation on bacteria. We conducted an enclosure study with natural seawater from Logy Bay, Newfoundland to test the possible effects of turbulence on two size-fractionated microbial communities, <20 microns and <200 microns, at an ambient temperature of 0°C within 300L enclosures. Turbulence was generated with a vertical oscillating perforated PVC plunger, rotating at a speed of 0.03 Hz. Analysis is ongoing but preliminary results suggest that the bacteria were least directly affected by the turbulent regimes, as would be expected due to their small size, while heterotrophic nanoflagellate growth and abundance was enhanced. Moreover, total Chl a growth was slightly higher and microzooplankton (i.e. dinoflagellates and ciliates) diversity was greater in the turbulent regime at the end of the incubation period. Therefore, we believe turbulence augments nutrient recycling in cold ocean systems.

OS32N-05 1430h

Micro-scale Patchiness of Zooplankton Organisms in Relation to Turbulent Diffusion

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The study was carried out in Skagerrak, August 2000, between Denmark and Norway. Micro-scale patchiness was investigated by the use of a high-resolution (15 cm) water sampler deployed in two depths strata: in the pycnocline (12 m) and in the chlorophyll a-maximum (25 m). The sampler covers 3 m and is equipped with 20 1.5 l-bottles. Subsamples for chlorophyll a, protozooplankton and copepods were taken from each depth. In the surface layer, phytoplankton was dominated by *Ceratium* spp. and the chlorophyll a-concentration was 2 μg l^{-1}. The deep chlorophyll a-maximum (20 μg l^{-1}) was, on the other hand, dominated by diatoms. The present zooplankton organisms were ciliates, dinoflagellates, copepod nauplii, *Microsetella norvegica*, *Oithona* spp. and calanoid copepods. Vertical profiles of temperature, salinity, density, fluorescence, turbulent- dissipation and diffusion were measured. The lowest turbulent diffusion was measured in association with the pycnocline. Here, a higher patchiness was observed for *Microsetella norvegica* and *Oithona* spp. and calanoid copepods compared to 25-m depth. There was, however, little or no patchiness of protozooplankton and copepod nauplii at both sampling depths. The talk will discuss the importance of swimming abilities of the different organisms versus turbulent diffusion for micro-scale patchiness.

OS32N-06 1445h

Behavioral Responses to Instantaneous Patterns of Water-Borne Chemical Cues Encountered by Microscopic Larvae in Turbulent Wave-Driven Flow Affect Larval Settlement

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Larvae of various benthic marine animals are induced to settle and metamorphose by dissolved chemical cues released by organisms on the substratum. As these cues and larvae are mixed in the turbulent ambient water flow over the benthos, how do the spatial patterns of cue concentration translate into the temporal patterns of cue encountered by microscopic larvae, and how do their instantaneous responses to cue encounters affect their likelihood of settling onto the substratum? We addressed these questions using larvae of the sea slug, *Phestilla sibogae*, which settle in response to a water-borne species-specific metabolite of their prey, *Porites compressa*, abundant corals that form reefs in shallow, wave-dominated habitats in Hawaii. We measured turbulent water flow above *P. compressa* reefs in the field and mimicked that flow over a reef constructed in a large flume/wave-tank. Using planar laser-induced flourescence (PLIF), we visualized the complex patterns of fine filaments of cue swirling above the reef. By tethering individual larvae of *P. sibogae* in a miniflume and exposing each to water movement mimicking the flow relative to a freely-swimming larva, we could videotape through a microscope the responses of each larva as it was exposed to temporal patterns of cue filaments like those it would encounter at different distances above a reef. We found that larvae retract their ciliated velum and cease swimming when they encounter filaments of water containing cue, and resume swimming when they pass out of them. We used a computer simulation of larvae placed in our PLIF videos to explore the effects of larval behavior on their settlement on the reef in such turbulent wave-driven flow. Our model shows that simply sinking when in a filament of cue can cause larvae to land on the reef, but the proportion of larvae that land is affected by various behavioral parameters such as swimming and sinking velocities, sensitivity to cue concentration, and lag time to respond to cue.

OS32N-07 1520h

The Mechanics of Macroalgal Spore Dispersal: Melding Physical Modeling With Field Measurements

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The dispersal of reproductive propagules in the sea is influenced by a variety of biological and physical factors. Here we use modifications to an existing turbulent transport model, in combination with field data, to examine the mechanics of nearshore macroalgal spore dispersal and its relationship to coastal hydrodynamic conditions. Results indicate that spore sinking speed and release height can affect dispersal distance substantially, but that the influence of these biological parameters is modulated strongly by the intensity of turbulence as dictated by waves and currents. In rapid flows with larger waves, it is primarily fluid dynamic processes, in particular current velocities, that determine dispersal distance. Simulations also suggest that patterns of spore dispersal are highly skewed. Although many propagules encounter the sea floor within a few meters of their parents, a sizeable fraction of spores may disperse as far as kilometers. Such predictions imply a greater potential for longer range dispersal in seaweeds than has traditionally been assumed. This may particularly be the case when spores disperse across sand flats between kelp beds where canopy obstruction and topographical reef effects on flow are minor.

OS32N-08 1535h

Simulations of Mesocosm Experiments Designed to Assess the Effect of Turbulence on Plankton Interactions

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Small-scale fluid motions in the ocean affect the rate of nutrient uptake by bacteria and phytoplankton and the predation rates of zooplankton. The magnitude of the effect depends on the size and swimming speed of the organisms. Theory predicts that nutrient uptake will be increased by turbulence and that zooplankton-phytoplankton encounter and capture rates will be increased at low turbulent intensity but the capture rate will be decreased at high turbulent intensity.

We present a mathematical model of an enclosure experiment carried out in Norway in July 2001, based on Thingstad et al. (1999, Aquatic Microb. Ecol. **18** 145-156). In the experiment the enclosed plankton communities were subjected to various levels of turbulence, generated using oscillating grids, and to different initial nutrient conditions. Theoretical predictions of the effect of turbulence on the model parameters are included in the model. We intend to compare prediction with observations when the latter become available.

This research was funded by the shared cost research project NTAP (contract no. EVK3-CT-2000-00022) of the EU RTD Programme 'Environment and sustainable development' and forms part of the ELOISE projects cluster.

OS32N-09 1550h

Effects of Turbulence on Growth of Heterotrophic Dinoflagellates.

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Effects of different natural levels of turbulence on growth and ingestion rates of heterotrophic dinoflagellates have been investigated using batch cultures. Ingestion rates and growth rates decreased with increasing turbulence levels. Although turbulence had a negative effect on grazing efficiency, no growth inhibition occurred even at high levels of turbulence, which stands in contrasts to previous reports on inhibitory effects of turbulence on growth of phototrophic dinoflagellates. In laboratory experiments initiated with a similar biomass of prey and predators, heterotrophic dinoflagellates reached higher maximum biomasses at higher turbulence levels, since the prey was grazed less efficiently, and consequently established a higher biomass available for grazing.

OS32N-10 1605h

Fluid Dynamic Effects on the Suspension Feeding and Growth of Marine Bivalves.

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There is an emerging realization that there is a domed-shaped response of aquatic organisms to fluid dynamics (namely turbulence), where moderate amounts of turbulence promote biological processes, whereas higher levels inhibit them. This realization has been well developed in pelagic environments especially those involving fluid dynamic interactions of larval fish and other zooplankters. Similar responses are also evident in benthic environments where bivalves and other benthic organisms respond to absolute water motions in addition to relative ones. A mechanistic understanding of the response of bivalves to fluid dynamic forces will provide essential and important information on the productivity of benthic ecosystems. Moreover, such information may bear on the niche separation of closely related species, such as those in the *Mytilus* group.

This paper reports on (1) short-term clearance rate experiments in a laboratory flow chamber and (2) longer-term growth rate experiments in a dockside flow-through chamber at Bamfield Marine Sciences Centre. The experiments involved the blue mussels *Mytilus trossulus* and *Mytilus californianus* of two size categories (1 cm long and 2 cm long) and water from the Bamfield Inlet delivered at 1 to 40 cm/s (1 to 20 cm/s in the feeding experiments). Some differences were observed between the species, yet larger mussels tended to clear more water than smaller ones. For example, *M. trossulus* tended to clear more water at higher chamber velocities, whereas *M. californianus* responded in an opposite manner. In terms of growth, *M. trossulus* grew significantly faster at 1 and 10 cm/s than at 20 and

40 cm/s in the dockside chamber. The results for *M. californianus* are not as yet available. Notwithstanding, it is evident that there are species specific responses to fluid dynamic forces that exist in marine bivalves. The implications of these results to the evolutionary ecology of mussels and to trophic transfer in benthic ecosystems will be discussed.

URL: http://quarles.unbc.ca/nres/jda.htm

OS32N-11 1620h

Growth Rates of Interface-Feeding Benthos in Laboratory Flumes.

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Spionid polychaetes feed at the sediment-water interface, facultatively switching from deposit feeding to suspension feeding as flow and the flux of suspended food increase. Juveniles of *Polydora cornuta* tend to suspension feed more than adults, especially at slow flows. To determine the degree to which juvenile growth is enhanced by near-bottom flow, we performed a series of experiments in which pre-measured individual worms were implanted into counter-rotating annular flumes containing natural sediment and suspended microalgae. The flux of suspended food was manipulated by setting flumes to 1 of 3 unidirectional flows (U* = 0.3, 0.5, 0.8 cm/s) and by adding 1 of 2 concentrations of suspended food (0.16 and 0.26 mg N/liter). Measurements of body volumes after 3 days in the flumes revealed rapid growth rates on an ecologically relevant time scale (3 d) during which flow often varies in nature (e.g., due to storms and the lunar tide cycle). The relative growth rate of *Polydora* ranged between 0.2-0.7 per day and was significantly enhanced by increasing the flux of suspended food. In addition to measuring growth rates in various hydrodynamic conditions, we tested the effects of intraspecific density on growth by implanting various numbers of adults in close proximity to a targeted juvenile. At slower flows (U* < 0.6 cm/s) dense assemblages of adults produced extensive fecal mounds, and the growth rate of juveniles was negatively correlated with adult density (presumably because the adults or their fecal mounds interfered with the feeding activity of juveniles). At flows fast enough to erode the fecal mounds, however, adult density had no effect on juvenile growth rates. We also measured rates of growth and regeneration following the loss of either one or both feeding palps (simulating non-lethal predation). Within the 3-day experimental period, worms were able to fully regenerate lost palp tissue, and total body growth was significant. The combined results demonstrate the general inadequacy of growth-rate estimates obtained from still-water experiments. Growth-rate data from realistic hydrodynamic conditions are especially needed for accurately modeling population dynamics and secondary production in benthic communities.

OS32O HC: 316 A Wednesday 1330h

Physical, Chemical, and Biological Processes Associated With Active Submarine Volcanism in the Pacific II

Presiding: **T Urabe,** University of Tokyo**; C de Ronde,** Institute of Geologican and Nuclear Sciences

OS32O-01 1335h

Sub-seafloor Aquifer Structure Deduced from Direct Drilling into the Hydrothermal System at Suiyo Seamount, Izu-Ogasawara Arc, Western Pacific

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A high-temperature hydrothermal system related to island-arc volcanism has been drilled in June 2001 using a tethered, submarine rock-drill system BMS (Benthic Multi-coring System) on-board the *R/V Hakurei-Maru # 2.* The purpose of the operation which is a part of the **Archaean Park Project** is described elsewhere (Urabe et al., 2001). The hydrothermal field spreads for 200 meters by 200 meters on the caldera floor (depth=1,390m) of the Suiyo Seamount (28°34ON, 140°38OE), Izu-Ogasawara Arc, western Pacific. Numerous short black smokers (Tmax.=317°C) were observed in addition to extensive low temperature simmerings with mussel colonies on the sandy floor (Watanabe and Kajimura, 1994). Six out of seven shallow drilled holes (av. hole-length=5m) produced fluid of various temperatures ranging from 40-60°C to 304°C. Casing pipe has been inserted to prevent the holes from the collapse. The drilling intersected dacite lava and/or pyroclastic rocks about 1-3 meter below the unconsolidated sediments of volcanic sands and pumice fragments. Intensive hydrothermal alteration is observed in sedimentary unit and the upper part of the volcanic rocks. The drilling indicated that an impermeable sheath develops beneath each high temperature vent that prevents the end-member fluid to mix with low-temperature seawater within the permeable sediment layer. Clay minerals and anhydrite cement are the main component of the sheath in addtition to pyrite and other sulfide minerals. The sheath is likely to be formed by self-sealing process of anhydrite. The end-member fluid is ponded beneath the sheath and the sheath acts as a cap rock of the terrestrial geothermal systems. The degree of hydrothermal alteration within the volcanic rocks decrease downwards. The cased holes were visited by *ROV Hakuyo 2000* during the *Shinsei-Maru* cruise which was conducted in July-August 2001, about a month after the drilling. The temperature of the fluids from the casing pipe was measured to be between 9.2°C and 308°C. We noticed that sulfide minerals clog the high-temperature holes. On the other hand, low-temperature holes were sealed by a mixture of iron-hydroxide and bacterial mat. These lines of observation suggest that the aquifer structure beneath the hydrothermal system of the Suiyo Seamount shares many similarities with that of the Kuroko deposits in Japan. (Reference) Urabe, T., A. Maruyama, K. Marumo, N. Seama, J. Ishibashi ,2001, *InterRidge News*, v.10 (1), 23-25. Watanabe, K. and Kajimura, T., 1994, *Shigen Chishitu*, 44, 133-140 (in Japanese with English Abstract).

OS32O-02 1350h INVITED

Subvent Hydrothermal Processes at the Suiyo Submarine Volcano, Japan: Constraints from Sulfur Isotope Compositions of Sulfides and Sulfates

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Sulfur isotope analyses were performed on sulfides and sulfates in the drilled core materials from the Suiyo submarine volcano, Japan. Drill core samples were collected from 6 locations (core #01, 02, 03, 04, 05, 07): #01 and 03 drill core samples were collected from the eastern part and others were from the central part. Petrographic studies indicate that samples were extremely altered by the hydrothermal process. Notable feature of the examined samples is the high abundance of sulfide (e.g., FeS2, CuFeS2, ZnS and PbS) and sulfate minerals (e.g., CaSO4, BaSO4). These sulfide and sulfate minerals were separated from the drill core samples, and then, sulfur isotope compositions were analyzed on these minerals by the conventional method and also by the Nd-YAG laser microprobe method. The total ranges of sulfur isotope compositions are +1 to +6 per mil for sulfides and +13 to +21 per mil for sulfates. Regional differences are found in sulfur isotope compositions between the eastern and central areas: (1) sulfur isotope compositions of sulfates are homogeneous (+19 to 21 per mil) in the eastern drill sections, but heterogeneous (+13 to +20 per mil) in the central area; and (2) sulfur isotope compositions of sulfides are heavier (2 to 6 per mil) in the central region compared to the eastern area (1 to 3 per mil). These regional differences indicate that: (3) oxidation of hydrothermal H2S, resulting in production of sulfate, is more vigorous in the subvert zone at the central region compared to the eastern region; and (4) temperatures of subvert hydrothermal fluids are generally lower in the eastern region compared to the central region. The oxidation of H2S is caused by the mixing of oxic seawater and reduced hydrothermal fluids, and this mixing process may control the redox boundary in the subvent zones. Those processes are recorded in the drill core samples from the Suiyo hydrothermal field.

OS32O-03 1405h

Seafloor hydrothermal alteration at Suiyo Submarine volcano: Niberalogical and geochemical.

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gArchaean Park Projecth focuses on the influence of magma-hydrothermal activities on biological communities of a seafloor hydrothermal system developed on atop of Suiyo seamount, Izu-Ogasawara island-arc, western Pacific. We made 10m-depths drilling at the active seafloor hydrothermal areas of Suiyo seamount, using the Boring Machine System (BMS) and RV Daini-Hakurei Maru. We also determined the hydrothermal mineral assemblages in the BMS core samples by XRD, XRF and TEM methods to describe the interaction of volcanic rocks and hydrothermal fluids beneath seafloor. The drill hole APSK-01, penetrated 2.88m depths , was located the south-east margin of hydrothermal area with a mound standing several dead chimneis and Shinkai-Hibarigai. The core samples contained sulfides, anhydrite, barite with some minor amounts of Mg-chlorite. The drill hole APSK-02 with 6.99 m penetration was drilled at south-west end of the hydrothermal areas, although no hydrothermal fluid was observed. The core samples were clay-rich containing significant amounts of montmorillonite and anhydrite. At the APSK-04 site, we drilled 3.85m with surface pumice sand and underlying highly hydrothermally altered dacite at the center of hydrothermal aeas where several hydrothermal mounds were observed. This hydrothermal alteration was characterized by Al-chlorite (sudoite), Mg-chlorite with anhydrite. The bottom core sample contained quartz and mica. The drill hole APSK-05 was located at 70cm away from a sulfide mounds with acitice venting. We penetrated 6.65m of clay and anhydrite veins. Mg-chlorite and Al-chlorite were dominant hydrothermal clay minerals, mica and quartz. The central active venting site was drilled by the drill hole APSK-07 up to 2.69m depths. The core samples contain anhydrite with Mg-chlorite and Al-chlorite from the top to bottom. The Mg-chlorite and Al-chlorite in the cores may be formed by the interaction of heated seawater and dacite. The seawater may have been heated rapidly by the heat source of dacite at the subsurface of the seafloor. Magnesium, calcium and sulfate in the seawater was lost by the heating process and the subsequent water-rock interaction precipitating Mg-chlorite and anhydrite. The pH of the heated seawater decreased by gaining hydrogen from dacite and that the fluid fell in the stability field of Al-chlorite.

OS32O-04 1420h INVITED

Organic Geochemical study of the deep-sea floor deposits and subvent drilled cores in Suiyo seamount hydrothermal system: Evidence of life activity in the subvent extreme environment

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Archaean Park Project focuses on the evaluation of a seafloor hydrothermal system developed on atop of Suiyo seamount, Izu-Ogasawara island-arc, western Pacific. Suiyo seamount is an active volcano, where active

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