Pacific Congress on Marine Science and Technology

PACON 2010

International Partnerships in Marine Science and Technology:
A Vehicle for Improving Pacific Rim Relations and Resource Management

June 1-5, 2010
University of Hawai‘i at Hilo
Hilo, Hawai‘i

http://blog.hawaii.edu/pacon/
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<td>Allen Tom</td>
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<td>Session 6A</td>
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<td>Kenji Hotta</td>
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<td>Session 6B</td>
<td>Submersible Operations and Research</td>
<td>John Wiltshire</td>
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<td>Session 6C</td>
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<td>Kekoa Anderson</td>
<td>Sat, Jun 5 10:00 a.m. - 12:00 p.m.</td>
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<td>Climate Change Law and the Pacific</td>
<td>Richard Hildreth</td>
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<td>Session 7C</td>
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<td>Session 8A</td>
<td>Coastal and Marine Engineering</td>
<td>Akio Kobayashi</td>
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<td>Energy and Climate Change II</td>
<td>Lorenz Magaard</td>
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<td>Session 8C</td>
<td>Minerals Management Service Renewable Energy</td>
<td>John B. Smith</td>
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MESSAGE FROM THE GENERAL CHAIR

Aloha mai kākou (Welcome to All)! It is my honor to serve as the General Chair for PACON 2010 and on behalf of PACON International welcome you all to the twenty-second international conference of the Pacific Congress on Marine Science and Technology (PACON). It is indeed a pleasure for me to return to the University of Hawai‘i at Hilo where I had previously served as Interim Vice Chancellor for Research. For those of you who are visitors to Hawai‘i, I hope that by the time you depart you will have gained an appreciation for the very unique environment and culture of the Big Island of Hawai‘i.

The overarching theme of PACON 2010 is international partnerships in marine science and technology as vehicles for improving Pacific Rim relations and resource management. In the spirit of the conference theme, PACON 2010 jointly co-organized by myself, Dr. DanLing Tang of the Chinese Academy of Sciences South China Sea Institute of Oceanology, and Dr. Wei-Hsien Wang of the Taiwan National Museum of Marine Biology and Aquarium.

The Pacific region harbors some of the greatest natural risks from volcanism, earthquakes and tsunamis in the world. In addition, key coastal areas and Pacific islands are at risk from sea level rise resulting from global warming. The intense commerce and rapid development in the region, in the face of unprecedented environmental threats, demand innovative and trans-disciplinary approaches to address these challenges. PACON 2010 will serve as an effective mechanism for information exchange among diverse groups from government, industry, and academia.

There are a number of successful international marine science partnerships and specific models that may be considered for implementation in other regions of the world. Often, such partnerships developed between nations are built upon a long history of close ties and cooperative relationships. However, marine science partnerships have been demonstrated to not only support the conduct of excellence in cooperative research, but also to serve as vehicles for improving relationships between nations.

PACON 2010 will include presentations and posters on aspects of marine science, technology, resource management, engineering, policy-making and education that address some facet of ongoing or proposed international partnerships within or impacting the Pacific Rim. Specific highlighted session topics will range from climate change to marine debris, seaport engineering to coral reef ecology, marine fisheries management to sustainable energy production, and local community outreach to development of national and international policies related to the Pacific Ocean.

Please embrace the Hawaiian “Aloha Spirit” and the PACON 2010 theme of international marine science partnership to renew and develop new friendships and professional collaborations to promote joint efforts for addressing the significant challenges faced through the Pacific Rim. Malama pono and Mahalo nui loa!

Dr. Michael P. Crosby
Senior Vice President for Research
Mote Marine Laboratory
Sarasota, Florida
PACON INTERNATIONAL MISSION STATEMENT

PACON International is dedicated to sharing scientific and technical information on the world’s oceans in order to advance marine science and technology and its utilization in ocean policy formation, and the sustainable development of the world’s oceans and coastal regions through education and public programs in the Pacific region.

PRINCIPAL GOALS

- To strengthen the global exchange of information and collaborative research linkages with the Pacific nation’s programs in marine environment
- To provide information freely to all participating nations
- To promote the environmentally-sound utilization and sustainable development of the ocean’s resources
- To emphasize through education and public programs, the need for sound ocean policies
- To advance the various disciplines involved in marine science and technology

BOARD OF DIRECTORS

- Dr. John Benzie, Moana Technologies, USA
- Dr. Jerome Comcowich, University of Hawai‘i, USA
- Ms. Elizabeth Corbin, State of Hawai‘i, DBEDT, Science & Tech. Branch, USA
- Dr. Michael P. Crosby, University of Hawai‘i, Hilo, USA
- Dr. Kenji Hotta, Dept. of Oceanic Architecture & Engineering, Nihon University, Japan
- Dr. Ho-Shong Hou, Ministry of Economic Affairs, Taiwan
- Dr. Susumu Ishii, Nihon University, Japan
- Dr. Young C. Kim, California State University, Los Angeles, USA
- Dr. Lorenz Magaard, Department of Oceanography, University of Hawai‘i, USA
- Dr. Koichi Masuda, Nihon University, Japan
- Dr. Narendra Saxena (retired), USA
- Dr. Friedhelm Schroeder, GKSS Research Centre, Geesthacht, Germany
- Dr. DanLing Tang, South China Sea Institute of Oceanology, China
- Dr. John Wiltshire, Hawaii Undersea Research Lab, University of Hawai‘i, USA
- Dr. Ki-Dai Yum, Korea Ocean Research & Development Institute, Korea

LOCAL ORGANIZING COMMITTEE

- Dr. Lorenz Magaard - Emeritus Professor of Oceanography, University of Hawai‘i at Manoa; Director, International Center for Climate and Society; President, PACON International
- Dr. Michael P. Crosby - Senior Vice President for Research, Mote Marine Laboratory, Sarasota, Florida; Adjunct Professor of Marine Science, University of Hawai'i at Hilo; President-Elect, PACON International
- Ms. Elizabeth Corbin - Manager, Science & Technology Branch, Hawai‘i Department of Business, Economic Development & Tourism; Secretary, PACON International
- Dr. John Wiltshire - Chair, Ocean and Resources Engineering, University of Hawai‘i at Manoa; Director, Hawai‘i Undersea Research Laboratory; Treasurer, PACON International
- Dr. Jerome Comcowich, School of Ocean and Earth Science and Technology, University of Hawai‘i at Manoa; Member, Board of Directors, PACON International

LOCAL SUPPORT COMMITTEE

- Ms. Elizabeth Glover, Administrative Assistant, PACON International
- Ms. Judith Fox-Goldstein, Administrative Director, University of Hawai‘i at Hilo Conference Center
- Ms. Mary Ann Tsuchiyama, Assistant Director, University of Hawai‘i at Hilo Conference Center
- Ms. Jules Ung, IT Manager, University of Hawai‘i at Hilo Conference Center
- Ms. Jackie Sayles-Iyo, Executive Assistant, Office of Research, University of Hawai‘i at Hilo
- Mr. Rick Tulloch, IT Coordinator, University of Hawai‘i Conference Center,
- Ms. Stephanie Salazar, Program Coordinator, University of Hawai‘i at Hilo Conference Center
- Ms. Sharay Uemura, Program Coordinator, University of Hawai‘i at Hilo Conference Center
- Ms. Alberta Mehau-Matsu, Registration Coordinator, University of Hawai‘i at Hilo Conference Center
- Ms. Hau‘oli Sayles, Fiscal Coordinator, University of Hawai‘i at Hilo Conference Center
WEDNESDAY, JUNE 2, 2010
OPENING CEREMONY 8:00 a.m. – 9:30 a.m.  Room UCB 100

Opening of the Conference and Welcome of Delegates
Dr. Michael Crosby, PACON 2010 General Chair, USA

PACON International Status Report
Dr. Lorenz Magaard, President, USA

8:00 a.m. – 9:30 a.m. Introduction by Dr. Michael Crosby

Keynote Address #1:  
David J. Lovell and Noelandi Puniwai (USA), “Back to the Future”

10:00 a.m.-12:00 p.m. Technical Sessions
#1A  Marine Spatial Planning: Case Studies  Room UCB 100
#1B  Spectroscopic Oceanographic Sensors and Other Instrumentation  Room UCB 114
#1C  Remote Sensing of Changing Oceans and Natural Hazards I  Room UCB 115

12:00 p.m. – 1:00 p.m.  Boxed Lunch  Campus Center Dining Room

1:00 p.m. – 5:00 p.m.  Ocean Day 2010  Room UCB 127

6:00 p.m. – 8:45 p.m.  Poster Judging Reception  Campus Center Dining Room

THURSDAY, JUNE 3, 2010

8:30 a.m. – 9:30 a.m. Introduction by Dr. Michael Crosby

Keynote Address #2:  Capt. Charles Moore (USA), “Synthetic Polymers in the Marine Environment: A Rapidly Increasing, Long-Term Threat”

10:00 a.m. – 1:30 p.m. Technical Session
#2A  Joint Session on Marine Debris, Marine & Coastal Education, Microbial Oceanography, and Ocean Exchange  Room UCB 100

10:00 a.m. – 12:30 p.m. Technical Session
#2B  Extraction and Conversion of Ocean Energy  Room UCB 114

12:30 p.m. – 5:00 p.m.  PACON International Board of Directors Meeting  Room UCB 127

12:00 p.m. – 5:30 p.m.  Free time and Lunch on Own

5:30 p.m. – 8:00 p.m.  Mokupapapa Discover Center Pre-Dinner Reception Dinner, Downtown Hilo
FRIDAY, JUNE 4, 2010

8:30 a.m. – 9:30 a.m. Introduction by Dr. Michael Crosby

Keynote Address #3: Daniel D. Darrach (USA),

10:00 a.m. – 12:00 p.m. Technical Sessions
#3A Coral Reefs I
#3B Remote Sensing of Changing Oceans and Natural Hazards II
#3C Fisheries Management and Stock Enhancement I

12:00 p.m. – 1:00 p.m. Boxed Lunch

1:00 p.m. – 2:15 p.m. Free Time

3:00 p.m. – 5:00 p.m. Technical Sessions
#5A Coral Reefs II
#5B Energy and Climate Change I
#5C Fisheries Management and Stock Enhancement II

6:00 p.m. – 9:00 p.m. Poster Award Reception

SATURDAY, JUNE 5, 2010

8:30 a.m. – 9:30 a.m. Introduction by Dr. Michael Crosby

Keynote Address #4: George L. Richardson (USA),
“U.S. Energy Policy Coalition”

10:00 a.m. – 12:00 p.m. Technical Sessions
#6A Coastal Environmental Restoration Technology
#6B Submersible Operations and Research
#6C Solutions to Coastal Disasters I

12:00 p.m. – 1:00 p.m. Lunch Buffet

1:00 p.m. – 2:30 p.m. Technical Sessions
#7B Climate Change Law and the Pacific
#7C Solutions to Coastal Disasters II

3:00 p.m. – 5:00 p.m. Technical Sessions
#8A Coastal and Marine Engineering
#8B Energy and Climate Change II
#8C Minerals Management Service Renewable Energy

6:00 p.m. – 9:00 p.m. Closing Dinner & Entertainment
Dinner Address: Dr. Michael Crosby (USA)
“The Value of International Marine Science and Technology Partnerships”
Session 1A: Marine Spatial Planning: Case Studies

Chair: Allen Tom (National Oceanic and Atmospheric Administration, USA)
Wednesday, June 2, 2010
10:00 a.m. – 12:00 p.m.
Room UCB 100

The National Marine Sanctuary System’s Role in Coastal and Marine Spatial Planning
John Armor
NOAA, Silver Spring, Maryland, USA

A Study Regarding the Logistical Network of Construction-Byproduct Processing Facilities
Shunsuke Miyahara, Keita Tokuyama, Takamasa Miyazaki
College of Industrial Technology, Nihon University, Chiba, Japan

Marine Spatial Planning: A Management Tool for Multiple-Use Marine Protected Areas
Billy D. Causey
NOAA / Office of National Marine Sanctuaries, Key West, Florida, USA

Information Management to Support Marine Spatial Planning at Papahanaumokuakea Marine National Monument
Kaylene E. Keller
NOAA/ONMS, Papahanaumokuakea Marine National Monument, Honolulu, Hawai‘i, USA

Capturing Cultural & Traditional Activities in Marine Spatial Planning in Fagatele Bay National Marine Sanctuary, American Samoa
Genevieve A. Brighouse
Fagatele Bay National Marine Sanctuary Program, Pago Pago, American Samoa

Marine Spatial Planning: Characterizing Shipwrecks in the Graveyard of the Atlantic
David W. Alberg
NOAA/Office of National Marine Sanctuaries, Newport News, Virginia, USA
Session 1B: Spectroscopic Oceanographic Sensors and other Instrumentation
Chair: S. Michael Angel (University of South Carolina, USA)
Wednesday, June 2, 2010
10:00 a.m. – 12:00 p.m.
Room: UCB 114

The Feasibility of Making Deep-Ocean Measurements Using Laser Induced Breakdown Spectroscopy (LIBS)
Stanley M. Angel, Marion Lawrence-Snyder, Christopher Gordon
Department of Chemistry & Biochemistry, The University of South Carolina, Columbia, South Carolina, USA

First Use of the Nereus Hybrid Underwater Robotic Vehicle (HROV) in the Southern Mariana Region
Patricia Fryer
University of Hawai’i at Manoa, Institute of Geophysics and Planetology, Honolulu, Hawai’i, USA

Discrimination and Chemical Sensing Using Single-Cell Fluorescence Excitation Spectroscopy of Phytoplankton
Michael L. Myrick, Timothy J. Shaw, Tammi L. Richardson, Laura S. Hill, Evelyn Lawrenz, Kathleen Donaldson, Joe Swanstrom
University of South Carolina, Columbia, South Carolina, USA

A Compact Raman and Fluorescence Spectrometer for Research in Marine Environment
Shiv K. Sharma, Anupam K. Misra
Hawaii Institute of Geophysics & Planetology, University of Hawai’i at Manoa, Honolulu, Hawai’i, USA

The Ocean-Bottom Seismometer Mission of Tori, Taiwan
Jung-Li Tien, Po-Chi Chen, Shang-Hsueh Yu, Chau-Chang Wang, Hsin-Hung Chen, Jia-Pu Jang
Taiwan Ocean Research Institute, National Applied Research Laboratories, Taipei, Taiwan

Gen-Sin Chang
Central Weather Bureau

Ching-Ren Lin, Ban-Yuan Kuo
Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan

Chau-Chang Wang, Hsin-Hung Chen
National Sun Yat-sen University
Azimuth Asymmetry in Typhoon Intensity Changes
W. Timothy Liu, Wenqing Tang
Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, USA

Impact of Natural Hazards on Ocean Color
Ramesh P. Singh
Department of Physics, Computational Science and Engineering, Chapman University, Orange, California, USA

Impacts of Tsunami 2004 on Coastal Resources in Thailand using Remote Sensing
Absornsuda Siripong
Marine Science Department, Faculty of Science, Chulalongkorn University, Bangkok, Thailand

Manisa Piyasingh
Distance Learning Foundation, Khet Laksi, Bangkok

Underwater Positioning Systems for Marine Applications
Li Zhou, Adam Zielinski
Department of Electrical and Computer Engineering, University of Victoria, Victoria, B.C., Canada

Real-Time Observation of Wave, Tide, Tsunami by GPS Buoy
Toshihide Miyake, Takashi Fujita, Yasuhiro Matsushita, Shigeo Okubo
Hitachi Zosen Corporation, Osaka, Taisho-ku, Japan

Masanori Takashima
Fuji Tokoha University, Shizuoka, Japan

Kimiro Meguro
Institute of Industrial Science, University of Tokyo, Tokyo, Japan
Session 2A: Joint Session on Marine Debris, Marine and Coastal Education, Microbial Oceanography and Ocean Exchange

Chairs: Howard Wiig (Hawai‘i State DBEDT-Energy Division, Hawai‘i, USA) and Chris Woolaway (NWHI Multi-Agency, Hawai‘i, USA)

Thursday, June 3, 2010
10:00 a.m. – 1:30 p.m.
Room: UCB 100

Dynamics of Near-Surface Currents with Implication to Pathways of Marine Debris
Nikolai A. Maximenko, Jan Hafner
International Pacific Research Center, University of Hawai‘i at Manoa, Honolulu, Hawai‘i, USA

The Behavior of Tsunami-Induced Driftage and Its Problem in Fishing Areas
Koji Otsuka
Japanese Institute of Technology on Fishing Ports, Grounds and Communities, Tokyo, Japan

Ken-ichi Satoh
Emergency management Division, Kesen-numa-City, Miyagi, Japan

Koji Fujima
Department of Civil and Environmental Engineering, National Defense Academy

Building on Partnerships: Midway Atoll-Marine Debris Coastal Monitoring Pilot Project
Christine Woolaway
Chris Woolaway & Associates, LLC, Hawai‘i

Seba Sheavly
Sheavly Consultants, Virginia Beach, Virginia

Project to Clean Up the "Garbage Patch" in the North Pacific
Mary T. Crowley, Karen J. Geisler
Project Kaisei/Ocean Voyages Institute, Sausalito, California, USA

Karen J. Geisler
MAS MBC Program, Scripps Institute of Oceanography, La Jolla, California, USA

Finding Solutions Through Partnerships: Solid Waste Challenges & Strategies for Island Communities
Christine Woolaway
Chris Woolaway & Associates, LLC, Hawai‘i

Rene Mansho
Schnitzer Steel Hawai‘i Corp. & Aloha Aina Earth Day, Kapolei, Hawai‘i

Pier 38 Partnership: A World Class Model
Howard C. Wiig
Hawai‘i State Department of Business Economic Development & Tourism, Energy Division, Hawai‘i
Hawai'i Island Coastal Education and Stewardship Project
Ho'oululahui E. Perry
Pacific Aquaculture & Coastal Resources Center, University of Hawai'i at Hilo, Hilo, Hawai'i, USA

Darius Kalvaitis
Education Department, University of Hawai'i at Hilo, Hilo, Hawai'i, USA

Comparing Nutrient – Groundwater – Phytoplankton Relationships off East and West Hawai'i Island
Jason E. Adolf, Topaz P. Collins, Judy K. Walker
University of Hawai'i at Hilo, Department of Marine Science, Hilo, Hawai'i, USA

Storm Effects on Water Quality and Productivity of a Tropical Hawaiian Estuary
Tracy N. Wiegner
Marine Science Department, University of Hawai'i at Hilo, Hilo, Hawai'i, USA

Lucas Mead
Tropical Conservation Biology and Environmental Sciences Master’s Program, University of Hawai'i at Hilo, Hilo, Hawai'i, USA

Numerical Simulation of the Indonesian Throughflow and the Makassar Jet
Bernhard Mayer, Peter Damm, Thomas Pohlmann
Institute for Oceanography, University of Hamburg, Hamburg, Germany

Syamsul Rizal
Center for Marine and Fishery Studies, Syiah Kuala University, Banda Aceh, Indonesia
Session 2B: Extraction and Conversion of Ocean Energy
Chair: Ki-Dai Yum (Korea Ocean Research & Development Institute, Korea)
Thursday, June 3, 2010
10:00 a.m. – 12:30 p.m
Room: UCB 114

35 Years of Marine Technological Developments at the Natural Energy Laboratory of Hawai'i Authority
Jan C. War
State of Hawai'i, Natural Energy Laboratory of Hawai'i Authority, Kailua-Kona, Hawai'i, USA

Tidal Current Power Development in Korea
Kwang Soo Lee, Jin Soon Park, Ki-Dai Yum
Coastal Engineering & Ocean Energy Research Department, KORDI, Seoul, Korea

Development of Highly Efficient Sluice Caisson for Tidal Power Generation
Dal Soo Lee, Sang-Ho Oh
Korea Ocean Research & Development Institute, Ansan, Kyunggi, Korea

Sihwa Tidal Power Plant Project in South Korea
Sang Hoon Kim
DAEWOO E&C, Seoul, Korea

Ki-Dai Yum, Kwang Soo Lee
Coastal Engineering & Ocean Energy Research Department, KORDI, Seoul, Korea

Performance of Vertical Axis Type Marine Turbine with Variable-Pitch Blades
Tomoki Ikoma, Koichi Masuda, Hisaaki Maeda
Department of Oceanic Architecture and Engineering, College of Science and Technology, Nihon University, Chiba, Japan

Shintaro Fujio
Sanyu Civil Engineering, Japan

Chang-Kyu Rheem
Institute of Industrial Science, The University of Tokyo, Japan

Stability of OTEC System Using Ammonia/Water Mixture
Yasuyuki Ikekami
Institute of Ocean Energy, Saga University, Saga, Japan

Economic Impacts of Sea Water Air Conditioning to Hawai'i
Neil Abranyi, Craig S. Coleman, Denise E. Konan
University of Hawai'i Economic Research Organization (UHERO), Honolulu, Hawai'i, USA

Craig S. Coleman, Denise E. Konan
Energy and Greenhouse Gas Solutions (EGGS), Honolulu, Hawai'i USA

Development of In-Stream Hydro Energy System (IHES)
Young Cheol Park and Cheol Soo Myung
ECOCEAN Co., Ltd., Incheon, Korea
Session 3A: Coral Reefs I
Chair: Chii-Shiarng Chen (National Museum of Marine Biology and Aquarium, Taiwan)
Friday, June 4, 2010
10:00 a.m. – 12:00 p.m.
Room: UCB 100

Coral Reefs
Chii-Shiarng Chen
National Museum of Marine Biology and Aquarium, Graduate Institute of Marine Biotechnology, National Dong-Hwa University, Pingtung, Taiwan

Strategies of National Museum in Promoting Coral Reef Conservation
Yung-Hui Chen
Science Education Department, National Museum of Marine Biology and Aquarium, Pingtung, Taiwan

Ming-Chin Liu, Hai Chiang
Department of Exhibition, National Museum of Marine Biology and Aquarium, Pingtung, Taiwan

High Resilience of a Fringing Coral Reef Influenced by Internal Tide-Induced Upwelling
Tung-Yung Fan
National Museum of Marine Biology and Aquarium, Pingtung, Taiwan

Yu-Chieh Hsieh, Yi-Ting Cheng
Institute of Marine Biodiversity and Evolution, National Dong Hwa University, Pingtung, Taiwan

An Experimental Test of the Adaptive Bleaching Hypothesis
Ruth D. Gates, Xavier Pochon
Hawai‘i Institute of Marine Biology, University of Hawai‘i at Manoa, Kaneohe, Hawai‘i, USA

Jane D’Ambrosia
Department of Organismic and Evolutionary Biology, Harvard University, USA

Bonnie Lee
Ecology and Evolutionary Biology, Yale University, USA

Anderson Mayfield
National Museum of Marine Biology and Aquarium (NMMBA), Taiwan

Free-Living Symbiodinium Biogeography at Habitat and Regional Spatial Scales
Lisa M. Adams, Misaki Takabayashi
Marine Science Department, University of Hawai‘i at Hilo, Hilo, Hawai‘i, USA

Xavier Pochon, Ruth D. Gates
Hawai‘i Institute of Marine Biology, University of Hawai‘i at Manoa; Honolulu, Hawai‘i

Vivian Cumbo
School of Marine and Tropical Biology, James Cook University
Observations from Space: Marine Ecosystem and Environment Response to Typhoons/Hurricanes
DanLing Tang, Y.Q. Chen, X.X. Yang, J.J. Wang  
Research Center for Remote Sensing of Marine Biology/Environment, South China Sea Institute of Oceanology, CAS, Guangzhou, China

Yi Sui  
Department of Ocean Environment Science, Ocean University of China, Qingdiao, China

SCUD: Surface Currents from Diagnostic Model
Jan Hafner, Nikolai A. Maximenko  
International Pacific Research Center, University of Hawai'i at Manoa, Honolulu, Hawai'i, USA

Alternating Quasi-Zonal Jets in the Eastern North Pacific
Oleg Melnichenko, Nikolai A. Maximenko  
International Pacific Research Center, University of Hawai'i at Manoa, Honolulu, Hawai'i, USA

Hideharu Sasaki  
The Earth Simulator Center, Japan Agency for Marine-Earth Science and Technology, Yokohama, Japan

Observations of the Subpolar Front in the Japan/East Sea
Emil T. Petruncio  
U.S. Naval Academy, Annapolis, Maryland, USA

Sunhye Cho  
Republic of Korea Navy

Research of Dynamic Variations of Gravitational Field in the Forthcoming Volcano Eruption
Vladimir Ivanovich Korochentsev, Pavel Sherbakov, Vera Kochetova  
Far Eastern State (National) Technical University, Vladivostok, Russia
Research on the Artificial Habitat Optimized for Adult Rockfish
Masashi Miyagawa, Motohide Tochino
Kagawa Prefectural Fisheries Experimental Station, Takamatsu, Kagawa, Japan

Munetoshi Aminaka, Munehiro Fujiwara
Graduate School of Engineering, Kagawa University

Yoshihiro Suenaga, Hisao Kakegawa
Faculty of Engineering, Kagawa University

Research on the Artificial In Vivo Insemination in Viviparous Rockfish
Motohide Tochino, Masashi Miyagawa, Katsuhiko Miki, Sadaaki Yoshimatsu
Kagawa Prefectural Fisheries Experimental Station, Takamastu, Kagawa, Japan

Munehiro Fujiwara
Graduate School of Engineering, Kagawa University, Kagawa, Japan

Yoshihiro Suenaga
Faculty of Engineering, Kagawa University, Kagawa, Japan

NOAA-USAID Partnership in the Coral Triangle Initiative Live Reef Food Fish Project
Robert E. Schroeder
NOAA National Marine Fisheries Service, Pacific Islands Regional Office, Habitat Conservation Division
Honolulu, Hawai'i, USA

Artificial Reef Project in the Banate and Barotac Bay, Iloilo, The Philippines
Hiroaki Terashima, Morihiro Tada
ICNet Ltd., Saitama, Japan

Mary Lou Larroza

Research for the Fisheries Ground Creation Using Artificial Reef with Current Control
Taichi Nagatomi, Yoshihiro Suenaga, Hisao Kakegawa
Faculty of Engineering, Kagawa University, Kagawa, Japan

Masashi Miyagawa
Kagawa Prefectural Fisheries Experimental Station

Munehiro Fujiwara
Graduate School Student of Engineering/Kagawa University

Takao Tamura
Institute of Technology and Science/The University of Tokushima

Takashi Hoshino
Kuroshio Marine Technology Co., LTD
Research on the Restraint Method over Structure Movement of Floating Aquaculture Facilities
Munetoshi Aminaka
Graduate School of Engineering, Kagawa University, Kagawa, Japan

Motohide Tochino, Masashi Miyagawa
Kagawa Prefectural Fishery Research Institute

Sadamitsu Akeda
Fisheries Research Agency

Hee-Do Ahn
Korea Ocean Research and Development Institute

Yoshihiro Suenaga
Faculty of Engineering, Kagawa University
Session 5A: Coral Reefs II
Chair: Chii-Shiargh Chen (National Museum of Marine Biology and Aquarium, Taiwan)
Friday, June 4, 2010
3:00 p.m. – 5:00 p.m.
Room: UCB 100

In Situ Identification of Tissue-Specific Small Molecules in Coral-Symbiodinium Endosymbiosis by Maldi-Tof
Li-hsueh Wang, Chii-Shiargh Chen
National Museum of Marine Biology and Aquarium, Pingtung, Taiwan

Chii-Shiargh Chen
Institute of Marine Biotechnology, National Dong Hwa University, Pingtung, Taiwan

Jentaie Shia
Department of Chemistry, National Sun Yat-sen University, Kaohsiung, Taiwan

Proteomics of Cnidaria-Dinoflagellate Endosymbiosis
Shao-En Peng, Li-hsueh Wang, Chii-Shiargh Chen
Taiwan Coral Research Center, National Museum of Marine Biology and Aquarium, Pingtung, Taiwan

Yu-Bao Wang, Li-hsueh Wang, Chii-Shiargh Chen
Graduate Institute of Marine Biotechnology, National Dong-Hwa University

Survey of Briarane-Type Diterpenoids of Marine Origin
Ping-Jyun Sung
National Museum of Marine Biology & Aquarium, Graduate Institute of Marine Biotechnology, National Dong Hwa University, Pingtung, Taiwan

Bioaccumulation of Hydrophobic Organic Chemicals in the Kenting Coral Reefs, Taiwan
Fung-Chi Ko, Jing-O Cheng, Te-Hao Chen, Wei-Hsien Wang
National Museum of Marine Biology and Aquarium, Pingtung, Taiwan

Te-Hao Chen
Institute of Marine Biodiversity, National Dong Hwa University, Pingtung, Taiwan

Study on Life History of the Semicircle Angelfish Pomacanthus semicirculatus in Taiwan
Chih-Wei Chang
National Museum of Marine Biology and Aquarium, Pingtung, Taiwan

Lu-Peng Wang
Institute of Marine Biodiversity and Evolutionary Biology, National Dong Hwa University, Pingtung, Taiwan

Application of Artificial Breeding Techniques in Coral Reef Fish Restoration
Ming Yih Leu, Pei-Jie Meng, Kwee Siong Tew, Wen-Hung Twan
National Museum of Marine Biology and Aquarium, Pingtung, Taiwan

Pei-Jie Meng, Kwee Siong Tew
Graduate Institute of Marine Biodiversity & Evolutionary Biology, National Dong Hwa University, Pingtung, Taiwan

Wen-Hung Twan
Institute of Marine Biotechnology, National Dong Hwa University, Checheng, Pingtung, Taiwan
Session 5B: Energy and Climate Change I  
Chair: Lorenz Magaard (University of Hawaii at Manoa, USA)  
Friday, June 4, 2010  
3:00 p.m. – 5:00 p.m.  
Room: UCB 114

Energy and Climate Change  
Lorenz C. Magaard  
School of Ocean and Earth Science and Technology, University of Hawaii, Honolulu, Hawaii, USA

A Comparative Analysis of Energy Systems' Structure: Hawaii vs. U.S.  
Sherilyn T.M. Wee, Denise Konan, Iman Nasseri, Craig S. Coleman  
University of Hawaii Economic Research Organization (UHERO), Energy and Greenhouse Gas Solutions (EGGS), Honolulu, Hawaii, USA

Economic Aspects of Adaptation to Climate Change  
Karl W. Steininger  
Wegener Center for Climate and Global Change and Department of Economics, University of Graz, Austria

The Emerging New Energy System  
Wolf D. Grossmann  
WegCenter, University of Graz, Austria

OTEC and the Local and Global Environment  
Hans J. Krock  
Ocean & Resources Engineering, University of Hawaii, Honolulu, Hawaii, USA

Economics of Innovative Solutions to Environmental Problems  
James B. Marsh  
University of Hawaii at Manoa, Honolulu, Hawaii, USA
Research on the Appropriate Condition for Zostera Bed in the Coastal Area
Munehiro Fujiwara
Graduate School of Engineering, Kagawa University, Kagawa, Japan

Kenichi Yamaga, Sadaaki Yoshimatsu, Masashi Miyagawa
Kagawa Prefectural Fisheries Experimental Station

Yoshihiro Suenaga
Faculty of Engineering, Kagawa University

Research on the Zostera Marina Beds Creation with Detached Breakwater
Takuro Ueda, Hironori Komatsu, Munehiro Fujiwara
Graduate School of Engineering, Kagawa University, Kagawa, Japan

Ryoichi Yamanaka
Institute of Technology and Science, The University of Tokushima

Kaori Yasuoka
Nittoc Construction Co. LTD

Yoshihiro Suenaga
Faculty of Engineering, Kagawa University

Reproductive Effort of Manila Clam, *Ruditapes philippinarum* Surveyed in 2009 Summer Spawning Period
Kwang-Sik Choi, Hyun-Sung Yang, Hee-Jung Lee, Hyun-Ki Hong
Faculty of Marine Biomedical Science, Jeju National University, Jeju, Korea

Chang-Keun Kang
School of Environmental Science and Engineering, Pohang University of Science and Technology, Gyungbuk, Korea

Biomass Resource from Mussels Attached to the Vertical Seawall in Osaka Bay
Machi Miyoshi
Tokushima Bunri University, Kagawa, Japan

Yasunori Kozuki, Ryoichi Yamanaka, Tatsunori Ishida
Institute of Technology and Science, The University of Tokushima

Nobuhiro Yamaguchi
Takeuchi Engei Company

Akio Sakamoto
FUJITA Construction Consultant Co., Ltd.

Kotaro Goto
Mikuniya Corporation
Removal of Nitrous Ion and Ammonia by the Ceramics Containing Titanium Dioxide
Noriko Mine
Graduate School of Engineering, Kagawa University, Kagawa, Japan

Yoshihisa Yamamoto
Yashima Station, National Center for Stock Enhancement/Fisheries Research Agency

Hiroshi Kawada, Tetsuya Matsuyama
Nihon Kogyo, Co. LTD

Yoshihiro Suenaga, Hisao Kakegawa
Faculty of Engineering, Kagawa University

Increase in the Lipid Peroxidation by a Water Environmental Pollutant Trichloroethylene
Koji Fujiwara, Kazuki Kodama
Graduate School Student of Engineering, Kagawa University, Hayashi, Kagawa, Japan

Yoshihiro Suenaga, Hisao Kakegawa
Faculty of Engineering, Kagawa University

Sustainable Fishery Districts in Metropolitan Seaside Areas
Masayuki Suga
Nihon Bunri University, Oita, Japan

Norihiro Satomi
Graduate School of Industrial Technology, Nihon University

Kiminori Nakazawa, Takamasa Miyazaki
Department of Conceptual Design, College of Industrial Technology, Nihon University
Session 6A: Coastal Environmental Restoration Technology  
Chair: Kenji Hotta (Nihon University, Japan)  
Saturday, June 5, 2010  
10:00 a.m. – 12:00 p.m.  
Room: UCB 100

Experimental Research on Development of Inorganic Coagulant for Removal of Coastal Wreck Oil
Kenji Hotta, Yuki Ogura, Kyoichi Okamoto  
Nihon University, College of Science and Technology, Department of Oceanic Architecture and Engineering, Chiba, Japan

Tatsutoshi Komatsu2  
JEC Aquastaff Co., LTD

Fermentative Study of Bioethanol from Sea Algae by Use of Microbiology
Hideki Kohno, Tomoe Komoriya, Kenji Hotta, Takuji Sakai  
College of Industrial Technology, Nihon University, Chiba, Japan

The Effective Use of the Sublittoral Zone Compatible to Urban Formation
Kiminori Nakazawa, Takamasa Miyazaki  
Department of Conceptual Design, College of Industrial Technology, Nihon University, Chiba, Japan

Experiment of Sediment Purification Ability by Sea Cucumbers in the Northern Seas
Kentaro Okamoto, Jun Yamamoto  
Fisheries Engineering Team, Civil Engineering Research Institute of Cold Region, Japan

Purification Experiments on Sedimentary Sludge by Microorganism Activation
Kyoichi Okamoto, Kenji Hotta  
Department of Oceanic Engineering, CST, Nihon University, Chiba, Japan

Assessment of Removal of Carbon, Nitrogen, Phosphorus and Oxygen Supply by Photosynthetic Activity of Laminaria japonica
Ryouma Shibata, Kenji Hotta, Kyoichi Okamoto  
Nihon University, College of Science and Technology, Department of Oceanic Architecture and Engineering, Japan

Hiroyuki Tobita  
Weather News Co., LTD
Pacific Remote Islands Monument Submersible Research Plan
John C. Wiltshire
University of Hawai’i, Honolulu, Hawai’i, USA

High-Speed, Low-Power Miniature Mass Spectrometer System for Chemical Analysis in the Ocean
Gary M. McMurtry, Irina Kolotyrkina
School of Ocean & Earth Sciences & Technology, University of Hawai’i, Honolulu, Hawai’i, USA

Gerardo Brucker, Jeffery Rathbone
Brooks Automation, Inc., Longmont, Colorado, USA

Zhejiang University Offshore Programs
Ying Chen
Department of Ocean Science and Engineering, Zhejiang University, Hangzhou, China

The Submersible Gas Sampler
Wei Fan
Institute of Mechatronical Engineering, Hangzhou Dianzi University, Xiasha, Hangzhou, China

The HURL Data Department
Rachel S. Orange
Hawai’i Undersea Research Lab, University of Hawai’i at Manoa, Honolulu, Hawai’i, USA
Disaster Planning and Evacuation Response – Case Study of Honolulu Tsunami Warning and Intelligent Transportation Systems
Kekoa Anderson, Seri Park
Tetra Tech, Engineering & Architectural Services, Irvine, California, USA

Tsunami Hazard to Hawaii From a M9+ Event Similar to the 2004 Indian Ocean Tsunami
Charles Mader
Mader Consulting Co., Honolulu, Hawaii, USA

Numerical Study on Tsunami Propagation and Resonance in the Seto Inland Sea
Ryoichi Yamanaka, Yasunori Kozuki
Institute of Technology and Science, The University of Tokushima, Tokushima, Japan

Shin Tanabe
Kokusai Kogyo Co. Ltd.

Kazuhisa Iwaka
The Graduate School of Advanced Technology and Science, The University of Tokushima, Japan

Hitoshi Murakami
Research Center for Management of Disaster and Environment, The University of Tokushima, Japan

Increase in Probability of the Correct Forecast of Tsunami Formation
Vladimir Ivanovich Korochentsev
Far Eastern State (National) Technical University, Vladivostok, Russia

Submarine Landslide Hazard Evaluation Offshore of Southwestern Taiwan
Jui-kun Chiu, Francy Kuo, Jeff Huang
Taiwan Ocean Research Institute, National Applied Research Laboratories, Taipei, Taiwan

Tropical Cyclones Hit Hainan Island in the South China Sea
Yu Ping Guan
Key Laboratory of Tropical Marine Environmental Dynamics, South China Sea Institute of Oceanology, CAS, Guangzhou, China

Haixia Shan, Han Zhang
School of Atmospheric Sciences, Lanzhou University, China

Tingzhao Guan
Information Center, Nanjing University of Information Science and Technology, China
Session 7B: Climate Change Law and the Pacific
Chair: Richard Hildreth (University of Oregon, USA)
Saturday, June 5, 2010
1:00 p.m. – 2:30 p.m.
Room: UCB 114

Climate Change Law and the U.S. Affiliated Pacific
Richard G. Hildreth
University of Oregon School of Law, Eugene, Oregon, USA

Is the Term, 'Climate' Too Unspecific for a Fruitful Discussion?
Arnd Bernaerts
Hamburg, Germany

Implementing Changes to Reduce Global Shipping Air Pollution
Sherry P. Broder
Law Offices of Sherry P. Broder, Honolulu, Hawai‘i USA

United Nations Environmental Program (UNEP) Regional Seas Programmes and Climate Change
Jon M. Van Dyke
University of Hawai‘i, William S. Richardson School of Law, Honolulu, Hawai‘i, USA
Session 7C: Solutions to Coastal Disasters II
Chair: Kekoa Anderson (Tetra Tech)
Saturday, June 5, 2010
1:00 p.m. – 2:30 p.m.
Room: UCB 115

A Study on Formulation of the Marine Hazard Map
Koichi Masuda
Department of Oceanic Architecture and Engineering, Nihon University, Chiba, Japan

Takujiro Miyamoto
Port Area Promotion Division, Ministry of Land, Infrastructure, Transport and Tourism, Tokyo, Japan

Yoichi Arai
Recycle Solution, Tokyo, Japan

Tomoki Ikoma
College of Science and Technology, Nihon University, Chiba, Japan

Enhancing Sea Grant's Ability to Help Coastal Communities Adapt to Climate Change
Andrew P. Bohlander
University of Hawaii Sea Grant College Program, Hilo, Hawaii, USA

Ship-To-Shore Causeway and Rapid Bridge Replacement System
Donald Resio, Jimmy Fowler, Stanley Boc
U.S. Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory, Vicksburg, Mississippi, USA
Session 8A: Coastal and Marine Engineering  
*Chair: Akio Kobayashi (Nihon University, Japan)*  
**Saturday, June 5, 2010**  
3:00 p.m. – 5:00 p.m.  
Room: UCB 100

**Beach Nourishment using Gravel as Environment-Friendly Shore Protection Measure**  
Akio Kobayashi  
*Nihon University, CST, Chiba, Japan*

Masahiro Koya  
*Graduate Division, CST, Nihon University, Chiba, Japan*

Takaaki Ueda  
*Public Works Research Center, Taito, Tokyo, Japan*

**Modified Probability Density Functions of Tidal Elevation Data**  
Hongyeon Cho  
*Marine Environment and Pollution Prevention Department, Korea Ocean R&D Institute, Seoul, Korea*

Shintaeck Jeong, Dachee Park, Kangpyo Cho  
*College of Engineering, Wonkwang University*

**Research of an Offshore Airport - Case Study of Kaohsiung**  
Yuan-Ho Lin  
*Ministry of Transportation and Communication and The Center of General Education, I-Shou University, Taiwan*

Ho-Shong Hou, Yang-Chi Chang  
*Department of Marine Environment and Engineering, National Sun Yat-Sen University, Taiwan*

Chen-Chu Lin  
*Language Center, College of Humanities and Social Sciences, Feng Chia University, Taiwan*

**Physical Environment of Seaweed Bed at the Rear Step of Breakwater**  
Jin Sato  
*Fisheries Engineering Research Team, Civil Engineering Research Institute for Cold Region, Hokkaido, Japan*

Kiyoto Koganezaki  
*Marine Engineering Department, Nippon Data Service Co., Ltd*

Eriko Shimizu, Hideto Narumi  
*Marine Environmental Consultant Co., Ltd*

Yasuhiro Suzuki  
*Fisheries Division, Hokkaido Regional Development Bureau MLIT*

**Impact Study of Typhoon Morakot Flooding on Taiwan South Coast and Management Strategy**  
Chin-Tsai Tan, Jih-Hwa Wu  
*Institute of Public Affairs Management, National Sun Yat-sen University, Taiwan*

Ho-Shong Hou  
*Department of Marine Environment and Engineering, National Sun Yat-Sen University, Taiwan*

Yuan-Ho Lin  
*Ministry of Transportation and Communication and The Center of General Education, I-Shou University, Taiwan*
Climate Feedbacks and Climate Sensitivity - Results from Recent IPRC Research
Kevin Hamilton
International Pacific Research Center (IPRC), SOEST, University of Hawai'i at Manoa, Honolulu, Hawai'i, USA

Methane Hydrates – Blessing or Curse?
Lorenz C. Magaard
School of Ocean and Earth Science and Technology, University of Hawai'i, Honolulu, Hawai'i, USA

The Influence Of Climate Change On The Maritime Australia And Pacific Islands:
Biology and Business
Michael J. Kingsford
School of Marine and Tropical Biology, James Cook University, Townsville, Queensland, Australia

Life Cycle Analysis of Greenhouse Gas Emissions from Electricity Production via Biofuels
Craig S. Coleman, Kanae Tokunaga, Paul Bernstein, Emily Makini, Denise Konan
University of Hawai'i Economic Research Organization (UHERO), University of Hawai'i at Manoa, Honolulu, Hawai'i, USA

Hybrid Policy Instrument under the Uncertainty
Iman Nasseri, James Roumasset
Department of Economics, University of Hawai'i at Manoa, Honolulu, Hawai'i, USA

Sittidaj Pongkijvorasin
Department of Economics, Chulalongkorn University

The Arctic European Winters 1939/40-941/42 Caused by Naval War? How to Substantiate?
Arnd Bernaerts
Hamburg, Germany

The Pacific War and a Climatic Shift, 1942-1945: Correlation or Causation?
Arnd Bernaerts
Hamburg, Germany
Role of the Hawaii Undersea Research Laboratory in Renewable Energy
John C. Wiltshire
University of Hawai'i, Honolulu, Hawai'i, USA

Overview of Specific Renewable Energy Projects – Cape Wind and Hawai'i Inter-Island Subsea Power Cable
Theresa P. Bell
Minerals Management Service, Camarillo, California USA

Renewable Energy Program Studies
Theresa P. Bell
Minerals Management Service, Camarillo, California USA

The Regulatory Framework for Renewable Energy Development on the Federal Outer Continental Shelf (OCS)
John B. Smith
U.S. Department of the Interior, Minerals Management Service, Camarillo, California, USA

Wave Power Device Development
Reza Ghorbani
Department of Mechanical Engineering, University of Hawai'i at Manoa, Honolulu, Hawai'i, USA

DBEDT - the Hawaii Offshore Initiative
Joshua B.Y. Strickler
Dept. of Business, Economic Development & Tourism, Strategic Industries Division, Honolulu, Hawai'i, USA
POSTER SESSION
Coordinator: Jason Adolf (University of Hawai‘i at Hilo, USA)
Wednesday, June 2, 2010
6:00 p.m. – 9:00 p.m.
UH Hilo Campus Center Dining Room
Student Posters

There is No Causation Without Correlation! Global Cooling and Naval War?
Arnd Bernaerts
Hamburg, Germany

Pacific Cooling from 1943-1970; Influenced by Naval War?
Arnd Bernaerts
Hamburg, Germany

Population Connectivity Patterns of Two Marine Microgastropod Species in Hawaii
Nancy Chaney*
Tropical Conservation Biology and Environmental Science Program, University of Hawai‘i at Hilo, Hilo, Hawai‘i, USA

Marta deMaintenon
Department of Marine Science, Volcano, Hawai‘i, USA

Eyes on Coral Reefs (ECOR): Long Term Coral Reef Observation in Taiwan
Chienhsun Chen, Shih-Hu Ho, Li-Fang Huang, Chiungjung Tseng, Grace Hwu, Wei-Ping Hou
Taiwan Ocean Research Institute, National Applied Research Laboratories, Taipei, Taiwan

Annual Variation of the Cockle, Fulvia mutica, in Cheonsu Bay Off the West Coast of Korea
Kwang-Sik Choi, Hyun-Sung Yang
Faculty of Marine Biomedical Science, Jeju National University, Jeju, Korea

Do-Hyung Kang, Heung-Sik Park
Marine Living Resources Research Department, KORDI, Seoul, Korea

The Quantitative Evaluation on the Growth of the Natural Zostera Marina
Munehiro Fujiwara*
Graduate School Student of Engineering, Kagawa University, Takamatsu, Kagawa, Japan
POSTER SESSION (cont’d)

Effects of Northeastern Monsoon on the Population Dynamic of Calanus sinicus in Northern Taiwan
Jiang-Shiou Hwang, Li-Chun Tseng
Institute of Marine Biology, National Taiwan Ocean University, Keelung, Taiwan

Sami Souissi, Juan Carlos Molinero
Marine Station of Wimereux, University of Sciences and Technologies of Lille, France

Qing-Chao Chen
South China Sea Institutes of Oceanography, Academia Sinica, Guangzhou, China

Chong Kim Wong
Department of Biology, The Chinese University of Hong Kong, Shatin, Hong Kong, China

Food Web Structure of Artificial Reef Ecosystems in the Southern Korean Peninsula
Chang-Keun Kang, Hyun Je Park
POSTECH Ocean Science & Technology Institute, Pohang University of Science and Technology, Pohang, Gyeongbuk, Korea

Sung-Gyu Yun
Department of Biology Education, Taegu University

Sang Kim Ho
Fisheries Resources Restoration Development & Management Center, National Fisheries Research & Development Institute

Eun Jung Choy
Korea Polar Research Institute, Korea Ocean Research and Development Institute (KORDI)

Kwang-Sik Choi
School of Applied Marine Science, Jeju National University

Lifting System of Offshore Integrated Mining Test for Deep Sea Mineral Resources
Changryol Kim, Chi-ho Yoon, Jongmyung Park, Joongseok Kang, Samgyu Park
Mineral Resources Research Division, Korea Institute of Geoscience and Mineral Resources, Chungcheongnam-do, Korea

Yong Chan Park
Geologic Environment Division, Korea Institute of Geoscience and Mineral Resources, Chungcheongnam-do, Korea

Research on Improvement of Bottom Sediment Environment by Porous Material
Hironori Komatsu*
Graduate School of Engineering, Kagawa University, Takamatsu, Kagawa, Japan
POSTER SESSION (cont’d)

**Tracing Sewage Effluent using Stable Isotopes**
Ambyr U. Mokiao-Lee*, Erik Johnson, Tracy N. Wiegner
*University of Hawaii at Hilo, Hilo, Hawaii, USA*

**Impact of Human Activities on the Coral Reefs Ecosystem - A Long-Term Study**
Pei-Jie Meng, Wen-Hung Twan, Ming-Yih Leu
*National Museum of Marine Biology & Aquarium, Checheng, Pingtung, Taiwan*

Pei-Jie Meng, Ming-Yih Leu
*Graduate Institute of Marine Biodiversity and Evolutionary Biology*

Wen-Hung Twan
*Institute of Marine Biotechnology, National Dong Hwa University, Checheng, Pingtung, Taiwan*

Chung, Kuo-Nan
*Institute of Public Affairs Management, National Sun Yat-sen University, Kaohsiung, Taiwan*

**Ways to Minimize the Soot and Discharge Contamination of Air and Marine Environment**
Alexander Mutaev
*Joint Stock Company Auto-Ural, Vladivostok, Primorye, Russia*

**Evaluation of CO\(_2\) Migration Behavior using Marine Controlled-Source Electromagnetics (CSEM) in the Porous Aquifer**
Samgyu Park, Changryol Kim, Chiho Yoon
*Mineral Resources Research Division, Korea Institute Geoscience and Mineral Resources, Chungnam, Korea*

Ytaka Sasaki
*Department of Earth Resources Engineering / Kyushu University*

**Genetic Architecture of Mugil cephalus in Northwestern Pacific with Implication to Management**
Kang-Ning Shen, C.C. Hsu, B.W. Jamandre, W.N. Tzeng
*Institute of Fisheries Science, National Taiwan University, Taipei, Taiwan*

J.D. Durand
*Institut de Recherche pour le Développement (IRD)*

**Research on the Nori (Porphyra) Production Increasing System using Numerical Model**
Takuro Ueda*
*Graduate School of Engineering, Kagawa University, Takamatsu, Kagawa, Japan*

**Gis-Based Monitoring of Water Quality in Pauoa Bay, Hawaii: Submarine Groundwater Discharge and Phytoplankton Blooms**
Judy K. Walker*, Jason E. Adolf
*Department of Marine Science, University of Hawaii at Hilo, Hilo, Hawaii, USA*
Changes in Coral Communities along Water Quality Gradients in the North Andaman Reefs
Pasinee Worachananant
Department of Environmental Science, Kasetsart University, Chatuchak, Bangkok, Thailand

Suchai Worachananant
Department of Marine Science, Kasetsart University, Chatuchak, Bangkok, Thailand

Rodney W. Carter
School of Science, Health and Education, University of the Sunshine Coast, Australia
BACK TO THE FUTURE

David J. Lovell¹ and Noelani Puniwai²

¹Research Corporation University of Hawai‘i
University of Hawai‘i at Hilo
Hilo, Hawai‘i, USA

²Natural Resources and Environmental Management Program
University of Hawai‘i at Manoa
Honolulu, Hawai‘i, USA

Our future depends on the ability to return to our past and recreate the balance that once existed. Join us as we begin our journey together at the PACON Conference with an overview of the Hawaiian Monarchy and how these early adopters embraced some aspects of Western science and technology and rejected others in favor of their own, more advanced systems. Let us challenge your preconceived notion of technology and Hawai‘i’s place in the history of that movement. Let us share with you what it was like 2-300 years ago and discuss ideas of socioecosystems - landscapes shaped by dynamically linked human-natural processes and how it defines a culture’s past - and how it can create a future. Envision almost a million people living on these islands before Western contact. What technology allowed them to flourish, sustain and create the Paradise we know today? Discover the Native Hawaiian worldview and learn to see the richness of our environment as we journey from the shores of the Pacific to the peaks of Mauna Kea.

David J. Lovell is the Director of the Research Corporation University of Hawai‘i – Hilo (RCUH), a one-stop-shop for research administration facilitating both pre- and post-award, human resources, on-line procurement and other administrative support services to researchers and clients from around the world. RCUH facilitates the development of strategic alliances between government, private industry, and the university. David is published in microbiology (Serratia, Bacillus licheniformis/firmus, skin flora maps) while at Letterman Army Institute of Research and worked with organomettalics while at Chevron Research Corporation. He is a member of the Society for Research Administrators International and the National Council of University Research Administrators. He is a legacy, third-generation member of the Royal Order of Kamehameha.

Noelani P. Puniwai holds several positions in the Marine Sciences while she is finishing her PhD in the Natural Resources and Environmental Management Program at UH Manoa, using GIS as a tool to communicate between managers and the community. She is the Coordinator for the Pacific Internship Programs for Exploring Science, and the Technical / Educational Specialist for the Pacific Aquaculture and Coastal Resources Center at the University of Hawai‘i at Hilo’s College of Agriculture, Forestry and Natural Resource Management. Noelani is interested in the integration of multiple sources of knowledge and encourages scientists and researchers to involve the community in their research and to share their results with the public. Recent grant projects include: Identification and Zoning of Nearshore Areas for Marine Aquaculture; Constructing a Prototype Geospatial Schema for an Indigenous Information Database of Hawaiian Traditional Ecological Knowledge; Inventory of Marine and Coastal Waters; Hawai‘i Coastal Survey GIS maps; and, Marine Gap Analysis Program.
SYNTHETIC POLYMERS IN THE MARINE ENVIRONMENT: A RAPIDLY INCREASING, LONG-TERM THREAT

Charles James Moore
Algalita Marine Research Foundation
Long Beach, California, USA

Synthetic polymers, commonly known as plastics, have been entering the marine environment in quantities paralleling their level of production over the last half century. However, in the last two decades of the 20th Century, the deposition rate accelerated past the rate of production, and plastics are now one of the most common and persistent pollutants in ocean waters and beaches worldwide. Thirty years ago the prevailing attitude of the plastic industry was that “plastic litter is a very small proportion of all litter and causes no harm to the environment except as an eyesore” [Derraik, J.G.B., 2002. The pollution of the marine environment by plastic debris: a review. Mar. Pollut. Bull. 44(9), 842–852]. Between 1960 and 2000, the world production of plastic resins increased 25-fold, while recovery of the material remained below 5%. Between 1970 and 2003, plastics became the fastest growing segment of the US municipal waste stream, increasing nine-fold, and marine litter is now 60–80% plastic, reaching 90–95% in some areas. While undoubtedly still an eyesore, plastic debris today is having significant harmful effects on marine biota. Albatross, fulmars, shearwaters and petrels mistake floating plastics for food, and many individuals of these species are affected; in fact, 44% of all seabird species are known to ingest plastic. Sea turtles ingest plastic bags, fishing line and other plastics, as do 26 species of cetaceans. In all, 267 species of marine organisms worldwide are known to have been affected by plastic debris, a number that will increase as smaller organisms are assessed. The number of fish, birds, and mammals that succumb each year to derelict fishing nets and lines in which they become entangled cannot be reliably known; but estimates are in the millions. We divide marine plastic debris into two categories: macro, 45mm and micro, o5mm. While macro-debris may sometimes be traced to its origin by object identification or markings, micro-debris, consisting of particles of two main varieties, (1) fragments broken from larger objects, and (2) resin pellets and powders, the basic thermoplastic industry feedstocks, are difficult to trace. Ingestion of plastic micro-debris by filter feeders at the base of the food web is known to occur, but has not been quantified. Ingestion of degraded plastic pellets and fragments raises toxicity concerns, since plastics are known to adsorb hydrophobic pollutants. The potential bioavailability of compounds added to plastics at the time of manufacture, as well as those adsorbed from the environment are complex issues that merit more widespread investigation. The physiological effects of any bioavailable compounds desorbed from plastics by marine biota are being directly investigated, since it was found 20 years ago that the mass of ingested plastic in Great Shearwaters was positively correlated with PCBs in their fat and eggs. Colonization of plastic marine debris by sessile organisms provides a vector for transport of alien species in the ocean environment and may threaten marine biodiversity. There is also potential danger to marine ecosystems from the accumulation of plastic debris on the sea floor. The accumulation of such debris can inhibit gas exchange between the overlying waters and the pore waters of the sediments, and disrupt or smother inhabitants of the benthos. The extent of this problem and its effects have recently begun to be investigated. A little more than half of all thermoplastics will sink in seawater.
Captain Charles Moore

A third generation resident of Long Beach, California, Captain Charles Moore grew up in and on the Pacific Ocean. His father was an industrial chemist and avid sailor who took young Charles and his siblings sailing to remote destinations from Guadalupe Island to Hawai‘i. Charles attended the University of California at San Diego where he majored in Chemistry and Spanish.

After 25 years running a woodworking and finishing business, Charles founded Algalita Marine Research Foundation in 1994. In 1995 he launched his purpose designed, aluminum hulled research vessel, Alguita, in Hobart, Tasmania, and helped organize the Australian Government's first "Coastcare" research voyage to document anthropogenic contamination of Australia's east coast. Upon his return to California, he became a coordinator of the State Water Resources Control Board's Volunteer Water Monitoring Steering Committee, and developed chemical and bacterial monitoring methods for the Surfrider Foundation's "Blue Water Task Force." As a member of the Southern California Coastal Water Research Project's Bight '98 steering committee, he realized the need for and provided a research vessel so that Mexican researchers from Baja California could participate for the first time in assessing the entire Southern California Bight.

Oceanographic Research Vessel Alguita and its Captain found their true calling after a 1997 yacht race to Hawai‘i. On his return voyage, Captain Moore veered from the usual sea route and saw an ocean he had never known, "every time I came on deck to survey the horizon, I saw a soap bottle, bottle cap or a shard of plastic waste bobbing by. Here I was in the middle of the ocean, and there was nowhere I could go to avoid the plastic." Ever since, Captain Moore has dedicated his time and resources to understanding and remediating the ocean's plastic load. Along with collaborators from the Southern California Coastal Water Research Project he developed protocols for monitoring marine and beach micro-plastics which are now used from the remote beaches of Polynesia to the five subtropical gyres of the world ocean.

He is the lead author of two scientific papers published in Marine Pollution Bulletin:


The first paper documented his 1999 study, which shocked the scientific world when it found 6 times more plastic fragments by weight in the central Pacific than the associated zooplankton. His second paper found that plastic outweighs plankton by a factor of 2.5 in the near coastal surface waters of Southern California.

He is also the sole author of a review article in the October, 2008 issue of Environmental Research, “Synthetic polymers in the marine environment: A rapidly increasing, long term threat,” and along with Richard Thompson, Fred vom Saal and Shanna Swan, edited the July 27, 2009 Theme issue of the Philosophical Transactions of the Royal Society B titled “Plastics, the environment and human health.”

Captain Moore has now done ocean and coastal sampling for plastic fragments over forty thousand miles of the North Pacific Ocean, across 22 degrees of latitude and 70 degrees of longitude. His latest 10,000 mile voyage took him and his crew two-thirds of the way to Japan across the International Dateline. Captain Moore's work has been highlighted in numerous major media outlets, including ABC’s Nightline, Good Morning America, the Late Show with David Letterman, and the Colbert Report.
Daniel D. Darrach

With the U.S. Department of State, Daniel D. Darrach is the Office Director in the Bureau of Oceans, Environment and Science’s Office of Science and Technology Cooperation. A Senior Foreign Service Officer since 2003, his most recent assignments include Coordinator for US-Mexico Border Affairs, American Citizen Services Chief in Frankfurt, Germany, Consular Section Chief in Monterrey, Mexico and Country Director for Colombia and Venezuela as an Exchange Officer in the Office of the Secretary of Defense. He also has had assignments in Caracas, Venezuela; Montevideo, Uruguay; Guadalajara, Mexico; St. Johns, Antigua; and Cd. Juarez, Mexico as well as the State Department's Bureau of Intelligence and Research. He is an Honors Graduate of the University of Oklahoma and Distinguished Graduate of the Marine War College. He holds five State Department Meritorious Honor Awards and one Superior Honor Award. He is married and has three children.

Abstract now available at time of printing
This is the story behind an initiative to influence federal energy policy, industry, and the public, through dialogue and education. This grass roots effort was born out of a belief that individual professionals, engineers, and scientists without bias, can, and indeed should, have an impact on U.S. Energy Policy.

The goal of the movement is to create an opportunity for a greener, balanced, shock resistant energy future. The political reality is that we face a new administrative philosophy favoring greater transparency, less lobbying, and more scientific analysis. The federal agenda is to encourage cleaner fuel by reducing CO2 and begin a transition to a broader renewable energy base.

The U.S. Energy Policy Coalition’s Mission is:

“To Assist the Federal Government in the analysis, evaluation, and formation of a long term, greener, shock resistant, U.S. Energy Policy. To educate and inform policymakers on energy choices available in forming an economic bridge to the future.”

Our approach will be to utilize existing industry, environmental, and academic research from the public domain to develop multi-dimensional analysis and dialogue of different energy choices against a consistent set of criteria. We have structured the movement to have a core group of generalists (6 to 8) ... scientists, engineers, and policy specialists, who will address the macro issues of energy choices and their benefits and opportunities through what we term as Energy Option Analysis. The secondary tier of the initiative will consist of professional society committees and subcommittees that will handle detailed analysis of complex issues, and give the Core Group feedback to be presented to Policy Makers.

SME is our primary sponsor, but we are gathering sponsoring societies as we speak. Our ultimate desire is to develop and present informed and unbiased views on behalf of our sponsoring technical societies. We are not lobbyists, nor do we represent specific commercial interests. Rather, we are experienced professionals/scientists, leaders, and caring citizens.

Richardson brings with him a strong domestic and international management record in successful development, start-up, and management of foreign operations. He is experienced in a variety of natural resources including minerals, metals, ocean mining, and hydrocarbons in Africa, Mexico, Ecuador, Kazakhstan, Indonesia and the United States. With excellent contacts, resources and knowledge of diverse foreign markets and governments, Richardson speaks English, Spanish, some Russian, and Afrikaans. From 2000-2008 he has either chaired or co-chaired the program committee of the Society of Mining and Exploration for the Offshore Technology Conference, the largest technical gathering of the international oil, gas and mining industry in the world. From 1995 to 1997 Richardson was Program Director of Kazakhstan Project for IHRDC (International Human Resources Development Corp). From 1976 to 1993 for Oryx Energy, Richardson was Chief Representative for Oryx Kazakhstan, President of Oryx Mexico and Managing Director and General Manager Oryx Ecuador. His early career began with Utah International and later with Kaiser Exploration and Mining Company. He held such position as Senior Exploration Geologist, Rocky Mountain District. Prior positions included Chief Geologist for Minerals and Fuels, as well as Project Manager in South Africa (Kaiser Exploration), and Chief Geologist for uranium exploration for Utah International. Richardson currently is involved as the founder of the U.S. Energy Policy Coalition sponsored by the Society of Mining, Metallurgy and Exploration (SME), which is attempting to better educate U.S. Policy Makers on future energy options. Richardson holds a BA in Geology from the University of Colorado, and an MS in Economic Geology from the University of Arizona.
ECONOMIC IMPACTS OF SEA WATER AIR CONDITIONING TO HAWAI'I

Neil Abranyi¹, Craig S. Coleman¹,² and Denise E. Konan¹,²

¹University of Hawai‘i Economic Research Organization (UHERO)
²Energy and Greenhouse Gas Solutions (EGGS)
Honolulu, Hawai‘i USA
¹abranyi@hawaii.edu

The objectives of this research are to investigate the economic impacts of a Waikiki-district seawater air conditioning (SWAC) system. This study will evaluate SWAC’s impact on tourism related sectors in Waikiki, in addition to the electricity related utilities, on the island of Oahu and relevant statewide sectors. Methods include a series of Waikiki interviews, surveys, state and local data analysis and variance interpretation between current and proposed technologies. Interviews will be conducted on possible stakeholders and users of the new system. The significance of this project is supported by the importance of tourism related sectors to Hawai‘i and the need to minimize impact on the fragile and unique habitat at the proposed marine site of the SWAC system. While the need for alternative energy and renewable resources are extremely important for limiting our dependence on fossil fuels and their negative impacts, so is the need for determining which alternatives are environmentally and economically sound themselves. As with conventional energy production, there are environmental and economic issues to be considered.

FREE-LIVING SYMBIODINIUM BIOGEOGRAPHY AT HABITAT AND REGIONAL SPATIAL SCALES

Lisa M. Adams¹, Misaki Takabayashi¹, Xavier Pochon², Ruth D. Gates² and Vivian Cumbo³

¹Marine Science Department
University of Hawai‘i at Hilo
Hilo, Hawai‘i, USA
lisaadam@hawaii.edu

² Hawai‘i Institute of Marine Biology, University of Hawai‘i at Manoa; Honolulu, Hawai‘i
³School of Marine and Tropical Biology, James Cook University

Free-living Symbiodinium are essential to coral reef ecosystems as sources of endosymbionts for hosts acquiring their endosymbionts anew each generation and repopulating those that have lost their endosymbionts because of bleaching. We used a stringent field sample isolation technique and direct molecular detection method to investigate the diversity and distribution patterns of free-living Symbiodinium types at several Pacific sites as well as Florida. We found large and small-scale spatial patterns in the genetic diversity of free-living Symbiodinium in the surface water and sediments of Hawaii and Florida. Also, in Okinawa, Japan, we found asymbiotic coral larvae acquired sediment-associated Symbiodinium earlier and in more abundance than Symbiodinium residing in the water. The distribution and diversity patterns of Symbiodinium at our study sites are important because of the varying levels of dependence on free-living Symbiodinium at these locations due to relative abundance of hosts with different Symbiodinium acquisition techniques and varying susceptibility to bleaching. The abundance and diversity of free-living Symbiodinium may ultimately influence a reef’s resiliency and recovery from bleaching.
COMPARING NUTRIENT – GROUNDWATER – PHYTOPLANKTON RELATIONSHIPS OFF EAST AND WEST HAWAI’I ISLAND

Jason E. Adolf, Topaz P. Collins and Judy K. Walker

University of Hawai’i at Hilo
Department of Marine Science
Hilo, Hawai’i, USA
jadolf@hawaii.edu

On Hawai’i Island (‘The Big Island’), the presence of submarine groundwater discharge (SGD) has a demonstrated impact on the physical and chemical structure of coastal marine waters. In West Hawai’i, SGD is a dominant source of freshwater and nutrients to coastal waters, while both surface and ground water have significant impacts on the physical-chemical environment along the coast of East Hawai’i. Less is known about the biological impacts of SGD in waters around Hawai’i Island. We have been examining the relationship between SGD and coastal phytoplankton around Hawai’i Island, focusing on Hilo Bay (East Hawai’i) and Pauoa Bay (West Hawai’i). Both bays showed salinity – nutrient relationships characteristic of SGD, although groundwater nutrient levels were 2-3 fold higher at Pauoa Bay compared to Hilo Bay. The two systems showed different patterns of phytoplankton dynamics (biomass and taxonomic composition). In both environments, the influence of SGD on phytoplankton is likely modulated by physical conditions determining water residence time. Ongoing research will include GIS-based dataflow mapping and real-time continuous monitoring buoys.

MARINE SPATIAL PLANNING: CHARACTERIZING SHIPWRECKS IN THE GRAVEYARD OF THE ATLANTIC

David W. Alberg

NOAA/Office of National Marine Sanctuaries
Newport News, Virginia, USA
david.alberg@noaa.gov

The waters off Cape Hatteras, North Carolina lie at the congruence of two major currents. Here, turbulent ocean conditions have taken thousands of vessels to the bottom in an area known as the “Graveyard of the Atlantic”. Recognizing that this area holds unique national significance, the Office of National Marine Sanctuaries has begun a cultural resource assessment of the shipwrecks lost in the Graveyard of the Atlantic, focusing primarily on WWII shipwrecks lost during the Battle of the Atlantic. As a first step towards the development of a management strategy for these resources, the Monitor National Marine Sanctuary has begun a comprehensive GIS and marine spatial planning project to help managers determine such things as the condition, locational relationship, historical context, users, etc. of these shipwrecks. These wrecks serve as invaluable cultural resources but many are popular dive sites and are important to coastal North Carolina’s economic welfare. This project will be critical in the long range decision making process for resource managers as they consider such things as enforcement strategies, new sanctuary designation/expansion, etc.
RESEARCH ON THE RESTRAINT METHOD OVER STRUCTURE MOVEMENT OF FLOATING AQUACULTURE FACILITIES

Munetoshi Aminaka¹, Motohide Tochino², Masashi Miyagawa³, Sadamitsu Akeda⁴, Hee-Do Ahn⁴ and Yoshihiro Suenaga⁵

¹Graduate School of Engineering
Kagawa University
Hayashi, Kagawa, Japan
s09g401@stmail.eng.kagawa-u.ac.jp

²Kagawa Prefectural Fishery Research Institute
³Fisheries Research Agency
⁴Korea Ocean Research and Development Institute
⁵Faculty of Engineering, Kagawa University

Valuable rockfish juveniles with hiding behavior reared in the floating aquaculture facilities decreases due to the stress from structure movement of the floating facilities caused by irregular and continuous ocean waves. Some methods to reduce structural movement was developed and attempted, however, it cost a large amount of money and effort. A more effective technology was required for reducing structural movement. Thus, we developed the technology that can reduce structural movement by absorbing the wave energy. This principle reflects the natural frequency of the oscillating wave column which is determined not by its volume but by its length. We found that adjusting the length of the oscillating water column to the natural frequency of incoming wave will absorb the wave energy most effectively.

DISASTER PLANNING AND EVACUATION RESPONSE – CASE STUDY OF HONOLULU TSUNAMI WARNING AND INTELLIGENT TRANSPORTATION SYSTEMS

Kekoa Anderson and Seri Park

Tetra Tech, Engineering & Architectural Services
Irvine, California, USA
kekoa.anderson@tetratech.com

With recent changes in the environment, growth in population densities, and potential human and natural disasters, the need for preparedness has become a focal point of research. Several studies have been conducted regarding the forecasts of catastrophes, especially in monitoring weather and site changes, various algorithms have been successfully implemented. However, even with an accurate prediction model, if timely reaction and evacuation in response to such threats are not well coordinated, the result could be significantly fatal. This paper covers a comprehensive analysis of traffic operation in the event of tsunami in Honolulu, Hawaii as a case study. Effectiveness of a controlled traffic routing under such an event is also discussed with the use of Advanced Traveler Management and Information System (ATMIS) through simulation application. The objective of this paper is to develop/evaluate the evacuation routing via ATMIS through case study and to enhance and improve the overall evacuation process. With suggested future recommendations, this paper can be of great use as a guideline in preparing a successful emergency evacuation system.
THE FEASIBILITY OF MAKING DEEP-OCEAN MEASUREMENTS USING LASER INDUCED BREAKDOWN SPECTROSCOPY (LIBS)

Stanley M. Angel, Marion Lawrence-Snyder and Christopher Gordon

Department of Chemistry & Biochemistry
The University of South Carolina
Columbia, South Carolina, USA
angel@mail.chem.sc.edu

Laser-induced breakdown spectroscopy (LIBS) has been demonstrated for bulk aqueous analysis at pressures above 400 bar, corresponding to an ocean depth of 4 km. Studies have shown the ability of LIBS in detecting many group I and group II elements, as well as certain transition metals. However, enhancement methods are needed to extend the technique to a wider range of relevant elements and to higher pressures. One way to enhance the LIBS signal is to use pairs of sequential laser pulses (DP LIBS). In this technique a vapor bubble is formed in solution by a first laser pulse, and a second laser pulse is used to excite a plasma in the bubble. DP LIBS requires careful control over the size and position of the vapor bubble and overlap of the laser pulses. Thus far we have demonstrated DP LIBS in bulk aqueous solution up to about 138 bar. In this paper we will discuss the effect of focusing optics on the reproducibility of the LIBS water signal, and possible extension of the technique to higher pressures. These results have implications to the use of LIBS for deep-sea oceanographic research.

THE NATIONAL MARINE SANCTUARY SYSTEM'S ROLE IN COASTAL AND MARINE SPATIAL PLANNING

John Armor

NOAA
Silver Spring, Maryland, USA
john.armor@noaa.gov

Protecting and managing special areas of the marine environment is a key component of any comprehensive coastal and marine spatial planning effort. Over the last 35 years, NOAA has been able to use the National Marine Sanctuaries Act to provide effective protection for many important parts of our marine environment while at the same time accommodating compatible economic uses. In this way, NOAA has shown the National Marine Sanctuary System to be a powerful tool in furthering the dual coastal and marine spatial planning goals of allowing for access to and economic use of the marine environment while protecting it and managing it for sustainability. This presentation will: 1) provide a basic overview of the system and the benefits sanctuaries have for the marine environment and local economies; 2) describe how the system is used in the broader context of national and regional planning including how it used in conjunction with other statutes with a broader geographic reach; and 3) describe how it is used at a local level to manage human activities at a very fine scale to achieve resource protection goals.
OVERVIEW OF SPECIFIC RENEWABLE ENERGY PROJECTS – CAPE WIND AND HAWAI’I INTER-ISLAND SUBSEA POWER CABLE

Theresa P. Bell
Minerals Management Service
Camarillo, California USA
theresa.bell@mms.gov

Under the Energy Policy Act of 2005, the Secretary of the Interior gave the authority to regulate a broad spectrum of activities on the Outer Continental Shelf (OCS) to the Minerals Management Service (MMS). Under that authority, the MMS oversees the production, transportation, or transmission of energy from sources other than oil and gas, involving renewable energy. The presentation will discuss two projects under this authority: Cape Wind, a wind turbine project offshore Massachusetts recently approved by the Secretary of the Interior, and the Hawai’i inter-island subsea power cable project currently being discussed to transmit power from onshore wind farms to demand centers on Oahu. We will discuss some of the obstacles such projects face and the importance of broad coordination and consultation. The right-of-way grant process associated with power cables will also be discussed.

RENEWABLE ENERGY PROGRAM STUDIES

Theresa P. Bell
Minerals Management Service
Camarillo, California USA
theresa.bell@mms.gov

The paper will summarize ongoing research for Minerals Management Service’s (MMS) Environmental Studies Program (ESP) and Technology Assessment & Research (TA&R) Program in support of Renewable Energy. The MMS oversees development of offshore renewable energy projects on the Outer Continental Shelf (OCS). This new activity in the marine environment requires an assessment of the potential environmental impacts to resources on the OCS. Through the ESP, MMS collects information to be used in this assessment. The ESP conducts research across the spectrum of the physical, biological and socioeconomic environments as required by the OCS Lands Act (OCSLA) and the National Environmental Policy Act of 1969 (NEPA). Additionally, the TA&R Program is a research element encompassed by the MMS Regulatory Program. The TA&R Program was established to ensure that industry operations on the OCS incorporated the use of the Best Available and Safest Technologies subsequently required through the 1978 OCSLA amendments. The TA&R Program supports research associated with operational safety, engineering standards and pollution prevention. This includes the Renewable Energy Program.
IS THE TERM, 'CLIMATE' TOO UNSPECIFIC FOR A FRUITFUL DISCUSSION?

Arnd Bernaerts

Hamburg, Germany
dr.arnd@gmail.com

While the debate on the climatic change issue has reached unprecedented global prominence over the recent years, the content is often a fierce clash of opinions rather than a fruitful discussion. One reason could be the use of insufficiently defined terms in climatology. The key term ‘climate’ is used by lay persons, politics, and science alike, while the U.N. Framework Convention on Climate Change (1992) does not define the term at all. Instead the Convention defines ‘climate change’ and ‘climate system’, which does not necessarily mean that it makes the terminology more definite. This requires looking at the ordinary meaning as used since Ancient Greek and how science explains the terms nowadays, and whether it is done in a manner that avoids confusion, or misleading interpretation. As science is supposed to define and use terms and definitions with care, the current situation may require that the major terms used in climatology are revised.

PACIFIC COOLING FROM 1943-1970; INFLUENCED BY NAVAL WAR?

Arnd Bernaerts

Hamburg, Germany
dr.arnd@gmail.com

Was the Naval War in the Pacific from 1943-1945 not only devastating to man and material, but did it also altered substantially the structure of the sea surface layer with a subsequent impact on the air temperatures? Until now the question has received little attention although it is evident that a rising trend prior the early 1940s turned into a decreasing mode for three decades until the mid 1970s by about 1943. While the impact of screw driven vessels since their invention in the 19th Century on the sea surface structure is difficult to assess, the naval war in the Pacific from 1943-1945 could be regarded as a large-scale ‘field experiment’ due to the suddenness, the hugeness and the intensity it penetrated the ocean to considerable depths. Naval operations and available sea and climate data need to be identified, linked, evaluated and discussed. What impact had the Pacific War on climate? It seems time to pay attention to the matter.
THE ARCTIC EUROPEAN WINTERS 1939/40-941/42 CAUSED BY NAVAL WAR?
HOW TO SUBSTANTIATE?

Arnd Bernaerts
Hamburg, Germany
dr.arnd@gmail.com

By analyzing the structure of the temperature records in the sphere of the North and Baltic Sea it can be shown that the sudden climatic shift 70 years ago is intertwined with the naval activities of WWII. It caused the coldest winters for more than 100 years. The examination of air temperature data series (Nasa/Giss) reveal that the locations most effected by extreme low temperatures were close to those sea areas with the highest naval activities, in 1939/40, The Netherlands, Denmark, and the Baltic Sea. After the invasion of Norway the Skagerrak region experienced a record cold winter 1940/41, and the severe winter conditions in 1941/42 can be attributed the Eastern Baltic Sea where naval force had been active since the German ambush on Russia in June 1941. Such three cold winters in succession have never been observed. Any confirmation or exclusion of the naval war thesis, would enhance ocean science on climatic matters, and the understanding of the reasons of the global cooling period from 1940 to the 1970s, which is still pending.

THE PACIFIC WAR AND A CLIMATIC SHIFT, 1942-1945: CORRELATION OR CAUSATION?

Arnd Bernaerts
Hamburg, Germany
dr.arnd@gmail.com

Although it is an established fact that during WWII a global cooling commenced that lasted for three decades, rarely any question have been asked, whether the significant correlation to naval activities in the Western North Pacific left a fingerprint in the temperature data at that time. As the US Navy and her Allies assembled a huge strike force since 1943 until the surrender of Japan in August 1945, their enormous range of activities at and under the sea surface could have changed the structure of sea layers at some depths considerably, either warming, or cooling the sea surface layer. The paper will discuss the circumstances during the relevant years, and analyze data sets, with the aim to demonstrate that the impact of WWII activities in the Pacific rectify to investigate the strong correlation thoroughly, as even a small contribution of naval war activities to the global cooling since 1945 should be known, understood, and a subject in the climate change debate.
THERE IS NO CAUSATION WITHOUT CORRELATION!
GLOBAL COOLING AND NAVAL WAR?

Arnd Bernaerts

Hamburg, Germany
dr.arnd@gmail.com

A better understanding of the perfect time correlation between naval activities during the Second World War and the start of a three decade long global cooling since 1940 could prove the role that anthropogenic activities may have had on the marine environment and climatic change matters. Although the global temperatures had been at the highest in the 1930s since the mid 19th Century, Northern Europe was suddenly back in the Little Ice Age after only four months in WWII. The study provides an overview of links between naval activities and a change of air temperatures, first during the extreme cold winters in Europe 1939/40, 1940/41 and 1941/42, followed by a three decade long global cooling. A significant fact of the three war winters in Europe is their appearance in succession, which is rare. As soon as the naval went global after December 1941, a simultaneous decrease of sea and air temperature throughout the Northern Hemisphere became evident. The number of links between human activities during WWII and temperature changes should not be ignored.

ENHANCING SEA GRANT'S ABILITY TO HELP COASTAL COMMUNITIES ADAPT TO CLIMATE CHANGE

Andrew P. Bohlander

University of Hawaii Sea Grant College Program
Hilo, Hawai‘i, USA
andrewbo@hawaii.edu

There is clear scientific consensus that climate change is taking place and coastal communities will need to make decisions in the coming years about adapting to the impending impacts. With limited resources, Sea Grant programs have been working with states and communities to inform policy and management decisions and to help communities prepare by considering possible strategies and actions. In order to begin to address these concerns, Sea Grant will undertake an initiative, the Sea Grant Coastal Communities Climate Adaptation Initiative (CCCAI), providing funds to conduct rapid response, community-based, climate adaptation demonstration projects in each Sea Grant state. The projects’ primary objectives will be to provide the selected demonstration communities with sufficient information to consider alternatives, enable them to make better informed decisions, and ultimately develop and implement customized solutions to the hazards and climate change challenges which threaten their economic and social well-being. Demonstration projects will be evaluated to identify best practices and enable Sea Grant to focus its subsequent efforts on those activities shown to have the greatest benefit for the target communities.
CAPTURING CULTURAL & TRADITIONAL ACTIVITIES IN MARINE SPATIAL PLANNING IN FAGATELE BAY NATIONAL MARINE SANCTUARY, AMERICAN SAMOA

Genevieve A. Brighouse

Fagatele Bay National Marine Sanctuary Program
Pago Pago, American Samoa
Gene.Brighouse@noaa.gov

Established in 1986 in partnership with the American Samoa Government, Fagatele Bay National Marine Sanctuary, south of the equator and one of the 14 sites in the national sanctuary system – confronts opportunities to bridge cultural and traditional processes in marine spatial planning with current efforts in management plan review. While Fagatele Bay NMS is in the process of management plan review, discussions at the village level have been paramount in addressing traditional and cultural values via marine spatial planning as a tool. Recognizing local customs in marine ecology and traditional practices similar to the Hawaiian culture, such as ‘tapu’, species and seasonal prohibitions, marine spatial planning allows traditional leaders and managers to capture ‘special’ zoning of cultural use and practices in enhancement of the existing site at Fagatele Bay and other potential sanctuary sites. This paper will offer a case study of how the site has bridged the concept of marine spatial planning into our village stakeholder process that will later translate to policy and mapping of areas for improved marine conservation in AS.

IMPLEMENTING CHANGES TO REDUCE GLOBAL SHIPPING AIR POLLUTION

Sherry P. Broder

Law Offices of Sherry P. Broder
Honolulu, Hawai‘i USA
sherrybroder@sherrybroder.com

The Global Shipping Fleet makes very significant contributions to air pollution and the climate crisis. The shipping industry serves as the backbone of global commerce and has greatly expanded in the last 25 years, particularly in the Pacific. Today more than 90 percent of global trade is carried by sea. The Global Shipping Fleet is virtually unregulated: yet it burns bunker fuel, which is unrefined, the dirtiest fuel on the market, and a major source of GHG, particulate matter, and other harmful substances. Reducing shipping emissions is critical to protecting the oceans and human health. The IMO and Pacific Nations can and should require emission standards and the use of best green and blue technologies.
MARINE SPATIAL PLANNING: A MANAGEMENT TOOL
FOR MULTIPLE-USE MARINE PROTECTED AREAS

Billy D. Causey

NOAA / Office of National Marine Sanctuaries
Key West, Florida, USA
Billy.Causey@noaa.gov

When the US Congress designated the Florida Keys National Marine Sanctuary (FKNMS) in November 1990, they directed NOAA to “consider temporal and geographical zoning, to ensure protection of sanctuary resources” in the development of a management plan. At the same time, Congress directed NOAA to “facilitate all public and private uses of the sanctuary consistent with the primary objective of sanctuary resource protection.” National Marine Sanctuaries are multiple-use MPAs, where commercial and recreational activities take place. The Florida Keys are one of the world’s most visited dive destinations and touted as the recreational fishing capital of the world. Besides tourism, commercial fishing is the second largest industry in the Keys. In order to accomplish one of the purposes Congress stated for Sanctuaries, which is “to maintain, restore, and enhance living resources by providing places for species that depend upon these marine areas to survive and propagate,” the FKNMS implemented this nation’s first comprehensive marine zoning plan. Marine zoning is one of several MSP tools used in the FKNMS that will be described in this paper.

POPULATION CONNECTIVITY PATTERNS
OF TWO MARINE MICROGASTROPOD SPECIES IN HAWAII

Nancy Chaney¹ and Marta deMaintenon²

University of Hawai‘i at Hilo
¹Tropical Conservation Biology and Environmental Science Program
²Department of Marine Science
Volcano, Hawai‘i, USA
¹chaney@hawaii.edu

Connectivity among populations of benthic marine organisms in Hawai‘i is poorly known. To help understand whether geographic distance is related to genetic distance in Hawai‘i’s coastal marine environment, I sampled populations of two species of micromollusks, Peristernia chlorostoma and Mitrella fusiformis (superfamily Buccinoidea), from thirteen locations on four islands spanning the main Hawaiian Islands. Both species have larvae that lack a planktonic stage, potentially limiting their dispersal ability. Resulting cytochrome oxidase I (COI) DNA sequences show evidence that there is clustering of haplotypes within locations, but these patterns vary between species. These data support the concept that some direct developers form distinct, localized populations, and that connectivity between populations may be very low. Understanding population connectivity of these gastropods may provide information important to understanding other species possessing non-planktonic development and help to utilize these patterns within the context of marine conservation.
STUDY ON LIFE HISTORY OF THE SEMICIRCLE ANGELFISH 
*Pomacanthus semicirculatus* IN TAIWAN

Chih-Wei Chang¹ and Lu-Peng Wang²

¹National Museum of Marine Biology and Aquarium  
Checheng, Pingtung, Taiwan  
changcw@nmmba.gov.tw

²Institute of Marine Biodiversity and Evolutionary Biology  
National Dong Hwa University

Life history traits of reproduction, early life history, age and growth of the semicircle angelfish *Pomacanthus semicirculatus* (Pomacanthidae) collected from the by-catch of inshore fisheries in Taiwan were elucidated by examinations of gonad and otolith. Body colorations of a sum of 646 semicircle angelfish could be categorized into the juvenile, pre-transition, post-transition and adult coloration stages. Lengths at sexual maturity and spawning seasons of the fish differed among sites. Transition of nutrients supply and timing of larval settlement in early life stage of fish was at ca. 6th and 13th day post-hatching. Otolith growth rings were evidenced to be deposited annually between December and January by the marginal increment analysis. Maximum ages of the fish were determined to be 21-23 yrs. The asymptotic lengths and growth coefficients of the von Bertalanffy growth formula were 401.7-476.1 mm and 0.12-0.16 yr⁻¹, with lengths at sexual maturity occurred after the maximum growth rate in body weight. In general, the semicircle angelfish was of slow growth and late reproductive investment.

EYES ON CORAL REefs (ECOR):  
LONG TERM CORAL REEF OBSERVATION IN TAIWAN

Chienhsun Chen, Shih-Hu Ho, Li-Fang Huang, Chiungjung Tseng,  
Grace Hwu and Wei-Ping Hou

Taiwan Ocean Research Institute  
National Applied Research Laboratories  
Taipei, Taiwan  
d91241002@ntu.edu.tw

Coral reefs are considered as one of the most critical marine resources; however, they are under great stress in Taiwan. To understand the effects of threats on coral reefs, Taiwan Ocean Research Institute of the National Applied Research Laboratories is conducting a multidisciplinary project to monitor the changes of coral reefs around Taiwan. A self-developed airborne image system will be applied to examine benthic community structure of the coral reef over large area, which is more efficiently than conventional methods. Integrated oceanographic stations that incessantly gather the chemical parameters of the oceanic environments for direct, near real-time monitoring of coral health will be deployed near the main reef area off Taiwan. In addition, we developed a real-time underwater video system to unobtrusively document biological process that is central to ecological and environmental sciences in general conditions. The system will also be used to record the destruction of coral reef communities vividly during a catastrophic typhoon. The combination of multidisciplinary approaches may provide insight to better resolutions concerning the conservation of the underwater assets of Taiwan.
Coral reefs are fundamentally important ecosystems worldwide. The importance of reef-building corals to coral reefs cannot be overstated. They are key reservoirs of global biodiversity and are of great economic significance to many countries. However, they are threatened with global decline due to a variety of factors, including overfishing, reduced water quality and the global warming. The results of all these threats used to result in the phenomenon of coral bleaching, which then leads to decreased reproduction and growth, increased susceptibility to disease and dramatically increased mortality of coral reefs. The session aims to stress the critical importance of Coral Reefs in Indo-Pacific Ocean by integrating research presentations from a variety of disciplines including Ecology, Cell & Molecular Biology, Natural Products, Conservation, Coral Reefs fishery, Physical & Chemical Oceanography and Education. The goal is to promote Coral Reefs studies from conservation to fundamental coral biology and education, and to initiate international and interdisciplinary researches in the future.

STRATEGIES OF NATIONAL MUSEUM IN PROMOTING CORAL REEF CONSERVATION

Yung-Hui Chen, Ming-Chin Liu and Hai Chiang

1Science Education Department
2Department of Exhibition
National Museum of Marine Biology and Aquarium
Pingtung, Taiwan
yhchen@nmmba.gov.tw

National Museum of Marine Biology and Aquarium (hereafter as NM MBA) adopts different strategies in designing exhibition on marine and aquatic ecosystems, cooperating with profit and non-profit organizations and installing multimedia learning materials on the official web site to promote coral reef conservation. Three exhibition buildings are contracted and transferred to the private company for the visitor services all year around. The government sector is therefore concentrated its efforts to the core missions-scientific research and education. By cooperating with National Dong Hwa University, NM MBA has established two academic institutes focused on the studies on coral reef including the aquaculture of corals. Furthermore, education departments cooperate with non-profit organizations to conduct training programs for educators and to carry out educational activities nation-wide. NM MBA has also constructed abundant of subject-orientated learning on marine life on websites for the public at all ages through internet. In short, NM MBA has efficiently promoted the conservation of coral reef by seeking any possible cooperation with different partners to achieve the goal in both research and education.
SUBMARINE LANDSLIDE HAZARD EVALUATION OFFSHORE OF SOUTHWESTERN TAIWAN

Jui-kun Chiu, Francy Kuo and Jeff Huang

Taiwan Ocean Research Institute
National Applied Research Laboratories
Taipei, Taiwan
jkchiu@narl.org.tw

Many submarine landslides were triggered after typhoons or earthquakes occurred offshore of Taiwan. In 2006, more than 9 submarine cables offshore of southern Taiwan were broken by submarine landsides triggered by the Hengchun Earthquake. In 2009, more than 5 submarine cables in the same area were cut after Typhoon Morakot hit Taiwan. The locations with the most broken cables in the two events were along the Kaoping Submarine Canyon. As a result, the submarine landslide hazard maps (or mudslide susceptibility maps) offshore of southwestern Taiwan were created to attempt to reduce loss of the submarine cables broken. The geophysical data (e.g. swath multibeam bathymetry, shallow sub-bottom profiles) and geological data (sediment coring, sediment flux) were collected and integrated into the GIS. The research results will provide important information for future planning on submarine cable deployment and protection.

MODIFIED PROBABILITY DENSITY FUNCTIONS OF TIDAL ELEVATION DATA

Hongyeon Cho¹, Shintaek Jeong², Daehee Park² and Kangpyo Cho²

¹Marine Environment and Pollution Prevention Department
Korea Ocean R&D Institute
Seoul, Republic of Korea
hycho@kordi.re.kr

²College of Engineering, Wonkwang University

The frequency information of tidal elevation in the coastal zone is very important in the coastal development, the ecological aspects and the tidal energy estimation. Double-peak (bi-modal) normal distribution function having four parameters was suggested as the probability density function (PDF) of tidal elevation data in Korean coastal zone. However, it has no limit of the tidal elevation and shows a little bit poor-fit in the low-frequency region. The truncated PDF was already suggested in order to limit the tidal elevation data. In this study, the modified PDF is suggested to improve the poor-fit pattern in the tail areas of the existing PDF based on the weighting-method. This method is the inverse frequency method having different weighting factors with respect to the data frequency. The higher the frequency of tidal elevation data is, the lower the weighting factor. This new method is tested by using hourly tidal elevation data and checked the goodness-of-fit level of the tail areas of PDF. It is clearly improved of that region, whereas slightly diminished in the other frequency areas.
REPRODUCTIVE EFFORT OF MANILA CLAM, *Ruditapes philippinarum*
SURVEYED IN 2009 SUMMER SPAWNING PERIOD

Kwang-Sik Choi¹, Hyun-Sung Yang¹, Hee-Jung Lee¹,
Hyun-Ki Hong¹ and Chang-Keun Kang²

¹Faculty of Marine Biomedical Science
Jeju National University
Jeju, Korea
skchoi@jejunu.ac.kr

²School of Environmental Science and Engineering
Pohang University of Science and Technology
Pohang, Gyungbuk, Korea

Manila clam, *Ruditapes philippinarum* is endemic to the Yellow Sea commonly occurring in coastal tidal flats or sand beaches. Previous studies have reported that Manila clams in Korean waters spawn as early as in May and continue until mid October. In June 2009, we surveyed gonad maturation and estimated reproductive effort using histology and an immunological probe. Reproductive effort of each clam was assessed using indirect enzyme-linked immunosorbent assay (ELISA) using the rabbit anti-clam egg protein IgG as the primary antibody. For histology, a transverse section was cut from each clam used in ELISA assay. Histology revealed that there was a strong variation in gonad maturity by locations, although most of clams were ripe and ready for spawn in most cases. Histology data also indicated that clams exhibiting poor gonad maturation and low GSI were associated with heavy infection with parasitic organisms such as *Perkinsus olseni* and *Cercaria sp*. The data obtained in this survey suggested that various internal and external parameters govern gonad development, which are spatially variable.

ANNUAL VARIATION OF THE COCKLE, *Fulvia mutica*,
IN CHEONSU BAY OFF THE WEST COAST OF KOREA

Kwang-Sik Choi¹, Hyun-Sung Yang¹, Do-Hyung Kang² and Heung-Sik Park²

¹Faculty of Marine Biomedical Science
Jeju National University
Jeju, Korea
skchoi@jejunu.ac.kr

²Marine Living Resources Research Department, KORDI, Seoul, Korea

The annual reproductive cycle and subsequent changes in tissue biochemical composition of cockle, *Fulvia mutica* was investigated over 12-month periods in Cheonsu Bay. Histology revealed that spawning was rather asynchronous; mature sperm released from the testis was first observed in late April, while spawning in ovaries was first observed in late May. Resting individuals could be seen August to February. The condition index (CI), a ratio of dry tissue weight to the shell dry weight, increased gradually from late May, peaked in early July and declined dramatically late July to the end of September. The rapid decrease in CI in late summer was matched with dispatching the gametes through spawning. Early developing eggs could be seen in November, suggesting that gametogenesis initiated as early as November. The annual gametogenesis of *F. mutica* observed in this study suggests that the currently established suspended fishing period of in the Bay from July to September needs to be re-stated as May to September to protect the spawning brood stocks.
LIFE CYCLE ANALYSIS OF GREENHOUSE GAS EMISSIONS FROM ELECTRICITY PRODUCTION VIA BIOFUELS

Craig S. Coleman, Kanae Tokunaga, Paul Bernstein, Emily Makini, and Denise E. Konan

University of Hawai‘i Economic Research Organization (UHERO)
University of Hawai‘i at Manoa
Honolulu, Hawai‘i, USA
craigc@hawaii.edu

By the year 2030, the State of Hawaii plans to reduce fossil fuel use by 70% (30% through energy efficiency and 40% through renewable energy). It also intends to produce significant amounts of electricity from biofuel. Tightly related to energy, though not entirely, the State is acting to reduce greenhouse gas emissions (GHGs) to 1990 levels by the year 2010 (Act 234). A common concern is how do GHGs compare between fossil fuel energy production and energy produced from agricultural products when considering their respective life cycles. To address this concern there has been a strong growth in what is now called life cycle analysis (LCA); these analyses account for inputs and outputs all along the value chain, and then compare the net sums. In this study, we report our findings from a LCA of GHGs from electricity production via a selection of biofuels compared to fossil fuel sources.

PROJECT TO CLEAN UP THE "GARBAGE PATCH" IN THE NORTH PACIFIC

Mary T. Crowley\textsuperscript{1} and Karen J. Geisler\textsuperscript{1, 2}

\textsuperscript{1}Project Kaisei/Ocean Voyages Institute
Sausalito, California, USA
mary@projectkaisei.org

\textsuperscript{2}MAS MBC Program, Scripps Institute of Oceanography, La Jolla, California, USA

Following an expedition to the North Pacific Gyre in 2010, Project Kaisei in partnership with Scripps Institute of Oceanography, is continuing research the effects of plastic pollution and marine debris on the health of the oceans and marine life. The aim of Project Kaisei is multi-faceted: primarily to raise global awareness of these issues through multiple channels; to support these findings with scientific research; and to apply new technologies in a number of ways. These range from the location and identification of areas of pollution using satellite mapping and computer modeling, to the capture and collection of plastic debris and the determination of best methods for potential recycling and fuel conversion opportunities. To accomplish these objectives, Project Kaisei seeks to bring together public and private partners to collaborate in the design, testing and implementation of breakthrough technologies in order to successfully address the issues of mitigation, remediation and prevention.
HIGH RESILIENCE OF A FRINGING CORAL REEF INFLUENCED BY INTERNAL TIDE-INDUCED UPWELLING

Tung-Yung Fan¹, Yu-Chieh Hsieh² and Yi-Ting Cheng²

¹National Museum of Marine Biology and Aquarium
Checheng, Pingtung, Taiwan
tyfan@nmmba.gov.tw

²Institute of Marine Biodiversity and Evolution
National Dong Hwa University
Checheng, Pingtung, Taiwan

Reproduction and recruitment play important roles in maintaining the resilience of coral reefs. A fringing coral reef well developed in Nanwan Bay, southern Taiwan. The reef is influenced by internal tide-induced upwelling which causes regular temperature drops of 4-6°C within 6h during the spring tide in summer. Reef corals release gametes from March to October. The major mass spawning occurs in April and May with more than forty species releasing gametes in each month. More than five brooding species release larvae throughout the year. Two species, Pocillopora damicornis and Seriatopora hystrix, show adaptive plasticity of larval release timing. Their larval release peaks in the full moon and spring tide in winter, but shifts to the first quarter moon and neap tide phase, thus avoiding the impact of upwelling. The annual coral recruitment rate is relatively high, ranged from 1298-1335 and 217-396 recruits m⁻² from recruitment tiles immersed for 2 and 6 months, respectively. The prolonged and flexible reproductive timing as well as high recruitment suggest this reef’s resilience is high although influenced by upwelling.

THE SUBMERSIBLE GAS SAMPLER

Wei Fan

Institute of Mechatronical Engineering
Hangzhou Dianzi University
Xiasha, Hangzhou, China

Abstract now available at time of printing
FIRST USE OF THE NEREUS HYBRID UNDERWATER ROBOTIC VEHICLE (HROV) IN THE SOUTHERN MARIANA REGION

Patricia Fryer

University of Hawai‘i at Manoa
Institute of Geophysics and Planetology
Honolulu, Hawai‘i, USA
pfryer@hawaii.edu

The first field test of the new Woods Hole Oceanographic Institution’s HROV “NEREUS” (named for Greek sea god Nereus), with 11 km operating-depth capability, took place in June-July, 2009 in the southern Mariana region. NEREUS is designed to operate as either an untethered autonomous underwater vehicle (AUV), or can be converted at sea into a remotely operated vehicle (ROV) tethered to the surface ship. It was successful in reaching the world’s greatest ocean depth (10,900 m) in the Challenger Deep. We also studied and brought back geologic and biologic samples from extinct volcanoes of the inner slope of the Mariana trench and from an active arc volcano near the southern Mariana backarc spreading center. The vehicle can carry a variety of sensors in either mode and, as an ROV, has a manipulator, thus can carryout experiments on the seafloor or in the water column anywhere in the world. It is useful at any water depth and has great potential for use under sea ice because of a unique tethering system. See http://www.whoi.edu/page.do?pid=10822 for more details.

INCREASE IN THE LIPID PEROXIDATION BY A WATER ENVIRONMENTAL POLLUTANT TRICHLOROETHYLENE

Koji Fujiwara¹, Kazuki Kodama¹, Yoshihiro Suenaga² and Hisao Kakegawa²

¹Graduate School Student of Engineering
²Faculty of Engineering
Kagawa University
Hayashi, Kagawa, Japan
¹s09g576@stmail.eng.kagawa-u.ac.jp

Trichloroethylene (TCE) is one of the water environmental pollutants. While TCE has been used widely as an industrial solvent for a long time, TCE has known to be toxic for creatures. However, the mechanism for toxicity of TCE has not yet been clarified. In the present study, we investigated the effect of TCE on lipid peroxidation of unsaturated fatty acids, such as oleic acid, linoleic acid and linolenic acid, and subsequent generation of unsaturated fatty acid-derived aldehydes. TCE significantly enhanced both the peroxidation of unsaturated fatty acids, especially linolenic acid, and the production of linolenic acid-derived aldehydes. To confirm whether the increases in the peroxide and aldehydes in the reactant of linolenic acid with TCE induce DNA damage, we examined the direct damage of DNA molecules by the reactant. As a result, the reactant containing these oxidative products and TCE caused DNA damage. On the other hand, TCE and linolenic acid didn't affect DNA molecules. These results suggest TCE seems to exhibit DNA damage indirectly via increasing in the lipid peroxidation of unsaturated fatty acids.
Zostera beds have important functions as water purification, and spawning and nursery grounds for valuable marine resources. In recent decades, Zostera beds have decreased dramatically from coastal reclamation, pollutant discharge from land area, and gathering up the sand from sea bed in the Seto inland Sea, Japan. Therefore, Japanese fisheries research institutes located in coastal areas have conducted planting experiments of Zostera beds. However, there are few successful outcomes for their efforts. In terms of environmental conditions, various factors must be considered for developing a Zostera bed. In this study, we tried an artificial creation of Zostera bed behind detached breakwater where wave height and energy was reduced. We observed the growth of those seeded or transferred there. Consequently we confirmed that the bed has rooted and its area has expanded through yearly fluctuation. We examined the appropriate growth conditions of the Zostera bed using field survey on the characteristics of the growth, maturation and horizontal distribution in the developed area.

In this study, we surveyed horizontal distribution of natural seagrasses by scuba diving along the coast of Shodo-shima island, second-largest island in Seto Inland Sea, Japan. We tried the quantitative evaluation from Zostera marina standing crop measured by the stratified clip method. As the result, we observed 3 kinds of seagrasses in this area. The area of Zostera beds was estimated at about 22 hectares and Zostera marina standing crop changed with the season. These results provided important information for Zostera bed creation technology in this area.
Corals form obligate endosymbioses with dinoflagellates in the genus *Symbiodinium*, a group that contains tremendous taxonomic diversity whose ecology is not random. Functional analyses reveal that taxonomically distinct *Symbiodinium* exhibit different performance optima and influence the susceptibility of corals to environmental disturbances and disease. The Adaptive Bleaching Hypothesis (ABH) proposes that corals can exploit these differences and modify their *Symbiodinium* communities as a mechanism to adapt to climate change. To evaluate the validity of this hypothesis, the *Symbiodinium* communities in corals located on two reefs in southern Taiwan characterized by different thermal regimes were analyzed using ITS2 genotyping. The corals were transplanted and maintained in a common aquarium at the NMMBA for six months and their *Symbiodinium* communities then reanalyzed. The data reveal that the *Symbiodinium* communities in the two corals species studies were highly diverse, distinct from one another and differentially impacted by the experimental manipulation. The data support the ABH through changes in the relative abundance of *Symbiodinium* types, but not via the acquisition of new types from the environment.

The ocean climate offshore the Hawaiian Islands with regards to wave energy conversion (WEC) potential has been analyzed. The emphasis is based on analysis performed using hydrodynamic potential theory and frequency domain analysis. Sea-state variability can be represented in terms of wave-climate spectra, which drive design factors (i.e., mass, damping, and stiffness characteristics) for wave energy converters. Two different design concepts of wave energy converters are developed including of a floating point absorber and an oscillatory water column. The energy-capture capability of a WEC depends on both hydrodynamic and power-take-off design characteristics. The hydrodynamic model will be variant to power-take-off criteria such that hydrodynamic design characteristics can be defined to match the power capture capability of a WEC to the wave climate of Hawaii. The electric power from a WEC will be sent to the shore to charge batteries for electric and plug-in hybrid electric vehicles dictating development of a large scale energy storage system. A novel method of modular buoyant energy storage system (M-BEST) to be installed in HURL is described. Finally remaining future work and obstacles are discussed.
THE EMERGING NEW ENERGY SYSTEM

Wolf D. Grossmann
ICCS at the University of Hawai‘i
WegCenter, Univ. Graz/Austria
Hamburg, Germany
wolf.grossmann@gmail.com

A new energy system is pushed into being by four factors: 1) necessity to decrease emissions of CO₂ to curb climate change and stop further ocean acidification, 2) erratic changes in price of fossil energy and political threats to supply, and 3) breakthroughs in technologies for renewable generating of electricity. A new energy system is acceptable only if it meets the criteria of competitiveness, security of supply, availability of all resources, availability of land area and compatibility with ecological criteria. The new energy system is based on renewable electricity from several sources, in particular wind, solar thermal electricity and photovoltaics (PV). In many countries PV has become competitive with electricity and it will achieve grid-parity in the U.S. at around 2013. Also, electricity is on the way to becoming competitive with many established applications of fossil energy, e.g. road transportation. However, there are many problems to overcome, in particular intermittency of renewable electricity, necessity for new electrical grids, transformation of the major energy consuming sectors, in particular transportation, buildings, lifestyles, the service sector and goods production.

TROPICAL CYCLONES HIT HAINAN ISLAND IN THE SOUTH CHINA SEA

Yu Ping Guan¹, Haixia Shan², Han Zhang², and Tingzhao Guan³

¹Key Laboratory of Tropical Marine Environmental Dynamics
South China Sea Institute of Oceanology, CAS
Guangzhou, China
guan@scsio.ac.cn

²School of Atmospheric Sciences, Lanzhou University, China

³Information Center, Nanjing University of Information Science and Technology, China

Hainan Island, located in the northwest of the South China Sea, is struck by a number of tropical cyclones (TCs) during Pacific typhoon season which creates tremendous damage and disaster each time. The most previous researches have focused on the tropical cyclone activity and possible links with El Niño–Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO) over the South China Sea. However, the impact of ENSO and PDO on tropical cyclones crossing Hainan Island seems to have received less attention. We will present the number variability of TCs hitting Hainan Island based on the best track data from the Joint Typhoon Warning Center (JTWC) during the 1945-2008 period. The objective is to figure out possible trends and cycles in these variations and examine its coherence with ENSO, PDO, and Asian Monsoon by crosswavelet analysis.
SCUD: SURFACE CURRENTS FROM DIAGNOSTIC MODEL

Jan Hafner and Nikolai A. Maximenko

International Pacific Research Center
University of Hawai‘i at Manoa
Honolulu, Hawai‘i, USA
jhafner@hawaii.edu

SCUD is a new diagnostic model of near-surface currents, developed recently at the International Pacific Research Center (IPRC). The model utilizes remotely sensed data of sea level (altimetry) and ocean surface wind (QuikSCAT). Coefficients of the model are tuned to best reproduce motion of 8,000 real Lagrangian drifters drogued at 15m depth. The SCUD provides a set of daily surface velocity maps on 1/4 degree grid. The product aims the tasks of tracking floating tracers, such as marine debris, oil spills, etc. It is fully public and accessible via the IPRC's Asia Pacific Data Research Center (APDRC) at http://apdrc.soest.hawaii.edu/projects/SCUD/.

CLIMATE FEEDBACKS AND CLIMATE SENSITIVITY
- RESULTS FROM RECENT IPRC RESEARCH

Kevin Hamilton

International Pacific Research Center (IPRC)
SOEST, University of Hawai‘i at Manoa
Honolulu, Hawai‘i, USA
kph@hawaii.edu

This paper will review research aimed at evaluating and reducing the uncertainty in modeling cloud-climate feedbacks. It will be shown that state-of-the-art coupled global models have serious deficiencies in representing the mean cloud climatology and the response of cloud fields to interannual fluctuations in the meteorological environment. It will be shown that considerably improved results can be obtained with a suitably tuned regional climate model. Implications for the cloud feedbacks determined from the regional model for global climate sensitivity will be discussed.
CLIMATE CHANGE LAW AND THE U.S. AFFILIATED PACIFIC

Richard G. Hildreth

University of Oregon School of Law
Eugene, Oregon, USA
rghildre@law.uoregon

This paper applies emerging international and U.S. climate change law to mitigation and adaptation in the U.S. affiliated Pacific. Priority concerns are ocean acidification and ocean warming which contributes to sea level rise. The most dramatic near-term effects of sea level rise are being felt by the inhabitants of low-lying islands and coastal areas. Thus ongoing sea level rise presents some of the most immediate legal, ethical and equity questions in all of climate change adaptation. Coral reefs are being adversely affected by acidification and warming. Important Pacific fisheries could be affected as well. Proposals to mitigate climate change through geoengineering include sequestering carbon dioxide under and in the oceans, e.g., by fertilizing them to increase their absorption of carbon dioxide. Additional renewable energy generating facilities may be located in the U.S. affiliated Pacific. This paper assesses the legal framework surrounding the decisionmaking processes connected to each of these important issues.

EXPERIMENTAL RESEARCH ON DEVELOPMENT OF INORGANIC COAGULANT FOR REMOVAL OF COASTAL WRECK OIL

Kenji Hotta¹, Yuki Ogura¹, Tatsutoshi Komatsu² and Kyoichi Okamoto¹

¹Nihon University, College of Science and Technology
Department of Oceanic Architecture and Engineering
hotta@ocean.cst.nihon-u.ac.jp

²JEC Aquastaff Co., LTD

Oil spills can have serious economic impacts on coastal activities and on those who exploit the resources of the sea. The impact on marine life is compounded by toxicity and tainting effects resulting from the chemical composition of oil, as well as by the diversity and variability of biological systems and their sensitivity to oil pollution. In 2006, 11 August, an oil spill accident happened at the offshore of Negros and Guimaras Island. Generally, it is difficult to remove the wreck oil and much hard labor is needed to scour it off. In order to easily remove the oil from the surfaces of rock, wood and sand, a developed inorganic coagulant to insolubilize toxicity inclusion was examined at the site of Gumaras Island in cooperation with the University of the Philippines. Also, after treatment, the influence of leaving processed oil in nature was investigated. As a result, it was found that wreck oil is easily removed compared with ordinal method and there is no influence to the environment, i.e. treated oil gradually gets eaten by bacteria.
EFFECTS OF NORTHEASTERN MONSOON ON THE POPULATION DYNAMIC OF *Calanus sinicus* IN NORTHERN TAIWAN

Jiang-Shiou Hwang¹, Sami Souissi², Li-Chun Tseng¹, Juan Carlos Molinero³, Qing-Chao Chen³ and Chong Kim Wong⁴

¹Institute of Marine Biology
National Taiwan Ocean University
Keelung, Taiwan
Jshwang@mail.ntou.edu.tw

²Marine Station of Wimereux, University of Sciences and Technologies of Lille, France

³South China Sea Institutes of Oceanography, Academia Sinica, Guangzhou, China

⁴Department of Biology, The Chinese University of Hong Kong, Shatin, Hong Kong, China

*Calanus sinicus* (Copepoda: Calanoida) has a key role in the dynamics of marine food web and also on fish recruitment in the west Pacific Ocean, particularly in the Yellow Sea, the East China Sea and the coastal waters of Japan. The spatial distribution of this copepod can be traced further south such as north and west of Taiwan, Hong Kong, Hi-Nan Island and Vietnam. To understand the mechanism of how this key species distributes spatially and temporally, two long-term monitoring programs of the planktonic copepods have been conducted since 1998. The spatio-temporal distribution pattern of this copepod in the studied areas showed a clear relationship between the intrusions of cold-water mass of the China Coastal Currents (CCC) during the northeast monsoons into north and west Taiwan thus transporting this copepod further south with high concentrations. *Calanus sinicus* can be considered a biological tracer of CCC during northeastern monsoons originating from the Yellow Sea and the East China Sea to the north and west of Taiwan and further south up to Hong Kong, Hi-Nan and Vietnam.

STABILITY OF OTEC SYSTEM USING AMMONIA/WATER MIXTURE

Yasuyuki Ikegami

Institute of Ocean Energy
Saga University
Saga, Japan
ikegami@ioes.saga-u.ac.jp

Though the power generation system using ammonia/water mixture (AWM) as working fluid has been put into practical use in the waste-heat power generation systems at high heat source temperatures, power generation using ocean thermal energy conversion (OTEC) system at low heat source temperatures is not verified thoroughly. Therefore, this paper reports on two weeks' continuous operation of an OTEC experimental device. The system had demonstrated a stable operation, and the turbine power and the revolution speed were almost constant though there is some variation of the condenser inlet temperature.
PERFORMANCE OF VERTICAL AXIS TYPE MARINE TURBINE
WITH VARIABLE-PITCH BLADES

Tomoki Ikoma¹, Koichi Masuda¹, Shintaro Fujio²
Hisaaki Maeda¹ and Chang-Kyu Rheem³

¹Department of Oceanic Architecture and Engineering
College of Science and Technology, Nihon University
Funabashi-shi, Chiba-ken, Japan
ikoma.tomoki@nihon-u.ac.jp

²Sanyu Civil Engineering, Japan

³Institute of Industrial Science, The University of Tokyo, Japan

There are many developments of generation system using marine turbines in tidal currents and ocean currents in the worlds. In strong marine currents, marine turbines can rotate, and thereby we can generate electric power. However, there is little marine fields over 2.0 m/s in current velocity in Japan. The authors propose vertical axis type marine turbine with variable-pitch blades for a marine current generation system. For a variable-pitch type vertical axis turbine, cycloidal mechanism is applied to control of the mechanical variable-pitching. In this study, a CFD software was applied to predictions of hydrodynamic forces and torque on a marine turbine. From the computational results and the blade element method, it is shown that the starting torque and the rotating torque become high performance.

FOOD WEB STRUCTURE OF ARTIFICIAL REEF ECOSYSTEMS
IN THE SOUTHERN KOREAN PENINSULA

Chang-Keun Kang¹, Hyun Je Park¹, Sung-Gyu Yun², Sang Kim Ho³,
Eun Jung Choy⁴, Kwang-Sik Choi⁵

¹POSTECH Ocean Science & Technology Institute
Pohang University of Science and Technology
Pohang, Gyeongbuk, Korea
ckkang@postech.ac.kr

²Department of Biology Education, Taegu University

³Fisheries Resources Restoration Development & Management Center
National Fisheries Research & Development Institute

⁴Korea Polar Research Institute, Korea Ocean Research and Development Institute (KORDI)

⁵School of Applied Marine Science, Jeju National University

Artificial reefs are spatially complex habitats and serve as a good model system for studying community succession and trophic recovery in coastal ecosystems. To evaluate whether artificially-created hard bottom habitats have similar community composition and ecological function to natural rocky habitats, the macrofaunal community was studied at three artificial reef sites (which were deployed in 1989, 1994 and 2000), and a natural rocky habitat on the coast of the southern sea of Korea in November-December 2007. Food web structures were examined using stable isotope techniques and compared to different hard bottom habitats. It was found that macrobenthic community structures differed slightly between artificial and natural systems. While the created hard bottom habitats were colonized predominantly by Thoracica barnacles and Anthozoa, the natural rocky habitat by Crustacean amphipods and decapods. Our results conclude that despite a dissimilarity in macrozoobenthic communities between the artificial and natural habitats, the artificial reef ecosystems form 1) a new habitat colonized by a large variety of zoobenthic species, and 2) trophic structure similar to that of natural rocky habitats.
Marine Spatial Planning is an important tool for resources managers to identify and address multiple use issues in coastal and marine environments. A key component to marine spatial planning is the development of spatially explicit data on resources and human uses within the managed area and tools for resource managers to access this information. Papahanaumokuakea is a fully protected marine area but provides the opportunity to develop and test marine spatial planning data sets and decision support tools. Papahanaumokuakea has undertaken the development of a web-based information management system to address issues of resource protection and balancing conflicting uses. The system is in early phases of development and currently provides access to past research and current data collection efforts. The information from the system allows resource managers to evaluate proposed projects in the context of ecosystem condition, natural resources and cultural resources. As data is collected and the system grows resource managers will be able to address cumulative impacts from multiple users and evaluate additional future internal zoning needs.

Mining technology for deep-sea mineral resources consists of two main things. One is lifting technology and the other is collecting technology. These two main technologies were integrated to be tested in May and June 2009. The sea test was conducted offshore in Hupo port, located in the east coast of Korean peninsula. The depth of the test site was about 100m. The lifting system of deep-sea mining includes flexible hoses, lifting pump, buffer, lifting pipes, solid-liquid separator, and control/measurement devices. The main role of the system is to lift the nodule-seawater mixture by the lifting pump from the collector crawling on the seafloor through flexible hoses and buffer to the mining ship. The exclusive test was conducted to examine and verify the function of the system in May. The lifting system was integrated with the collecting system thereafter and the integrated mining system was examined in June. From the test, the lifting system was proved to perfectly work and the test results will provide the important basis for future test in the deep-sea.
SIHWA TIDAL POWER PLANT PROJECT IN SOUTH KOREA

Sang Hoon Kim¹, Ki-Dai Yum² and Kwang Soo Lee²

¹DAEWOO E&C
Seoul, Korea
ksh1210@chol.com

Coastal Engineering & Ocean Energy Research Department
Korea Ocean Research & Development Institute, Seoul, Korea

The Sihwa Tidal Power Plant is composed of 10 units of 25.4MW each turbine, the total capacity of 254MW. The amount of annual generation is 552.7GWh which can be supplied for around 200,000 residents. For the enough water circulation, 8 culvert type sluice gates were also planned. The total project period is 7 years from 2003 and the total project cost is 355 million USD. At the initial design stage, it was key issues to maximize the tidal current circulation for the water quality improvement and control the basin water level for industrial/metropolitan area around Sihwa lake. Under those considerations, a single-effect flood generation type was adopted to the project. The construction was commenced in 2004 and the expected completion date is December, 2010. The Sihwa Tidal Power Plant will help boost Korea’s energy self-sufficiency through the renewable energy development and contribute to cutting down oil imports by 862,000 barrels per year and reducing the emission of carbon dioxide by 315,000 tons per year.

THE INFLUENCE OF CLIMATE CHANGE ON THE MARITIME AUSTRALIA
AND PACIFIC ISLANDS: BIOLOGY AND BUSINESS

Michael J. Kingsford

School of Marine and Tropical Biology
James Cook University
Townsville, Queensland, Australia
michael.kingsford@jcu.edu.au

Global climate change is the biggest issue facing resource managers and poses a great challenge to businesses. Unless business adapts to changing resources, gives greater attention to sustainable behaviour and reduces the use of fossil fuel then there are risks. Here I review physical changes that are predicted to happen over the next 100 years, the impact of change on marine ecosystems, challenges to fisheries managers and novel approaches to dealing with climate change. Coral reefs, the foundation of fisheries throughout the Pacific, are vulnerable to change and experiments demonstrate that the risk to reefs is greatest where exploitation of fishes is at a high level. Risk is not limited to the coastal belt, many islands of the Pacific are dependent on tuna for protein – changing oceanic currents can take fish away from traditional fishing grounds and nearby infrastructure for processing. Control of CO₂ is still the biggest issue to reduce climate change. Innovative ways of making carbon neutral fuels and reducing methane emissions is working toward a solution and generating opportunity.
BIOACCUMULATION OF HYDROPHOBIC ORGANIC CHEMICALS IN THE KENTING CORAL REEFS, TAIWAN

Fung-Chi Ko¹, Jing-O Cheng¹, Te-Hao Chen¹,² and Wei-Hsien Wang¹

¹National Museum of Marine Biology and Aquarium
²Institute of Marine Biodiversity
National Dong Hwa University
Pingtung, Taiwan
¹ko@nmmba.gov.tw

Hydrophobic organic contaminants (HOCs) such as polycyclic aromatic hydrocarbons (PAHs) enter coastal waters from a variety of point and diffuse sources. In order to predict the impact of these chemicals on the coral reefs, it is important to understand the different chemical properties that result in different bioaccumulative behaviors. The main goal of this study is to understand the chemical concentrations and bioaccumulative behaviors in different corals exposed to an external contaminant. Due to a fugacity gradient between the environment and the biota stores, organisms theoretically tend towards equilibrium with their surrounding environment. To characterize inventories and distributions of HOCs in the Kenting coral reefs, field cruises were conducted seasonally in 2009 to analyze the correlation in coral tissue and ambient sediment HOC levels, and PAH bioaccumulation was estimated to a first approximation. Equilibrium partition approach was used, which included an analysis of the chemical property (Kow) and the quantity of lipid stores in the coral tissue. The bioaccumulation processes were compared to field observations and used to predict future trends in bioaccumulative levels.

BEACH NOURISHMENT USING GRAVEL AS ENVIRONMENT-FRIENDLY SHORE PROTECTION MEASURE

Akio Kobayashi¹, Masahiro Koya² and Takaaki Ueda³

¹Nihon University, CST
Funabashi, Chiba, Japan
kobayashi@ocean.cst.nihon-u.ac.jp

²Graduate Division, CST, Nihon University, Chiba, Japan
³Public Works Research Center, Taito, Tokyo, Japan

The sea-level rise by the global warming accelerates shoreline recession, and environment-friendly measures are needed for protecting human, living and beach eco-system. The beach nourishment using gravel is one of the effective measures for beach protection. In this study, field surveys were carried out to monitor the subsequent beach changes after beach nourishment using gravel, which was carried out on the Akashi coast facing the Pacific Ocean. On the basis of the surveys, it was found that fine sand was deposited on the gravel surface, and gravel beach was covered with sand only one month later. The mechanism is explained using the contour-line-change model. The effectiveness of the beach nourishment using gravel for environment-friendly measure is shown. This method could be used in other areas around the Pacific to build beaches.
FERMENTATIVE STUDY OF BIOETHANOL FROM SEA ALGAE
BY USE OF MICRO-BIOLOGY

Hideki Kohno, Tomoe Komoriya, Kenji Hotta and Takuji Sakai

College of Industrial Technology
Nihon University
Chiba, Japan
kouno.hideki@nihon-u.ac.jp

Production of bioethanol now attracts a lot of attention in bioindustries. These processes, however, increase the price of grain. In Japan, based on fermentation technology, we developed a new process to produce bioethanol from polluted sea algae and even water sludge. These sea algae are mainly composed of cellulose and alginate. We isolated *Streptomyces violaceolber* to decompose alginate and *Bacillus halodurance* to degrade cellulose into glucose, in the pre-treatment process. We succeeded in effectively using *Saccharomyces cerevisiae* or *Rhodobacter sphaeroides* to produce bioethanol and biohydrogen. In this presentation, we would like to report how to use and co-culture three different types of strains of microbiology in obtaining bioethanol through the fermentation production process.

RESEARCH ON IMPROVEMENT OF BOTTOM SEDIMENT ENVIRONMENT
BY POROUS MATERIAL

Hironori Komatsu

Graduate School of Engineering
Kagawa University
Takamatsu, Kagawa, Japan
s10g410@stmail.eng.kagawa-u.ac.jp

Regular red tide occurrence and generation of oxygen-depleted water mass at sea bottom of the Seto Inland Sea, located at the western part of Japan, in the summer is a coastal marine area environmental condition. There is concern about the impact of these phenomena against biological production processes in the sea area. We monitored and found that some types of metals in the bottom sediment around the detached breakwater function in creating calm areas behind the structure. The calm areas would become Zostera beds which is a valuable marine resource, but environmental sediment deterioration has occurred around the structure. Therefore, we propose technology for improving the marine sediment environment by setting newly porous material which consists of slag as one of the industrial by-products. This porous material is able to efficiently remove metal from deteriorated bottom sediment. We also examined the effect of sediment quality improvement around the structure, which was settled at the real sea bottom by measuring the sulfide, COD and metal concentration.
The presented paper exhibits results of work on the gravitational methods of natural disasters prognosis. The tsunami formation depends on many factors. Nowadays, an underwater earthquake is considered to be a dangerous tsunami potential if its magnitude exceeds seven. However, such a magnitude of earthquake proposes probability of tsunami formation no more than 60 percent. For increases of the forecast probability of the beginning tsunami to 80% we developed the equipment complex including simultaneous measurement of seismic wave force and variations of gravitational field. We tested field experiments with some variants of complex installation in the tsunami originating areas.

Impending process of volcano eruption is accompanied by the dynamic change of physical fields: elastic seismo-acoustic waves, acoustic noise, variations of magnetic and electric fields. However, to make up considering change of these fields the short-term forecast of the eruption beginning a few hours before the event is impossible, with probability more than 70 percent. In the report it is offered to enter the additional parameters of signs appeared together with accelerated moving in a volcano. This accelerated movement of mass is supposed to be registered by gravimeters and other devices developed by the authors.
OTEC AND THE LOCAL AND GLOBAL ENVIRONMENT

Hans J. Krock

Ocean & Resources Engineering
University of Hawai‘i
Honolulu, Hawai‘i, USA
hans.krock@energyhs.com

A commercial scale floating ocean thermal energy conversion (OTEC) plant is unlikely to have any measurable effect on the water quality of the local environment. This conclusion is based on data and observations gathered in Hawaiian waters on: water quality profiles, daily and seasonal observations of currents, eddy diffusivity measurements, real world net phytoplankton growth kinetics, and observations and modeling of plume dynamics. The deployment of a large number of floating OTEC platforms in the equatorial global ocean would tend to reverse some of the detrimental environmental effects of global warming. These detrimental effects are related to: increasing CO₂ concentrations in the atmosphere and in the ocean surface layer and increasing thermal stratification of the tropical ocean.

DEVELOPMENT OF HIGHLY EFFICIENT SLUICE CAISSON FOR TIDAL POWER GENERATION

Dal Soo Lee¹, Sang-Ho Oh¹, Suk-Jin Ahn² and Hyu-Sang Cho²

¹Korea Ocean Research & Development Institute
Ansan, Kyunggi, Korea
dslee@kordi.re.kr

²Hyein E & C Co.

Tidal power generation is to make electricity by converting the potential energy associated with the rise and fall of sea water level due to tide. The design method of sluice caisson is one of key factors that are associated with the efficiency of the tidal power generation. If the sluice caisson is designed to maximize the water discharge capability, it is possible to save the construction cost of the tidal power plant by reducing the number of the sluice caisson required for target power generation. In this study, the physical and numerical experiments were performed to develop design criteria of highly efficient sluice caisson for tidal power generation. The change of water discharge capability according to the variation of geometrical shape of the sluice caisson is explained and the design methodology for maximizing the water discharge capability is discussed.
In order to harnessing the kinetic energy of tidal currents, a current power generation system has been developed with the aim of industrialization. The herical type vertical axis turbine was adopted and various tests including laboratory and in-situ experiments and CFD works have been conducted to investigate applicability and improve turbine performance efficiency. The pilot tidal current power plant (TCPP) with the capacity of 1MW was designed and constructed at Uldolmok Channel on May 2009. To enhance the efficiency of the generating system are being carried out in the pilot TCPP including monitoring of structural stability diagnose system. The basic development plan of ULdolmok tidal current power commercial plant will be established on the basis of experimental results from the pilot TCPP.

The artificial breeding of coral reef fish would help safeguard coral reefs and develop a new source of organisms for the aquarium trade. Over the past few years, we have conducted experimental studies with several species of coral reef fish. The present study investigates, for the first time, critical processes in early life history in captive rearing of semicircle angelfish (*Pomacanthus semicirculatus*), bluestriped angelfish (*Chaetodontoplus septentrionalis*), five-lined snapper (*Lutjanus quinquelineatus*), Tiera batfish (*Platax teira*) and Indian Ocean oriental sweetlips (*Plectorhinchus vittatus*). Wild-caught broodstock were spawned naturally in captivity, without the use of hormones or other treatments. The hatched larvae were reared in 500-l circular fiberglass tanks and fed initially on dinoflagellates, followed by S-type rotifers, and/or copepods nauplii. This study represents an important first step for successful spawning and rearing of coral reef fishes. The long-term goal of this research is to develop aquaculture techniques for raising reef fish in captivity to increase our understanding of their ecological requirements, to preserve rear and endangered species, and to reduce harvesting pressure on natural populations.
Offshore facilities such as airports, artificial islands and floating cities are examples of large-scale constructions built on oceans for accommodation, living, entertainment and commercial activities. Offshore airports are airports built on reclaimed lands near coastal areas. Renowned examples include the Honolulu International Airport in Hawaii (USA) and Japan’s Nagasaki Kansai Airport. The chosen site for the South Star Project (SSP) is in close proximity to Kaohsiung City’s International Airport and the Second Harbor. It occupies an area of 3km x 1km. Estimates suggest that the land reclamation project would yield roughly 300 hectares. The SSP is for the relocation of Kaohsiung International Airport. Offshore airports offer three primary advantages: 1) the facility allows planes to take off and land at night; 2) reduced noise and pollution, and 3) well-defined courses to prevent accidents during landing. Since the construction of an international airport at SSP’s designated site is of vital importance to Taiwan, we present a careful analysis on the feasibility for the construction of an offshore airport at said site from the perspective of location theory planning and engineering.
AZIMUTH ASYMMETRY IN TYPHOON INTENSITY CHANGES

W. Timothy Liu and Wenqing Tang

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California, USA
W.T.Liu@jpl.nasa.gov

A decade of observations by the wide-swath microwave scatterometers and radiometers provide unprecedented opportunity to study typhoon structure. Composite maps of surface stress and sea surface temperature (SST) were constructed from over 8,000 satellite passes, over global oceans in a decade. The composites show clear asymmetric patterns of stress and SST with respect to the translation direction of the storm. The stress measured by the scatterometer is clearly stronger on the right (left) side of the hurricane path in Northern (Southern) Hemisphere. SST is lower on the right and front parts of the typhoon in the Northern Hemisphere. Scatterometer data also revealed positive radial velocity in a narrow sector in the front to the left of the translation direction, opposite to inflow from other directions. The intensity of left-right speed and radial in-out flow asymmetries increases with translation speed, in all ocean basin and storm categories. The angular momentum transported into the storm shows asymmetry that increases with translational speed. Weakening and strengthening storms are found to be associated with strong and weak asymmetries respectively.

TSUNAMI HAZARD TO HAWAII FROM A M9+ EVENT SIMILAR TO THE 2004 INDIAN OCEAN TSUNAMI

Charles Mader

Mader Consulting Co.
Honolulu, Hawaii, USA
mccohi@aol.com

The current Tsunami evacuation zones in Hawai‘i are based upon the tsunami flooding history of the last 150 years. The Fritz surveys after the December 26, 2004 Indian Ocean Tsunami found the death zone was the areas below 10 meters and less than 1 kilometer from shore and all areas below 5 meters above sea level and within 3 miles of shoreline need to be evacuated. The only current Tsunami evacuation zone in Hawaii that would be adequate for a M9+ tsunami similar to the 2004 Indian Ocean Tsunami is that of Hilo, Hawaii. Hawaii is especially vulnerable to M9+ tsunamis from the Tonga Trench, the Marianas Trench and the Japan Trench. The current Hawaii Tsunami evacuation zones leave tens of thousands of Hawaiians at risk from a Tsunami similar to the 2004 Indian Ocean Tsunami. Charles L. Mader, Numerical Modeling of Water Waves, CRC Press (2004) and 2010 DVD for Numerical Modeling of Explosives and Water Waves. Web site - www.mccohi.com/tsunami/m9hawaiinm.ppt.
This is an introduction to a session that I have organized for PACON 2010. Energy policy and climate change are very closely related. Global fossil energy use is responsible for 83% of all emissions of GHSs (IPCC, 4th assessment report, 2007). Meanwhile the issue has made ever larger political waves. Countries that have high emissions of CO₂ equivalents consider how they can reduce these emissions for the sake of mitigating climate change, and low-lying countries struggle for adaptation to climate change to avoid going under water. This implies scientific and technological ocean and coastal studies as well as economic considerations involving many countries. These topics can only be studied in cooperation between nations and are, therefore, prime examples for international partnerships in marine science and technology as a vehicle for improving Pacific Rim relations and resource management. GHG emissions do not only cause global warming. They also cause ocean acidification. The issues in this study have to combine natural sciences (physics, chemistry, biology, geology and geophysics, oceanography and meteorology) and social sciences (history, economics). Both aspects are addressed in this section.

Methane hydrates are the world’s most abundant form of natural gas. Worldwide, the resource is twice the total of all other fossil fuels, and found in sea-floor sediments and areas of arctic permafrost. On Alaska’s North Slope, the hydrate energy resource onshore is fifteen times greater than conventional natural gas reserves. Based on methane hydrates, the Hawaii-Alaska New Energy Project has been developed, and is seeking funding. Other permafrost areas besides Alaska’s North Slope are in the northern regions of Canada, Siberia, and Sweden. So, methane hydrates may well be a significant contributor to solving the world’s energy crises, and as such, it would a blessing. Now it has to be determined how to extract methane hydrates safely from the ground without polluting the atmosphere. Methane is a greenhouse gas about twenty-five times more powerful than CO₂. Due to global warming there is already some outgassing from permafrost areas. Such outgassing will lead to more outgassing and to more global warming and so on. This unstable process is called runaway methane global warming and as such, it is a curse.
Radical innovation has long been a source of leapfrog jumps in economic activity. Climate change and catastrophe studies can be enriched with such inputs. The paper is a survey of and contribution to economic innovation theory in the context of climate mitigation and adaptation. Economic history shows that innovation occurs continuously, often as increments improving existing technologies. Radical innovation, major disruptions of the state of the arts, occur almost randomly over time, often fitting well in Poisson or Lotka statistical analysis. Furthermore, innovations are rationally fed into commercial exploitation not as they are invented but as they can assure profitable production. This paper, long in preparation and not yet complete, aims toward integration of significant contributions with policy analysis of social problems.
DYNAMICS OF NEAR-SURFACE CURRENTS WITH IMPLICATION TO PATHWAYS OF MARINE DEBRIS

Nikolai A. Maximenko and Jan Hafner

International Pacific Research Center
University of Hawai‘i at Manoa
Honolulu, Hawai‘i, USA
maximenk@hawaii.edu

Statistical and diagnostic (SCUD) models, based on trajectories of Lagrangian drifters, drogued at 15 m depth, are used to study pathways of floating objects from initially homogeneous distribution and from isolated sources. Results outline five major areas (all in the subtropics), where debris collects over time. While the North Pacific and North Atlantic collection areas are proven by direct observations to contain high density of defragmented plastic, other three regions are not validated yet, including the South Pacific, where the strongest convergence is predicted. The areas of debris collection are largely defined by the convergence of basin-scale Ekman currents, but exact locations and sizes are the result of complex kinematic interplay between Ekman and geostrophic velocities. Distribution of regions where debris goes on shore is also discussed, and Hawai‘i is hypothesized to be the final destination of most debris, originating from the North Pacific.

NUMERICAL SIMULATION OF THE INDONESIAN THROUGHFLOW AND THE MAKASSAR JET

Bernhard Mayer¹, Peter Damm¹, Thomas Pohlmann¹ and Syamsul Rizal²

¹Institute for Oceanography
University of Hamburg
Hamburg, Germany
mayer@ifm.uni-hamburg.de

²Center for Marine and Fishery Studies, Syiah Kuala University, Banda Aceh, Indonesia

The Indonesian throughflow is a key component in the global conveyor belt and the only low-latitude connection between oceans, where inter-ocean exchange of water mass and heat occurs. This makes it important for the regional as well as global weather and climate. A nested numerical model system has been set up to realistically simulate more than 30 years of the Indonesian Throughflow. Both models were forced with NCEP data. Results of the regional model are in good agreement with measured data regarding velocity distribution, stratification as well as transported water masses. Model results show a highly variable and very complex current system. The strong jet in the Makassar Strait, which has been simulated in correspondence to measurements, can be visualized in its full extension and variability including the regions of its origin. The presence of a realistic throughflow has been simulated even without a barotropic pressure gradient directed from the Pacific towards the Indian Ocean. Furthermore, model results indicate that the seasonal wind system plays on the average a rather blocking role on the through flow.
HIGH-SPEED, LOW-POWER MINIATURE MASS SPECTROMETER SYSTEM FOR CHEMICAL ANALYSIS IN THE OCEAN

Gary M. McMurtry¹, Irina Kolotyrkina¹, Gerardo Brucker² and Jeffery Rathbone²

¹School of Ocean & Earth Sciences & Technology, Department of Oceanography
University of Hawai‘i, Manoa
Honolulu, Hawai‘i, USA
garym@soest.hawaii.edu

²Brooks Automation, Inc., Longmont, Colorado USA

Mass spectrometers are analytically powerful instruments with wide dynamic range. Methods such as Membrane Introduction Mass Spectrometry (MIMS) are at the forefront of on-line analytical approaches for quantitative determination of aqueous volatile organic compounds (VOC), dissolved gases, and other compounds in the lab and in portable, terrestrial applications. Very few instruments are capable of such analysis in situ, underwater, especially in deep waters. With funding from CEROS (Center of Excellence for Research in Ocean Sciences) we are developing and testing a new version of our existing Deep-Ocean Mass Spectrometer (DOMS) system. A primary upgrade is inclusion of the new auto-resonant ion trap (ART) mass spectrometer recently developed by Brooks Automation, which will feature compact size, lower power, higher resolution and greatly increased scan speed. Additional improvements will be made to the system operating software, plus multiple hardware enhancements to improve the DOMS MIMS, and augment the present turbo-pumped high vacuum with a low-power NEG-Ion pump system. The MIMS effort will improve instrumental sensitivity and reliability for in-situ sub-ppb detection of aqueous dissolved VOC and gases.

ALTERNATING QUASI-ZONAL JETS IN THE EASTERN NORTH PACIFIC

Oleg Melnichenko¹, Nikolai A. Maximenko¹ and Hideharu Sasaki²

¹International Pacific Research Center
University of Hawai‘i
Honolulu, Hawai‘i, USA
oleg@hawaii.edu

²The Earth Simulator Center, Japan Agency for Marine-Earth Science and Technology, Yokohama, Japan

Recently, prominent jet-like features of the ocean circulation with a meridional scale of O (300-500 km) and extending for thousands of kilometers in length, have been detected in satellite and in situ observations and in high-resolution numerical models. In this study we review basic properties of migrating systems of quasi-zonal jets in the region to the east of the Hawaiian Archipelago and discuss some implications of the existence of these highly anisotropic, intermediate scale features.
IMPACT OF HUMAN ACTIVITIES ON THE CORAL REEFS ECOSYSTEM
- A LONG-TERM STUDY

Pei-Jie Meng\textsuperscript{1,2}, Wen-Hung Twan\textsuperscript{1,3}, Chung, Kuo-Nan\textsuperscript{4} and Ming-Yih Leu\textsuperscript{1,2}

\textsuperscript{1}National Museum of Marine Biology & Aquarium
Pingtung, Taiwan
pjmeng@nmmba.gov.tw

\textsuperscript{2}Graduate Institute of Marine Biodiversity and Evolutionary Biology, National Dong Hwa University, Taiwan

\textsuperscript{3}Institute of Marine Biotechnology, National Dong Hwa University, Pingtung, Taiwan

\textsuperscript{4}Institute of Public Affairs Management, National Sun Yat-sen University, Kaohsiung, Taiwan

Since July 2001, the National Museum of Marine Biology & Aquarium, co-sponsored by the Kenting National Park Headquarters and National Science Council, has launched a Long-Term Ecological Research (LTER) program to monitor the anthropogenic impact on the ecosystem of the Kenting area in southern Taiwan, a subtropical coral reef area facing increasing numbers of tourists and hotel developments. Some major findings were that the seawaters of intertidal zone along Nanwan Bay were polluted by sewage discharge at some monitoring stations. The results indicate that anthropogenic nutrient loads have negatively influenced on the survival of the shallow water corals due to degrading water quality of these estuaries. Actually, higher nutrients and suspended sediments have leading to the parts of shallow water corals being covered by algae and buried by sediments. Our results also show that increasing numbers of tourists was one of the dominant factors leading to the drop in coral coverage.

REMOVAL OF NITROUS ION AND AMMONIA
BY THE CERAMICS CONTAINING TITANIUM DIOXIDE

Noriko Mine\textsuperscript{1}, Yoshihisa Yamamoto\textsuperscript{2}, Hiroshi Kawada\textsuperscript{3}, Tetsuya Matsuyama\textsuperscript{3}, Yoshihiro Suenaga\textsuperscript{4} and Hisao Kakegawa\textsuperscript{4}

\textsuperscript{1}Graduate School of Engineering, Kagawa University
Hayashi, Kagawa, Japan
s09g578@student.eng.kagawa-u.ac.jp

\textsuperscript{2}Yashima Station, National Center for Stock Enhancement/Fisheries Research Agency

\textsuperscript{3}Nihon Kogyo, Co. LTD

\textsuperscript{4}Faculty of Engineering, Kagawa University

The purpose in the present study is to verify the removal of nitrous ion and ammonia from the seawater in the closed recirculation system for aquaculture by the ceramics containing anatase type titanium dioxide and baking bone dust (natural hydroxyapatite). Anatase type titanium dioxide was used as a photocatalytic functional element of the ceramics. The ceramics containing anatase type titanium dioxide prepared by burning for 2 hours at 700℃ showed significant removal of nitrous ion, but not ammonia, from water artificially contaminated with sodium nitrite and ammonium chloride under UV irradiation. On the other hand, the ceramics containing anatase type titanium dioxide and baking bone dust prepared by burning for 2 hours at 700℃ showed removal of ammonia from the water artificially contaminated with ammonium chloride under UV irradiation. These results suggest that the ceramics prepared with anatase type titanium dioxide and baking bone dust seem to be available to remove nitrous ion and ammonia from the seawater with UV irradiation in the closed recirculation system for aquaculture.
RESEARCH ON THE ARTIFICIAL HABITAT OPTIMIZED FOR ADULT ROCKFISH

Masashi Miyagawa¹, Motohide Tochino¹, Munetoshi Aminaka², Munehiro Fujiwara², Yoshihiro Suenaga³ and Hisao Kakegawa³

¹Kagawa Prefectural Fisheries Experimental Station
Takamatsu, Kagawa, Japan
dn0566@pref.kagawa.lg.jp

²Graduate School of Engineering, Kagawa University

³Faculty of Engineering, Kagawa University

Oblong rockfish, *Sebastes oblongus*, one of the high-priced fish, are released for stock enhancement in Kagawa prefecture in Japan. We proposed new enhancing technology in this study. Pregnant fish released and gathered in the artificial reef with higher adhesion of prey abundance provide greater numbers of spawned fry and better reproduction. In terms of their aggregation, since this species has hiding behavior, the appropriate shelter for hiding in the artificial reef is required for gathering them. What size rocks are preferable for them? We confirmed that this species selects hiding gaps not by height but by width and this suggests that the appropriate size of the gap in the shelter is wider than 10cm.

A STUDY REGARDING THE LOGISTICAL NETWORK OF CONSTRUCTION-BYPRODUCT PROCESSING FACILITIES

Shunsuke Miyahara, Keita Tokuyama and Takamasa Miyazaki

College of Industrial Technology
Nihon University
Narashino, Chiba, Japan
shunsuke_brasil@hotmail.co.jp

This paper proposes a system of a logistical network in the coastal area of Chiba Prefecture that is environmentally gentle, by analyzing the site-characteristics of construction-byproduct processing facilities (intermediary processing facilities), in the metropolitan coastal areas of Japan. In recent years, it has become more difficult to obtain places to dispose construction waste as the amount of both construction by-products and discharged carbon dioxide has increased within the construction industry. In the light of this problem, our research shows a new logistical system through analyses of the geographical relations between processing facilities, urban infrastructure and urban formation by using GIS. This study advocates a view, in which the simplification of transportation, which merits sorting dismantle at construction sites and the land-use of the seaside sections, will promote recycling and more efficient logistics, and therefore, can create necessary conditions for a recycling society.
REAL-TIME OBSERVATION OF WAVE, TIDE, TSUNAMI BY GPS BUOY

Toshihide Miyake¹, Takashi Fujita¹, Yasuhiro Matsushita¹, Shigeo Okubo¹, Masanori Takashima² and Kimiro Meguro³

¹Hitachi Zosen Corporation
Osaka, Taisho-ku, Japan
miyake_t@hitachizosen.co.jp

²Fuji Tokoha University, Shizuoka, Japan

³Institute of Industrial Science, University of Tokyo, Tokyo, Japan

GPS Comprehensive Oceanographic Monitoring System using a buoy platform was developed by Hitachi Zosen Corporation. A nationwide oceanographic monitoring system utilizing our technology is now being operated in 12 locations along the Japanese coast. The Real-Time Kinematic GPS (RTK-GPS) positioning method is applied to the observation of real-time waves, tide-level variations and tsunamis. In order to enable highly accurate real-time based observations, however, the buoys must be deployed within approximately 20-kilometer from the ground reference stations. As a solution, a new GPS positioning method: Point precise Variance Detection (PVD) method has been developed since 2000. The PVD method, the accuracy of which is equivalent of that of RTK-GPS, can eliminate the aforementioned restriction on the buoy installation, because its single point positioning methodology based on the carrier phase measurement can exclude the requirement of setting reference stations. Besides, the PVD-based compact wave-monitoring unit, which is being developed with experiments in an ocean, is presented. This unit can easily be attached to thousands of existing offshore facilities such as floating fish-breeding reefs or floating beacons.

BIOMASS RESOURCE FROM MUSSELS ATTACHED TO THE VERTICAL SEAWALL IN OSAKA BAY

Machi Miyoshi¹, Yasunori Kozuki², Ryoichi Yamanaka², Tatsunori Ishida², Nobuhiro Yamaguchi³, Akio Sakamoto⁴ and Kotaro Goto⁵

¹Tokushima Bunri University
Kagawa, Japan
haseda@fe.bunri-u.ac.jp

²Institute of Technology and Science, The University of Tokushima
³Takeuchi Engei Company
⁴FUJITA Construction Consultant Co., Ltd.
⁵Mikuniya Corporation

The invasive mussel *Mytilus galloprovincialis* dominates the vertical seawall structure which composes much of the coast in Japan. A lot of oxygen is consumed after the feces are dropped by this species and the mussels themselves to the bottom during the summer months. This causes a dissolved oxygen deficiency in the bottom environment. In this study, we made estimates of the standing stock of this species and examined the difference of attached biomass in relation to the environmental conditions at Amagasaki Harbor, Osaka Bay, Japan. The organisms from the mass dropouts of mussels on the sea floor was TOC (Total Organic Carbon) 1.5 tons. This corresponded to the volume of oxygen which dissolved in 5.2 tons of sea water, which is equivalent to the size of Amagasaki Port with a 1.9 m-depth of the body of water. We speculated that: 1) When the attached mussels to the vertical seawall are harvested, an enough biomass resource will be obtained, and 2) The dropout of mussels became the cause of the prolonged decrease of Dissolved Oxygen (DO).
TRACING SEWAGE EFFLUENT USING STABLE ISOTOPES

Ambyr U. Mokiao-Lee, Erik Johnson and Tracy N. Wiegner
University of Hawai‘i at Hilo
Hilo, Hawai‘i, USA
ambyrmlee@gmail.com

The Wai ‘Opae tide pools in Kapoho, Hawai‘i Island, has been designated as a critical wastewater disposal area and it is suspected that sewage-enriched groundwater is entering the coastal zone, resulting in ecological and human health hazards. Goals of the following study were to determine locations of groundwater seeps into the area, sources of nutrients to the groundwater, and the incorporation of these nutrients into the tidal pool macroalgae. Stable isotopes of nitrogen, oxygen, and boron are currently being used to determine if sewage and its associated nutrients, particularly nitrogen, are entering the tide pools. To date, groundwater seeps into the Wai ‘Opae tide pools have been located by mapping temperature and salinity in the near shore waters. In addition, preliminary water quality samples have been collected from the region to assess nutrient inputs from groundwater seeps. Future work will entail determining sources of nitrogen into coastal waters and its utilization by primary producers using stable isotope signatures of nitrogen, oxygen, and boron in sewage, groundwater, ocean water, and macroalgae.

WAYS TO MINIMIZE THE SOOT AND DISCHARGE CONTAMINATION OF AIR AND MARINE ENVIRONMENT

Alexander Mutaev
Joint Stock Company Auto-Ural
Vladivostok, Primorye, Russia
m195805@mail.ru

Effect of “green house” consists of many elements providing its formation. One of them is utilization of wastes after fuel production. Environmentally cleaner itself the new method of mazut (it is the residual fraction after extraction of gasoline, kerosene, diesel fuel from crude oil) cracking is based on chemically deeper hydrocarbon chains cracking. Applying of different physical forcing in this method, including high frequency elastic oscillations, converted excessive water from harmful ballast into burning products. Eliminated air surplus evoked the sharp reduce (till 70%) of dangerous toxic discharge like NOx, CO2, SO2 during combustion of this resulted new fuel. When improved, it might be used in the suitable equipment for burning up to protect environment from soot and discharge, facilitating engine operation (for example, installed in the marine ship). The new equipment used for processing and production of new mazut fuel possesses some constructional elements made from new alloy that admit high pressure (5 –15 kg/square cm) inside installation for reaction. New chemical compounds in this fuel are chemical product being homogeneous during a few years. Other fractions – tar (goudron), bitumen could be processed either. All the properties were tested and documented.
DISCRIMINATION AND CHEMICAL SENSING USING SINGLE-CELL FLUORESCENCE EXCITATION SPECTROSCOPY OF PHYTOPLANKTON

Michael L. Myrick, Timothy J. Shaw, Tammi L. Richardson, Laura S. Hill, Evelyn Lawrenz,
Kathleen Donaldson and Joe Swanstrom

University of South Carolina
Columbia, South Carolina, USA
myrick@sc.edu

Fluorescence excitation spectroscopy is a tool for plankton identification based on pigmentation. We show that single-cell spectra show wavelength regions of great utility in classification even when the fluorescence intensity overall is quite variable. We also show how nitrogen limitation during growth affects the spectra. Generally, we find that the long-wavelength excitation region (e.g., 550-610 nm) is relatively stable in profile and suited to linear discriminants analysis as a classification tool for plankton, while the shorter-wavelength regions (e.g., 350-470 nm) are much more variable in a nutrient limited condition. Some plankton show pronounced fluorescence excitation changes at short wavelength that could form a good indicator of a nutrient limit. We also report evidence that single-cell action spectra are feasible, and present some limited data experiments in which an individual plankton is subjected to a rapid chemical change.

RESEARCH FOR THE FISHERIES GROUND CREATION USING ARTIFICIAL REEF WITH CURRENT CONTROL

Taichi Nagatomi¹, Masashi Miyagawa², Munehiro Fujiwara³, Takao Tamura⁴, Takashi Hoshino⁵, Yoshihiro Suenaga¹ and Hisao Kakegawa¹

¹Faculty of Engineering
Kagawa University
Takamatsu, Kagawa, Japan
nagatomi@eng.kagawa-u.ac.jp

²Kagawa Prefectural Fisheries Experimental Station
³Graduate School Student of Engineering/Kagawa University
⁴Institute of Technology and Science/The University of Tokushima
⁵Kuroshio Marine Technology Co., LTD

In Japanese politics project, many types of artificial reefs have been developed and settled to create fishery ground for the production enhancement in marine areas. There are many issues to be clarified about the suitable installation of artificial reefs, such as the relation between flow conditions and the biological effect of them. In this research, a set of technologies newly developed to restore marine biological environment is introduced. It consists of a numerical simulation model including Euler-Lagrangian method to select out the most appropriate area for marine habitat restoration and a new structure. We examined that the precise current situation in and around the structure which has a function generating complicated upwelling or downward current behind the structure by water flow, using both of numerical model and hydraulic experiment. Also, we can expect improvement of sediment quality with this current control function. After those trials, the set of technologies was applied to many coastal areas of different characteristics and was verified to improve biological environment and sediment quality around the structure.
THE EFFECTIVE USE OF THE SUBLITTORAL ZONE COMPATIBLE TO URBAN FORMATION

Kiminori Nakazawa and Takamasa Miyazaki

Department of Conceptual Design
College of Industrial Technology
Nihon University
Narashino, Chiba, Japan
nakazawa.kiminori@nihon-u.ac.jp

This study examines methods of the effective use of the sublittoral zone of the coastal area in Japan. Algae in the coastal sublittoral zone, which are photosynthetic as land plants, store within carbon dioxide as carbohydrates. Currently, many studies in various fields regarding the production of bioethanol using algae as the material, are being conducted. However, the habitation for algae is limited by such factors as temperature, depth, water quality, sediment quality, and the supply of macronutrients. In addition, there will be concerns as to the relationship to urban formation in applying the biofuel from algae to practical uses. This paper, in the light of the production of biofuel from algae and its effective use, evaluates the geographical conditions of the sublittoral zone, by analyzing spatially, with GIS, the sublittoral zone from a broader perspective.

HYBRID POLICY INSTRUMENT UNDER THE UNCERTAINTY

Iman Nasseri¹, Sittidaj Pongkijvorasin² and James Roumasset¹

¹Department of Economics
University of Hawai‘i at Manoa
Honolulu, Hawai‘i, USA
iman@hawaii.edu

²Department of Economics, Chulalongkorn University

In order to employ pollution control instrument, generally, government can decide between controlling on price (i.e. tax or effluent charge) and quantity (i.e. quotas). Theoretically, in the world of certainty, both policies should yield the same outcome, thus the choice usually relies on the relative transaction or administrative cost. However, in the real world, uncertainty can arise from many reasons. Corresponding to some pioneer researches, there are attempts to introduce the possibility of using a mixed policy instrument. A two level tax schedule, introduced by Roberts and Spence (1976), which can mimic either a pure tax or pure cap-and-trade system, is shown to be superior to both pure systems in the presence of uncertainty in marginal benefit of emission. This paper aims to find the optimal hybrid system policy in the presence of uncertainties in both marginal benefit and marginal cost of emission, for the hybrid pollution control systems.
Aquaculture is practiced extensively in harbor basins of Japan, where uneaten feed deposited on the sea floor and deteriorating sediment conditions are acknowledged as problems. The authors conducted a study to quantify the ability of sea cucumbers to purify sediment through their feeding as a measure. In previous laboratory testing, sediment collected from sea cucumber’s habitat was used. However, the question remained as to whether sea cucumbers feeding on sediment deposited on an already polluted site were capable of purification this material. This paper reports on a laboratory test conducted to study the feeding behavior of sea cucumbers that fed on sediment in a fishing port. The port is located in Hokkaido, Japan, where the sediment has deteriorated. The test confirmed that the sea cucumbers could feed on polluted sediment in an aerobic environment, and that their feed intake was greater than that in their natural habitats. Thus, it was revealed that the effect of sea cucumber’s feeding on sediment purification could be strongly expected.

Sedimentary sludge around waterfront area becomes a very serious problem. The sludge gives the very big environmental load to the around sea area. Here, micro-bubble technology was paid attention to apply the purification of the sludge. The important thing of this technique is to activate the bacteria existing in the area by a micro-bubble. But, some papers showed it gets back to the original state which is oxygen-deficient after only one week from when the micro-bubble service was stopped. And more, another papers pointed out the purification of sludge needs much more time. In this study, our objects are to develop the new powerful purification system for the sedimentary sludge which is used a micro-bubble device and a liquid for microorganism activation, and to examine the effects on purification quality by this system. As the results from our experiments, we obtained it is getting more reducing time to purify the sedimentary sludge.
THE HURL DATA DEPARTMENT

Rachel S. Orange

Hawaii Undersea Research Lab
University of Hawai‘i at Manoa
Honolulu, Hawai‘i, USA
shackelf@hawaii.edu

The HURL Data Department processes, organizes, and archives the original data obtained during dive missions. HURL biologists and data department staff apply a standardized data-logging protocol, which aims to extract as much information from each videotape as possible, to all submersible and ROV dive video. The resulting logs include the names of all identifiable organisms, coded descriptions of substrate and geologic features, depths, and miscellaneous notes that include GPS coordinates, specimens collected, and tape counter positions for video-still grabs. These logs are subsequently imported into the archive database which extends from 1981 when operations started with the submersible Makali‘i. As noted in the workshop report by Marine Conservation Biology Institute, Research Priorities for the Pacific Remote Islands Marine National Monument, very little research has been done on benthic deep habitats in this region. By applying our standard protocol to dive video collected and incorporating it into our database, we will be able to help maximize the quantity and quality of data analyses possible.

THE BEHAVIOR OF TSUNAMI-INDUCED DRIFTAGE AND ITS PROBLEM IN FISHING AREAS

Koji Otsuka¹, Ken-ichi Satoh² and Koji Fujima³

¹Japanese Institute of Technology on Fishing Ports, Grounds and Communities
Tokyo, Japan
otsu@jific.or.jp

²Emergency management Division, Kesen-numa-City, Miyagi, Japan

³Department of Civil and Environmental Engineering, National Defense Academy

Japan has received extensive damage with earthquakes and tsunamis in the past. Coastal region fishing communities are especially susceptible to damage from these natural occurrences. Aquaculture cages, fishing gear, mooring fishing vessels, work vehicles, etc. are kept close to the water. When the tsunami occurs, some of these items are set adrift by the huge waves and the tsunami-induced driftage blocks the route to the port and may hinder or prevent closing of the sea route and marine transport for immediate rescue and restoration. Some fishing communities may even be completely isolated due to the paralyzed sea route. We carried out simulation studies to understand how the driftage behaves in a tsunami through simulation and specific problems.
EVALUATION OF CO₂ MIGRATION BEHAVIOR USING MARINE CONTROLLED-SOURCE ELECTROMAGNETICS (CSEM) IN THE POROUS AQUIFER

Samgyu Park¹, Ytaka Sasaki², Changryol Kim¹ and Chiho Yoon¹

¹Mineral Resources Research Division
Korea Institute Geoscience and Mineral Resources
Chungnam, Korea
samgyu@kigam.re.kr

²Department of Earth Resources Engineering / Kyushu University

The feasibility study on the application of Marine Controlled-Source Electromagnetics (CSEM) was conducted to evaluate the migration behavior of CO₂ in the sandstone formations of the gas reservoir in the East Sea of Korean Peninsula. The specimens of the porous sandstones were taken from the gas reservoir, and the resistivities of the specimens were measured after saturated with different concentrations of NaCl solutions. The resistivity variation attributed to the CO₂ injection amount in the sandstone formation of the aquifer model was calculated by using Archie's formula. Both numerical simulation and inversion of simplified saline aquifer models in three stages (before, 30%, and 50% saturation of CO₂) were carried out in order to evaluate the CO₂ behavior of the models. The results of the study have shown that the change ratios of the resistivity of the models correspond to the CO₂ injected range and migration behavior in the saline aquifer, and that the marine CSEM is effective as a monitoring technique for evaluation of CO₂ migration behavior in the marine porous aquifers.

DEVELOPMENT OF IN-STREAM HYDRO ENERGY SYSTEM (IHES)

Young Cheol Park and Cheol Soo Myung

ECOCEAN Co., Ltd.
Incheon, Korea
ypark115@ecocean.co.kr

In order to develop techniques for utilizing clean and renewable hydro energy, ECOCEAN has been conducting a study together with the Korea Ocean Research & Development Institute (KORDI) and Korea Electric Power Research Institute since 2003. Field measurements and numerical modeling as well as estimation of hydro-turbine efficiency have been performed in a discharge canal at the Hadong Power Plant Company in Korea. Helical-type hydro turbine has been selected on the basis of field conditions and results of preliminary experiments. The turbine jacket, kinetic energy transfer system and electrical facilities for the in-stream hydro energy system (IHES) are designed. The established IHES has been successfully operated for the last 8 months. The present application to a discharge canal is advantageous since water current speed and temperature in the canal is decreased and adverse impacts on nearby ecosystem can be improved.
PROTEOMICS OF CNIDARIA-DINOFLAGELLATE ENDOSYMBIOSIS

Shao-En Peng¹, Yu-Bao Wang², Li-Hsueh Wang¹² and Chii-Shiarng Chen¹²

¹Taiwan Coral Research Center
National Museum of Marine Biology and Aquarium
Pingtung, Taiwan
pengse@nmmba.gov.tw

²Graduate Institute of Marine Biotechnology, National Dong-Hwa University

Endosymbiosis in cnidaria-dinoflagellate association plays critical role in regulating productivity of corals and related marine ecosystems. Cellular endosymbiosis with dinoflagellate Symbiodinium spp. (i.e. the symbiont or “zooxanthellae” in generic name) in corals (i.e. the host) is initiated by the internalization of symbionts via phagocytic process into host endoderm cells. However, the mechanism by which the symbiont is able to reside inside the host cell and establish an obligatory and mutualistic association remain unclear after four decades of investigation. In the present study, the proteomic strategy was successfully performed to explore and identify the endosymbiosis-related proteins in this complex system.

HAWAII ISLAND COASTAL EDUCATION AND STEWARDSHIP PROJECT

Ho'oululahui E. Perry¹ and Darius Kalvaitis²

¹Pacific Aquaculture & Coastal Resources Center
²Education Department
University of Hawai'i at Hilo
Hilo, Hawai'i, USA
hperry@hawaii.edu

The Hawai'i Island Coastal Education and Stewardship (HICES, pronounced “High Seas”) project is building partnerships between coastal environmental education (EE) related organizations, while training pre-service teachers, educating K-6 students, and engaging community audiences to advance EE and stewardship though formal and informal education efforts. The project aims to foster EE at multiple levels by empowering the wide range of its partners and participants to work together by using coastline, marine life, and conservation concepts as an integrating context for learning and building a lifetime stewardship ethic. The research component will focus not only on program evaluation with pre-post assessments for K-6 student participants and pre-service UH Hilo teachers but will investigate student conceptions and relationships with the ocean. Qualitative and quantitative measures will be used to describe and assess the HICES program and results will be shared in a visual manner that depicts program outcomes.
OBSERVATIONS OF THE SUBPOLAR FRONT IN THE JAPAN/EAST SEA

Emil T. Petruncio¹ and Sunhye Cho²

¹U.S. Naval Academy
Annapolis, Maryland, USA
petrunci@usna.edu

²Republic of Korea Navy

The temporal and spatial variability of the Subpolar Front (SPF) in the Japan/East Sea during the winter of 2009-2010 is evaluated through analysis of weekly, 10 km resolution AVHRR multi-channel sea surface temperature (SST) data provided by the U.S. Naval Oceanographic Office. Between 1 October and 24 December 2009, the magnitude of the average cross-front SST gradient increases from 0.05 C/km to a maximum of 0.14 C/km, and the difference in SST averaged over broad areas north and south of the front increases from 3.7°C to 9.4°C. The average SST gradient remains fairly constant between 24 December 2009 and 4 March 2010, ranging between 0.11 and 0.14 C/km, with occasional strengthening in response to cold air outbreaks. The maximum SST gradient observed at any point along the SPF is 0.29 C/km on 28 January 2010. The position of the SPF, defined by the location of the maximum SST gradient between 38°N and 41°N, generally aligns with bathymetric contours between 129°E and 131°E (along a ridge east of the East Korea Bay), and between 135°E and 139°E (along the 3000m depth contour east of Yamato Rise).

SHIP-TO-SHORE CAUSEWAY AND RAPID BRIDGE REPLACEMENT SYSTEM

Donald Resio, Jimmy Fowler and Stanley Boc

U.S. Army Engineer Research and Development Center
Coastal and Hydraulics Laboratory
Vicksburg, Mississippi, USA
Donald.T.Resio@usace.army.mil

Earthquakes, tsunamis, and typhoons/hurricanes can devastate coastal areas and limit or deny access to critical transportation hubs. For most purposes, airlift is insufficient to provide the quantity of materials or required heavy equipment needed in such post-disaster situations. Instead, it is essential to rapidly restore access to the coast from the sea and connections to these access points. ERDC is developing and demonstrating an innovative Lightweight Modular Causeway System (LMCS) which could meet such requirements, tailored specifically for coastal and near-coast areas. It is transportable and deployable from a number of existing vessels, requires minimal onboard equipment and does not require heavy construction equipment already in place at the site of debarkation. Our presentation addresses the engineering basis and the development and testing of this new system, along with discussion of potential future testing and applications. To date, highly successful demonstrations of the LMCS have been conducted in July 2008 at Fort Eustis, Va., in September 2008 in Oahu, Hawai‘i, and in September 2009 in Oahu, Hawai‘i.
PHYSICAL ENVIRONMENT OF SEAWEED BED
AT THE REAR STEP OF BREAKWATER

Jin Sato1, Kiyoto Koganezaki2, Eriko Shimizu3, Hideto Narumi3 and Yasuhiro Suzuki4

1Fisheries Engineering Research Team
Civil Engineering Research Institute for Cold Region
Sapporo, Hokkaido, Japan
90190@ceri.go.jp

2Marine Engineering Department, Nippon Data Service Co., Ltd
3Marine Environmental Consultant Co., Ltd
4Fisheries Division, Hokkaido Regional Development Bureau MLIT

Coralline flats, into which seaweed beds disappear, are widely distributed in sea areas. Seaweed beds are important for spawning areas and living places for fishes. The coastal structures which make up the algae place (the rear step of breakwater) have been constructed in Hokkaido, Japan. However, the decrease in the effect of algae place creation is feared by the aged deterioration of the substrate and the elevated water temperature in recent years. It is required to devise the measures against disappearance of the seaweed colony. Field investigation concerning distribution of seaweed beds and physical environment was performed in fishing ports of Hokkaido from 2007 to 2010. In this study, the results of the field investigation are introduced. It was found that one of the causes is feeding pressure to seaweed of sea urchin. It is strongly dependent on water temperature in winter. To control feeding the seaweed, it is necessary to improve flow velocity on the rear step of breakwater more.

NOAA-USAID PARTNERSHIP IN THE CORAL TRIANGLE INITIATIVE
LIVE REEF FOOD FISH PROJECT

Robert E. Schroeder

NOAA National Marine Fisheries Service
Pacific Islands Regional Office
Habitat Conservation Division
Honolulu, Hawai‘i, USA
Robert.Schroeder@noaa.gov

NOAA-National Marine Fisheries Service (NMFS), with USAID support, is partnering with the Coral Triangle Initiative countries (Indonesia, Malaysia, Philippines, Papua New Guinea, Solomon Islands, and Timor-Leste) and NGOs to implement a Live Reef Food Fish Project. Demand for live reef fish for food is high in Southeast Asia. This lucrative (>US$850M/yr) but destructive fishing industry depletes reef predators, including their juvenile-stages. Target fish (e.g., grouper, humphead wrasse) are captured, some grown to larger size in pens, and transported alive for consumption, largely in Hong Kong and mainland China. This practice reduces food fish available to local residents and destabilizes the reef ecosystem. As demand for and scarcity of these resources increases, their value and need for sustainable management concurrently intensifies. NMFS will partner with host-country governments to improve local technical expertise and build capacity towards ecosystem-based fisheries management. Consideration of aspects of the U.S. system for fisheries science and management are options, but will need careful evaluation as to local appropriateness. Development of locally supported and effective enforcement measures will also be critical to success.
A COMPACT RAMAN AND FLUORESCENCE SPECTROMETER
FOR RESEARCH IN MARINE ENVIRONMENT

Shiv K. Sharma and Anupam K. Misra

Hawaii Institute of Geophysics & Planetology
University of Hawai‘i at Manoa
Honolulu, Hawai‘i, USA
sksharma@soest.hawaii.edu

Advancements in the field of spectroscopic instruments have made it possible to measure distribution of minerals and phytoplankton in the ocean with Raman and fluorescence spectroscopy. We will describe a new small, compact and portable remote Raman and fluorescence system with pulsed lasers for characterizing minerals and pigments such as chlorophyll-a and beta-carotenes in seawater. The combined time-resolved Raman and fluorescence system utilizes (i) a regular 85mm Nikon (F/1.8) lens with clear aperture of 50mm as collection optics, and (ii) a miniature spectrograph that is 1/14th in volume in comparison to commercial spectrograph from Kaiser Optical System Inc. used in our previous work. The system can be operated from shipboard and/or incorporated in unmanned underwater vehicles for analytical research in marine environments.

GENETIC ARCHITECTURE OF Mugil cephalus IN NORTHWESTERN PACIFIC
WITH IMPLICATION TO MANAGEMENT

Kang-Ning Shen1, C.C. Hsu1, B.W. Jamandre1, W.N. Tzeng1 and J.D. Durand2

1Institute of Fisheries Science
National Taiwan University
Taipei, Taiwan
shenkangning@yahoo.com.tw

2Institut de Recherche pour le Développement (IRD)

Among the estuary-dependent taxa, Mugil cephalus is unique, primarily due to its worldwide distribution. This species is highly exploited for its roe, most especially in the northwestern Pacific region. This study investigates the genetic architecture of M. cephalus to infer basic genetic structure for drawing future management schemes. Three cryptic species of M. cephalus were identified within the northwestern Pacific region (NWP 1, 2 and 3) using both mtDNA and microsatellite DNA. Speciation occurred in two steps: (1) Allopatric and adaptative speciation that probably occurred during the Pliocene and Pleistocene epoch, periods when the Sea of Japan was periodically disconnected and impacted by northern oceanographic currents; (2) Range expansion after the last glacial maxima facilitated by changing oceanographic currents and the species’ temperature preference. Therefore, the current genetic architecture of M. cephalus species complex in the northwestern Pacific is the result of the complex interaction of contemporary and evolutionary time-scale factors. Identification of population/species is crucial to any fishery resource management. Although these species are occurring in sympatry, each “species” must be managed separately.
ASSESSMENT OF REMOVAL OF CARBON, NITROGEN, PHOSPHORUS AND OXYGEN SUPPLY BY PHOTOSYNTHETIC ACTIVITY OF Laminaria japonica

Ryouma Shibata1, Kenji Hotta1, Hiroyuki Tobita2 and Kyoichi Okamoto1

1Nihon University, College of Science and Technology
Department of Oceanic Architecture and Engineering
Chokai11@yahoo.co.jp

2Weather News Co., LTD

Reduction of carbon dioxide (CO₂) is the cause of global warming and one of the most important issues. Generally, CO₂ concentration in the sea is 40 to 50 times higher than the atmosphere. If concentrations of CO₂ in seawater rise continuously, water quality will gradually change to be acidic, and this will certainly influence the ocean’s habitable environment. In this paper, from the viewpoint of CO₂ reduction and purifying of sea areas, assessment of CO₂, carbon, nitrogen, phosphorus reduction by photosynthesis of the Macroalgae (Laminaria japonica, as an example) as well as oxygen supply to sea water were examined. As a result, it was observed that if the Laminaria japonica for 65ton/ha is able to be produced by a culture system, carbon 4.4 tons, CO₂16.1 ton, nitrogen 0.45 tons and phosphorus 0.05 tons will be fixed, and in addition, 6.9 tons of oxygen will be supplied to the seawater.

IMPACT OF NATURAL HAZARDS ON OCEAN COLOR

Ramesh P. Singh

Department of Physics, Computational Science and Engineering
Chapman University
Orange, California, USA
rsingh@chapman.edu

Natural hazards occur on land, ocean and in atmosphere. Satellites are now capable of monitoring land, ocean and atmosphere. The recent satellite observations have shown a strong coupling between land, ocean and atmosphere irrespective of the origin of natural hazards wherever they occur either on land or ocean. The impact of the natural hazards that occur either on land or ocean is linked through the atmosphere. A detailed analysis of multi satellite sensors data is carried out after some of the deadly and intense natural hazards such as recent earthquakes, Haiti, Chile, Gujarat and Sumatra; forest fire in California, dust storms observed over India and Australia, cyclone/hurricanes observed on the east coast of India and USA, the analysis shows pronounced changes in the ocean color parameters after these natural hazards. The changes observed on the land, ocean and atmosphere show strong coupling associated with the ocean related natural hazards.
IMPACTS OF TSUNAMI 2004 ON COASTAL RESOURCES IN THAILAND USING REMOTE SENSING

Absornsuda Siripong\(^1\) and Manisa Piyasingh\(^2\)

\(^1\)Marine Science Department, Faculty of Science
Chulalongkorn University, Phya Thai Road, Khet Pathumwan
Bangkok, Thailand
sabsorns@chula.ac.th

\(^2\)Distance Learning Foundation, Khet Laksi, Bangkok

The tsunami of 26 December 2004 caused extensive damage on six provinces on the coastal zone of Thailand. This study showed the capability of remote sensing (Landsat and SPOT) to classify damage levels from high, medium, and low using the Normalized Difference Vegetation Index (NDVI) methodology on vegetation and other natural resources. The tide gauge data from 7 coastal stations, 99 transects of run-up data and MOST (Methods of Splitting Tsunami) model data were used to validate the classification results on the six coastal provinces. The outcomes of this study are useful for tsunami mitigation in the future, on preparation for tsunami hazards and risk maps for evacuation planning, and coastal management for protection and rehabilitation before and after the occurrence of a tsunami in the future. It is also much useful for educational purposes.

THE REGULATORY FRAMEWORK FOR RENEWABLE ENERGY DEVELOPMENT ON THE FEDERAL OUTER CONTINENTAL SHELF (OCS)

John B. Smith

U.S. Department of the Interior
Minerals Management Service
Camarillo, California, USA
john.smith@mms.gov

Encouraging the production, development, and delivery of renewable energy is one of the Department of the Interior’s (DOI) highest priorities. The Energy Policy Act of 2005 authorizes the Secretary of DOI to grant leases, easements, and rights-of-way on the Outer Continental Shelf (OCS) for activities that produce or support production, transportation, or transmission of energy from sources other than oil and gas. The Secretary has delegated these responsibilities to the Minerals Management Service (MMS). In April 2009, the MMS published final rules for the OCS renewable energy development program. Under this regulatory framework, the MMS can issue commercial leases for full development and power generation and limited leases for resource assessment and technology testing. The leases must be issued on a competitive basis unless it is determined that no competitive interest exists. The MMS is also authorized to grant leases, easements, and rights-of-way to a State, Federal agency or university for renewable energy research activities that support the future production, transportation, or transmission of renewable energy. The MMS does not charge any fees for the purpose of ensuring a fair return for research leases. This presentation will describe the regulatory framework for renewable energy development on the OCS.
The climate scenario we will observe and do have to adapt to is roughly given for up until the mid of this century, irrespective of the future global greenhouse gas emission path that is chosen up until then (with the latter mainly determining climate change impacts beyond 2050). This sets out the requirements for adaptation. Adaptation to climate change takes both forms autonomous and policy induced. This contribution from an economic perspective identifies under which circumstances policy is appropriate and necessary to overcome shortcomings in autonomous adaptation. Applications are given for coastal management, agriculture and the energy market.

DBEDT - THE HAWAI'I OFFSHORE INITIATIVE

Joshua B.Y. Strickler

Department of Business, Economic Development & Tourism
Strategic Industries Division
Honolulu, Hawai'i, USA
Joshua.B.Strickler@dbedt.hawaii.gov

Abstract now available at time of printing
SUSTAINABLE FISHERY DISTRICTS IN METROPOLITAN SEASIDE AREAS

Masayuki Suga1, Norihiro Satomi2, Kiminori Nakazawa3 and Takamasa Miyazaki3

1Nihon Bunri University
Oita, Japan
sugamy@nbu.ac.jp

2Graduate School of Industrial Technology, Nihon University

3Department of Conceptual Design, College of Industrial Technology, Nihon University

This study aims at analyzing the plans which promote formations of sustainable fishery districts in Metropolitan areas in Japan. Our research clarifies the relationships and the differences between urban industries and fishing industry, by evaluating the spatial relationship between the situation of fishery districts and the process of urban formation in the Fukuoka and Kita-Kyushu metropolitan area in Japan. The research displays the developing process of traditional fishery housing, by investigating the analyses of the distribution-composition, the degree of life-integration, and the use-configuration of the buildings. Thus, this paper examines a possibility, in which such fishery districts can be a starting point of an urban space formation which incorporate both land and water areas.

SURVEY OF BRIARANE-TYPE DITERPENOIDS OF MARINE ORIGIN

Ping-Jyun Sung

National Museum of Marine Biology & Aquarium
Graduate Institute of Marine Biotechnology
National Dong Hwa University
Checheng, Pingtung, Taiwan
pjsung@nmmba.gov.tw

In the past 40 years, over 500 new briarane-type diterpenoids were isolated from various marine organisms, particularly with octocorals belonging to the genus Briareum. Briarane-type natural products continue to attract the attentions of investigations because of the structural complexity and interesting bioactivities. An interesting octocoral, Briareum excavatum, was transplanted in the Pingtung campus, National Dong Hwan University, located in the National Museum of Marine Biology and Aquarium, for their interesting and potential chemical constituents. In our continuing research on the cultured octocorals, a series of new bioactive terpenoid derivatives have been isolated from the above cultured species.
IMPACT STUDY OF TYPHOON MORAKOT FLOODING ON TAIWAN SOUTH COAST AND MANAGEMENT STRATEGY

Chin-Tsai Tan¹, Ho-Shong Hou², Jih-Hwa Wu¹ and Yuan-Ho Lin³

¹Institute of Public Affairs Management
National Sun Yat-sen University, Taiwan
ft830@ms58.hinet.net

²Department of Marine Environment and Engineering, National Sun Yat-Sen University, Taiwan
³Ministry of Transportation and Communication and The Center of General Education, I-Shou University, Taiwan

On 8 August 2009, Typhoon Morakot brought 2888mm of rainfall in 96 hours. The ensuing flood devastated the southern part of Taiwan. Mountainous landslides of earth and rock washed downstream by rivers caused serious damage to embankments, bridges and nearby farms. The rivers, clogged with earth and stones, were severely damaged. The coastline and harbors choked with driftwood was devastated. Boats were destroyed. The urgent task of completing the clean up before the start of the flood season and annual weather hazards are extremely difficult challenges for the government in 2010. Realistic circumstances urge policy to clear the deep troughs of the rivers via dredging. However, there will still be potential problems of earth and rocks in regions with flood-water produced landslides causing silting of estuaries and elevating the western coastal land. There are also problems of increased flooding in low-lying regions, sand drifts in the coastal waters, and silting of waterways in ports. The coastal management countermeasure policy will be devised to provide a reference for the government, to help prevent future coastal disasters.

OBSERVATIONS FROM SPACE: MARINE ECOSYSTEM AND ENVIRONMENT RESPONSE TO TYPHOONS/HURRICANES

DanLing Tang¹, Y.Q. Chen¹, X.X. Yang¹, Yi Sui², J.J. Wang¹

¹Research Center for Remote Sensing of Marine Biology/Environment (RSMEE)
LED, South China Sea Institute of Oceanology
Chinese Academy of Sciences
Guangzhou, China
lingzistdl@126.com

²Department of Ocean Environment Science, Ocean University of China, Qingdiao, China

The marine ecosystem is sensitive to environmental factors, including typhoons. Typhoon activities have been strengthening in both intensity and spatial coverage in the past several decades, along with global changes; however, our knowledge about the impact of typhoons upon the marine ecosystem is very scarce. To understand how typhoons/hurricanes impact on marine ecosystems, we have conducted a series of studies in the South China Sea using satellite remote sensing and in situ observation data to investigate phytoplankton concentration, sea surface temperature (SST) and related factors before, during, and after typhoons. Results show that typhoons can induce large areas of phytoplankton blooms with increases of Chlorophyll a (Chl a) concentrations and decreases of sea surface temperature (SST) about 4°C. Analyses also show that typhoons can support nutrients to surface phytoplankton by upwelling and vertical mixing, and typhoon rain can also nourish marine phytoplankton. These and further studies may help better understand the mechanism of typhoon impacts on marine ecosystems, and the role of typhoons in global environmental changes.
ARTIFICIAL REEF PROJECT IN THE BANATE AND BAROTAC BAY, ILOILO, THE PHILIPPINES

Hiroaki Terashima¹, Morihiro Tada¹ and Mary Lou Larroza²

¹ICNet Ltd.
Saitama, Japan
terashima@icnet.co.jp


The Banate-Barotac Bay Resource Management Council, Inc. (BBBRMCI) and local communities have implemented coastal resources management (CRM) work since 1996 in order to improve the coastal resource condition and to utilize the resources sustainably in Banate and Balotac bays. As one of activities for this CRM work, BBBRMCI has been considering artificial reef (AR) project which would be managed and monitored by local communities. AR can be utilised in several purposes such as boosting coastal fisheries and also resource management for protecting sensitive habitats, biota and nursery grounds and for increasing biodiversity and biomass. In these recognitions, the feasibility study for artificial reef project was undertaken.

THE OCEAN-BOTTOM SEISMOMETER MISSION OF TORI, TAIWAN

Jung-Li Tien¹, Po-Chi Chen¹, Shang-Hsueh Yu¹, Gen-Sin Chang², Chau-Chang Wang¹,⁴, Hsin-Hung Chen¹,⁴, Ching-Ren Lin³, Ban-Yuan Kuo¹, Jia-Pu Jang¹

¹Taiwan Ocean Research Institute
National Applied Research Laboratories
Associate Research Institute
Taipei, Taiwan
shila@narl.org.tw

²Central Weather Bureau
³Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan.
⁴National Sun Yat-sen University

The Taiwan Ocean Research Institute (TORI) has been in charge of the coordination to establish instrumentation capability with her collaborating universities and research institutes in Taiwan in pursuit of the advancement in marine technology and hazard mitigation. The Ocean-Bottom Seismometer (OBS) project is one of the missions to address the earthquake hazard problem facing the island whose seismic rate is arguably the highest of the Pacific seismic rim. The OBS project strategy was two-fold, acquiring turn-key solutions and developing in-house systems at the time. Three German-made broadband OBSs (Lobster) were deployed in the southern longitudinal trough offshore SE Taiwan for three months in 2009 summer as a pilot experiment. At this time when the Lobsters are in service, TORI and her collaborators are manufacturing a 10-unit array comprising of self-designed short-period OBSs. The broadband and short-period arrays will be complementary in the mission to monitor the earthquakes, delineate the seismogenic zones, and map the tectonic regime offshore Taiwan.
RESEARCH ON THE ARTIFICIAL IN VIVO INSEMINATION IN VIVIPAROUS ROCKFISH

Motohide Tochino¹, Masashi Miyagawa¹, Katsuhiro Miki¹, Munehiro Fujiwara², Sadaaki Yoshimatsu¹ and Yoshihiro Suenaga³

¹Kagawa Prefectural Fisheries Experimental Station
Takamastu, Kagawa, Japan
vh1540@pref.kagawa.lg.jp

²Graduate School of Engineering, Kagawa University
³Faculty of Engineering, Kagawa University

Since Eugenie Clerk published the artificial insemination technique of poeciliid, a freshwater viviparous fish, in 1950, techniques for poeciliid reproduction have been developed through basic experiments and commonly been practiced in breeding. However, more than half a century has passed without development of the artificial insemination technique for viviparous rockfish. Although rockfishes are one of the acceptable species in the fishery industry, artificial production of the juvenile for aquaculture has been dependent only on the larvae, which are spawned by the bloodstock after natural mating in the marine cage or in the open sea. To fulfill this gap in rockfish, a technique of artificial insemination in Oblong rockfish (Sebastes oblongus) has been developed successfully and this report encompasses that research outcome. The most remarkable point of this technique is the sperm samples activated by male urine that are inserted into the urogenital opening of a female individual. This technique revealed that the most optimum time for injection is the period when ovaries are in a developmental stage and testes are in a regressing period.

RESEARCH ON THE NORI (PORPHYRA) PRODUCTION INCREASING SYSTEM USING NUMERICAL MODEL

Takuro Ueda

Graduate School of Engineering
Kagawa University
Takamatsu, Kagawa, Japan
s09g402@stmail.eng.kagawa-u.ac.jp

Nori (Porphyra) is not only a valuable marine resource but also an important food for Japan. There are many Nori culture facilities in Japan’s coastal famous areas such as the Ariake Sea, Tokyo Bay, and Seto Inland Sea, where Nori is cultured. Kagawa Prefecture, located on the eastern part of Seto Inland Sea, has a production as does Hyogo Prefecture, located across the Seto Inland Sea. Recently, bleaching of Nori has occurred and production decreased to 60% or more of the normal annual yield because of lack of nutrients in seawater. One of the conflict-resolution methods is to supply nutrients to the Nori culture grounds by fertilization, but there is little effectiveness to Nori production. In this research, we put in particles likened to the nutrients in the various formations of Nori culture facilities. We also simulated the movement of nutrients in and around the Nori culture facilities. As a result, we determined that appropriate formation of Nori culture facilities could be an economic and efficient fertilization for Nori production.
RESEARCH ON THE ZOSTERA MARINA BEDS CREATION WITH DETACHED BREAKWATER

Takuro Ueda\textsuperscript{1}, Hironori Komatsu\textsuperscript{1}, Munehiro Fujiwara\textsuperscript{1}, Ryoichi Yamanaka\textsuperscript{2}, 
Kaori Yasuoka\textsuperscript{3} and Yoshihiro Suenaga\textsuperscript{4}

\textsuperscript{1}Graduate School of Engineering
Kagawa University
Hayashi, Kagawa, Japan
s09g402@stmail.eng.kagawa-u.ac.jp

\textsuperscript{2}Institute of Technology and Science, The University of Tokushima
\textsuperscript{3}Nittoc Construction Co. LTD
\textsuperscript{4}Faculty of Engineering, Kagawa University

There are many algae beds on the coastal area of Japan. The Zostera marina, known as valuable plants in algae, have very important functions as water purification, spawning and nursery grounds for marine resources. But in recent years, fishery products have decreased due to their disappearance and aggravation of water quality. In Japan, although a great number of Zostera marina beds development have been conducted as political projects there are few appropriate methods to enroot Zostera marina beds in the Seto Inland Sea. In Tsuda Bay, located on the eastern part of the Seto Inland Sea, planted Zostera Marina beds have been preserved behind the detached breakwater for over ten years. It is one of the most successful examples. In this study, we evaluate the effects from surrounding tidal currents on the Zostera marina bed by three-dimensional hydrodynamical models. Then we examine the new construction method of the detached breakwater that provides better current conditions suitable for preservation of the Zostera marina beds.

UNITED NATIONS ENVIRONMENTAL PROGRAM (UNEP) REGIONAL SEAS PROGRAMMES AND CLIMATE CHANGE

Jon M. Van Dyke

University of Hawai‘i
William S. Richardson School of Law
Honolulu, Hawai‘i, USA
jvandyke@hawaii.edu

The UNEP Regional Seas Programmes were established in the 1970s and 1980s amid much fanfare and excitement, but they have been underfunded and left to languish without strong leadership in many regions. Some, including the South Pacific Regional Environment Programme (SPREP), have sought to address climate change issues directly, but others, such as the Northwest Pacific Regional Seas Programme (NOWPAP) have done almost nothing to deal with these challenges. In some parts of the world the Large Marine Ecosystesms (LME), funded through the Global Environment Fund (GEF), seem to have superceded the Regional Seas Programme in the area, but the funding for the LMEs will expire soon. What is the future of the UNEP Regional Seas Programmes and what are their relationships with the LMEs?
GIS-BASED MONITORING OF WATER QUALITY IN PAUOA BAY, HAWAII: SUBMARINE GROUNDWATER DISCHARGE AND PHYTOPLANKTON BLOOMS

Judy K. Walker and Jason E. Adolf

Department of Marine Science
University of Hawai‘i Hilo
Hilo, Hawai‘i, USA
jkwalker@hawaii.edu

Pauoa Bay, on the west side of the island of Hawai‘i, is an area of low rainfall and few intermittent surface streams and rivers. Submarine groundwater discharge (SGD) is the primary source of freshwater and nutrients to the system, but there have been little study of SGD’s biological impacts in this environment. We developed a technique for producing surface maps of water quality in Pauoa Bay using a water quality sonde towed behind a kayak along a grid pattern covering the bay. Eight parameters were measured, with geo-referenced data collected at 2-second intervals. Water temperature and salinity were used to identify SGD and chlorophyll measurements were used as an indication of phytoplankton. In addition to sonde measurements, water samples were taken for nutrient and microscopic analysis. A comparison of temperature and salinity patterns in the bay during bloom and non-bloom conditions suggested that nutrients introduced by SGD had a greater residence time during bloom conditions, allowing Euglena sp. to become established and briefly flourish. During non-bloom conditions, phytoplankton densities in the bay are low with picoplankton prevalent.

IN SITU IDENTIFICATION OF TISSUE-SPECIFIC SMALL MOLECULES IN CORAL-SYMBIODINIUM ENDOSYMBIOSIS BY MALDI-TOF

Li-hsueh Wang¹, Jentaie Shiea³ and Chii-Shiargh Chen¹,²

¹National Museum of Marine Biology and Aquarium
Checheng, Pingtung, Taiwan
wanglh@nmmba.gov.tw
²Institute of Marine Biotechnology, National Dong Hwa University, Checheng, Pingtung, Taiwan
³Department of Chemistry, National Sun Yat-sen University, Kaohsiung, Taiwan

Mechanism of coral-dinoflagellate endosymbiosis involves in a complex interaction between the coral host cells and their intracellular symbionts. Although this interaction remains unclear, experimental evidences strongly indicate that several cellular processes, such as phagocytosis and membrane trafficking, play critical role. By developing novel experimental process using MALDI-TOF imaging, the present study aims to first identify tissue-specific lipid molecules, and then to examine their in situ expression during the endosymbiosis in the stony coral Euphyllia glabrescens. Results showed that (i) at least night tissue- or cell-specific lipid molecules, including two epidermis-specific, three host tissue-specific and four symbiont-specific lipids, were identified; and (ii) the in situ expression changes of these lipids correlated to various endosymbiotic stages. Upon the bleaching process, lipids of Symbiodinium, especially photosynthesis-related significantly decreased. Nevertheless, expression of both host tissue- and symbiont-specific lipids significantly increased when the symbiosis recovered. The present study indicates that the MALDI-TOF imaging represents a novel technique to unravel lipid in situ expression, which could provide new insights in understanding the specific role of membrane trafficking in regulating endosymbiosis.
35 YEARS OF MARINE TECHNOLOGICAL DEVELOPMENTS
AT THE NATURAL ENERGY LABORATORY OF HAWAI'I AUTHORITY

Jan C. War
State of Hawai'i
Natural Energy Laboratory of Hawai'i Authority
Kailua-Kona, Hawai'i, USA
janw@nelha.org

The Natural Energy Laboratory of Hawai'i Authority (NELHA) was created in 1974 to develop and diversify the State of Hawai'i’s economy by providing resources and facilities for energy and ocean-related research, education and commercial activities in an environmentally sound and culturally sensitive manner. Operating on 942 acres of master permitted property adjacent to the Kona International Airport, NELHA currently supports over 42 commercial and research related enterprises. Emphasis during the presentation will concentrate on the development of NELHA's extensive seawater distribution system, the status of renewable energy technologies such as Ocean Thermal Energy Conversion (OTEC) and Seawater Air Conditioning (SWAC), and the production of health care and food based products derived from land based aquaculture operations and desalination facilities. Concluding remarks will focus on the potential for information exchange and collaborative research opportunities with Asia-Pacific nations.

A COMPARATIVE ANALYSIS OF ENERGY SYSTEMS’ STRUCTURE:
HAWAI'I vs. U.S.

Sherilyn T.M. Wee, Denise E. Konan, Iman Nasseri and Craig S. Coleman
University of Hawai'i Economic Research Organization (UHERO)
Energy and Greenhouse Gas Solutions (EGGS)
Honolulu, Hawai'i, USA
swee@hawaii.edu

International efforts to decrease greenhouse gas (GHG) emissions, increase renewable energy and energy efficiency are at the focal point of today’s global environmental and energy concerns. The combination of a different energy structure and Hawai'i’s geographic isolation makes the state’s energy solutions vastly different from that of the mainland U.S. Data mainly collected from the U.S. Energy Information Administration (EIA) for 2007, grouped according to energy source and the main energy consuming sectors allowed us to examine the trends of change in energy related parameters of economy and environment in Hawai'i and compare it with mainland U.S, and to rank the data to see where Hawai'i places relative to the mainland states and the U.S. as a whole. We also present comparisons in the structure of different energy-related profiles such as consumption, supply, and fuel types. This paper aims to provide the tools to understand these differences and attain these goals of reduced GHG emissions and increased renewable energy and energy efficiency by providing a comparative analysis of Hawai'i’s and the mainland U.S.’s energy profile.
STORM EFFECTS ON WATER QUALITY AND PRODUCTIVITY
OF A TROPICAL HAWAIIAN ESTUARY

Tracy N. Wiegner¹ and Lucas Mead²

¹Marine Science Department
University of Hawai‘i at Hilo
Hilo, Hawai‘i, USA
wiegner@hawaii.edu

²Tropical Conservation Biology and Environmental Sciences Master’s Program
University of Hawai‘i at Hilo

Storms transport large quantities of watershed materials to estuaries dramatically affecting their water quality and productivity. Presently, little is known about storm effects on tropical estuaries. We studied Hilo Bay, Hawai‘i, examining how water quality changed immediately following a storm and evaluating the estuary’s short-term response to storms. Hilo Bay was sampled during dry conditions and for five days following storms. Directions of water quality parameters’ responses to storms were similar among stations; however, the magnitude of the response depended on whether the station was directly influenced by rivers, groundwater, or ocean exchange. Storms increased nitrate and particulate nitrogen concentrations, decreased those of ammonium, but did not affect dissolved organic nitrogen concentrations. Storms also increased dissolved organic carbon and particulate carbon concentrations. Dissolved phosphorus was generally below detection and not affected by storms. Five days following storms, nutrient concentrations remained high, waters cleared, but phytoplankton blooms were not detected. Our results demonstrate that storms affected water quality and production in Hilo Bay and that understanding storm effects is paramount as more storms are predicted to hit this region with global warming.

PIER 38 PARTNERSHIP: A WORLD CLASS MODEL

Howard C. Wiig

Hawaii State Department of Business Economic Development & Tourism
Energy Division
Honolulu, Hawai‘i, USA
hwiig@dbedt.hawaii.gov

Honolulu Pier 38 services Oahu’s fishing industry, offering mooring space, fishing supplies, office space and even a fish restaurant. A marine debris partnership has also evolved, making Pier 38 a recycling epicenter as diverse as to serve as a model for the world. This paper outlines the evolution of the partnership and describes the dynamic interactions that make Pier 38’s program unique and effective. The sources cited consist largely of interviews and correspondence as little has been written about the program. This paper details the problems caused by plastic in the North Pacific Gyre through the voices of debris pioneer Captain Charles Moore and NOAA scientists. Next is described the growth of the partnership for a few concerned individuals to a mega-partnership including Pier 38 merchants, fishing organizations, Oahu’s waste-to-energy plant, activists, the U.S. Coast Guard and Hawai‘i’s largest recycling company. The paper concludes by describing the Pier 38 as a catalyst for similar programs in Massachusetts and Washington State.
The Hawai‘i Undersea Research Lab is planning a major cruise to investigate NOAA’s Pacific Remote Islands Monument in 2011. The focus will be especially in the region of Palmyra, Kingman Reef, Johnston Island and Jarvis Atoll. NOAA designated this monument along with 2 others in 2009. They contain pristine areas of coral reef with species found nowhere else. In 2005, HURL collected deepwater coral samples which showed deepwater precious corals to be up to 4,265 years in age. A research plan has been designed by NOAA for the three new monuments. This plan will focus on habitat and environmental characterization, identify and describe new species, establish transects for long term monitoring and highlight fundamental research topics such as connectivity, tropho-dynamics, life history strategies and the effects of potential natural and anthropogenic changes. HURL runs the deep diving submersibles PISCES IV and PISCES V which carry 3 people to depths of 2000m. The submersibles operate off the research vessel Kaimikai-o-Kanaloa which has an integrated ROV and mapping system.

The State of Hawai‘i has a legislated goal of providing 70% of its electricity from alternate energy sources by 2030. The Hawai‘i Undersea Research Lab (HURL) has been assisting in the fulfillment of this goal through surveys and equipment testing. The HURL site at Makai pier is a designated energy test site for the U.S. Department of Energy Offshore Renewable Energy Center. HURL conducted a detailed bathymetric survey for a major deepwater power transmission line joining Molokai and Lanai with Oahu. The cable is slated to bring 400 MW of electric power generated by wind to the population center on Oahu. HURL is also rehabilitating its Launch, Recovery and Transport vehicle (LRT) to deploy wave power test devices of up to 15 tons. The HURL submersibles are being used for bottom surveys associated with Ocean Thermal Energy Conversion specifically to collect data for an environmental impact statement for developing the plant. Hawai‘i is on track to develop commercial wind, wave and OTEC power operations in the next decade. Ocean renewable energy will play a big part in the State’s future energy portfolio.
BUILDING ON PARTNERSHIPS
MIDWAY ATOLL-MARINE DEBRIS COASTAL MONITORING PILOT PROJECT

Christine Woolaway¹ and Seba Sheavly²

¹Chris Woolaway & Associates, LLC, Hawaii
christis@woolaway.com

²Sheavly Consultants, Virginia Beach, Virginia

One of the crucial management problems facing the Papahanaumokuakea Marine National Monument is marine debris. Up until recently there have been no attempts to develop a scientifically rigorous marine debris monitoring protocol for island environments. During the conception, design and implementation of this pilot project and program partners worked to develop a statistically sound and biologically relevant marine debris monitoring protocol for the Midway Atoll National Wildlife Refuge that can serve as the basis for a long-term coastal monitoring program within the Monument System. The Program trained U.S. Fish & Wildlife Midway Atoll volunteers incorporated within their other on-island responsibilities, a rigorous standardized sampling plan. The data collected was inputted into a baseline database that can be used to develop strategies to quantify beach debris forms and to mitigate identified sources.

FINDING SOLUTIONS THROUGH PARTNERSHIPS
SOLID WASTE CHALLENGES & STRATEGIES
FOR ISLAND COMMUNITIES

Christine Woolaway¹ and Rene Mansho²

¹Chris Woolaway & Associates, LLC, Hawai‘i
chris@woolaway.com

²Schnitzer Steel Hawai‘i Corp. & Aloha Aina Earth Day, Kapolei, Hawai‘i

Island communities, large and small; those with large land mass and those that are very small all share a common challenge and that is what to do with the solid waste. In the Midway Atoll Marine Debris Coastal Monitoring project we included an important solid waste management component that built on our ten year work with recovery and proper disposal of recovered derelict fishing gear in the NWHI. Engaging a network of professionals from industry and government we developed a number of marine debris, solid waste removal and processing options which can result in a more sustainable waste management plan for Midway Atoll NWR. This plan includes the recycling industry coordinated by the Aloha Aina Earth Day program, along with the County, federal and state agencies. In completing the Midway Atoll Marine Debris Coastal Monitoring project there were lessons learned, hopefully these lessons will also benefit other island communities which face similar solid waste issues. With proper solid waste management marine debris will be reduced, and our entire planet will benefit.
Hard coral, fish, and macroalgae were surveyed on selected reefs in the North Andaman, along an expected water quality gradient from sewage discharge to identify water quality impacts on coral communities. The study sites were also categorised by the level of tourism concentration from intensive activity at Phuket, semi-intensive activity at Koh Phi Phi, Krabi province and sporadic activities at Mu Koh Surin, Phang-Nga province. A water quality index was calculated for each study site based on dissolved nutrient, pH and suspended solids. The surveys revealed strong gradients in ecological attributes associated with tourism concentration levels and water quality. Percentage of living coral cover and fish assemblages decreased with increasing tourist intensity as well as decreasing distance from sewage discharge and increasing nutrients within each site. The number of species of the divisions Rhodophyta and Chlorophyta and their coverage increased with increasing nutrients while Phaeophyta remained constant. The response of coral reef communities to pollution varied depending on factors such as level of nutrient load, distance from point source, current direction and species of organisms.

Tsunami disaster prevention of the Seto Inland Sea is slow to take action for lack of knowledge of generation mechanism of Tsunami damages. According to previous research papers, there is a possibility of appearance of sudden water level raising and long-term water level fluctuation in sympathetic vibration with characteristic vibration in some bay. Therefore, this study simulates a tsunami propagation and period characteristics by 2D Hydrodynamics Numerical Model. As a result of numerical analysis, tsunami waves propagate through narrow channels which located eastern and western end of the sea and wave characteristics were changed by complex topography. According to wavelet analysis, these wave characteristics were generated by tsunami resonance and coastal-trapped wave.
Underwater acoustic positioning systems have been extensively used in a wide variety of underwater work, including oil and gas exploration, ocean sciences, marine archaeology, and military activities, and are generally of three broad types, according to the length of their baselines: long (LBL), short (SBL), and ultra short (USBL) systems. We will review an extensive literature to discuss the working principles and resolutions of these three groups of underwater acoustic positioning systems, discuss the advantages and disadvantages of these methods and the state-of-the-art performance, as well as propose a novel acoustic positioning concept. This approach relies on the measurement of a phase shift between two acoustic signals that is proportional to the distance between a reference point and a moving target. The resolution of the proposed method is affected by environmental factors, including ocean currents and acoustic ray refraction. The proposed method can be used for underwater remotely operated vehicle (ROV) localization, ocean current observation, and long-term monitoring of submerged tectonic plate movements.
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