Short History

1973 **Water Quality Research** in Puget Sound and Bering Sea, **DOMES**, **Tsunami**
1976 First **equatorial mooring**
1979 Begin **Equatorial Climate Studies**
1983 Begin **VENTS/FOCI**, end Puget Sound, major **El Niño**
1986 First **megaplume** discovered
1992 First **FOCI** pollock recruitment prediction
1993 First acoustic detection of **deep sea volcanic eruption**
1994 **El Niño** Array completed—largest in world
1997 First prediction of major **El Niño** using **TAO** data, begin **National Tsunami Hazard Mitigation Program**
1999 NeMONet — first deep ocean **volcano observatory**
2001 **Tsunami** array completed, begin **Ocean Exploration**
2002 Second prediction of **El Niño**
2003 Begin CO_2 repeat sections, **ARGO** float Program
2004 Liquid CO_2 discovered at 1600 m depth at NW Eifuku volcano

Information Technology

PMEL has developed a strong Information Technology team and infrastructure to support in-house computing needs, network support to all of NOAA's Seattle-area offices, and key support to many NOAA-wide and international programs. PMEL IT staff play a lead role in the development of the data management system for the Integrated Ocean Observing System and makes available on the web software and data management capabilities that allows scientists to access, view, and analyze observational and gridded data, and to work with geographical information systems. PMEL has been a leader in making data available on the internet for several years, including data analysis and reduction routines to tailor output to the specific needs of scientists and citizens.

Engineering Development

The Engineering Development Division supports NOAA and the PMEL research effort with innovations in ocean instrumentation and real-time observing systems. The Division has decades of experience in whole-system design and the staff has a strong background in the fields of digital and analog electronics, software engineering, mechanics and materials. The Division emphasizes the teaming of engineers and scientists to solve complex ocean observation problems that meet NOAA goals.

Joint Institutes

In conjunction with leading universities, NOAA has established formal collaborative research agreements to form the Joint Institutes. These institutes combine the resources and scientific excellence of both NOAA and the universities to form centers of excellence to address environmental issues that are of mutual concern to the parties. PMEL collaborates with these four universities to address ocean and climate-related concerns through their respective Joint Institutes:

University of Washington: Joint Institute for the Study of the Atmosphere and Ocean (JISAO)
Oregon State University: Cooperative Institute for Marine Resources Studies (CIMRS)
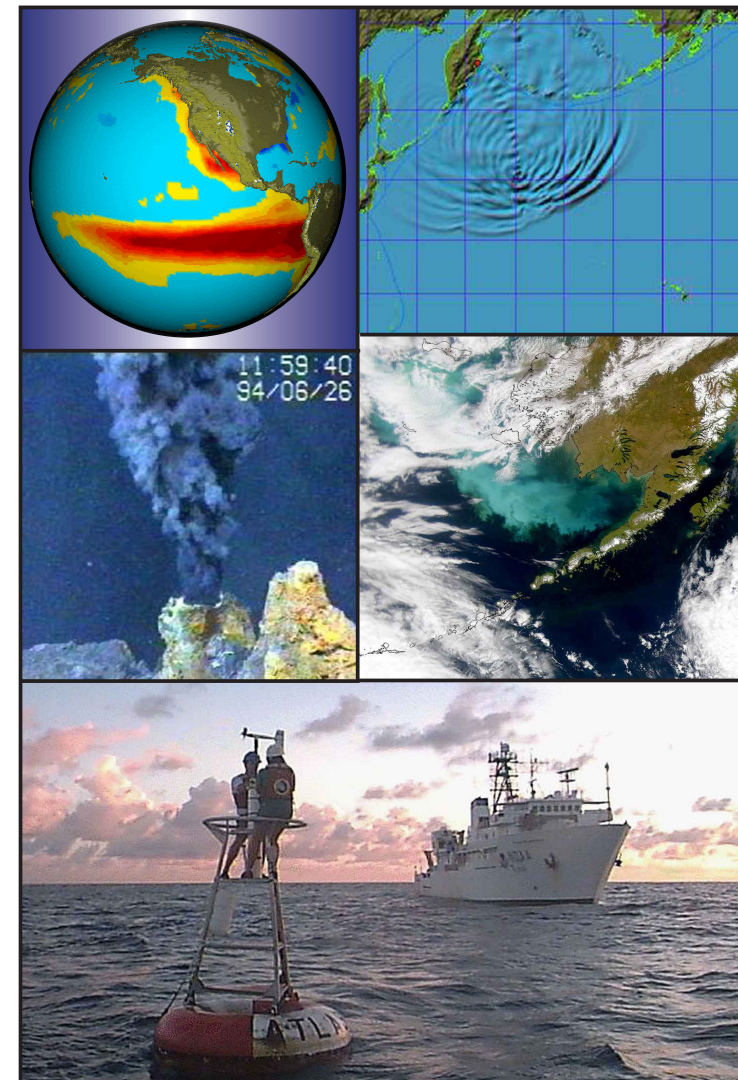University of Alaska: Cooperative Institute for Arctic Research (CIFAR)
University of Hawaii: Joint Institute for Marine and Atmospheric Research (JIMAR)

Pacific Marine Environmental Laboratory

A leader in developing ocean observational systems to address NOAA's mission

The Pacific Marine Environmental Laboratory (PMEL) carries out interdisciplinary scientific investigations in oceanography and atmospheric science. Current PMEL programs focus on open ocean observations in support of long-term monitoring and prediction of the ocean environment on time scales from hours to decades. Studies are conducted to improve our understanding of the world's oceans, to define processes driving the global climate system, and to improve environmental forecasting capabilities for public safety, marine commerce, and fisheries.

Results from PMEL research activities contribute to NOAA's mission goals:

1. *Protect, restore, and manage the use of coastal and ocean resources through ecosystem-based management,*

2. *Understand climate variability and change to enhance society's ability to plan and respond,*

3. *Serve society's needs for weather and water information, and*

4. *Support the Nation's commerce with information for safe, efficient, and environmentally sound transportation.*

PMEL has the capability to collect oceanographic data from any depth at any location in the world's oceans and distribute these data in real-time over the internet.

For more information, contact: **Dr. Eddie Bernard, Director**
Pacific Marine Environmental Laboratory

7600 Sand Point Way N.E.
Seattle, WA 98115-6349
206-526-6800

http://www.pmel.noaa.gov

Climate

El Niño Research

The El Niño/Southern Oscillation (**ENSO**) cycle is the most prominent year-to-year climate fluctuation known on Earth. Warm (El Niño) and cold (La Niña) phases of the cycle recur roughly every 3 to 7 years. These climate swings have significant impacts on global patterns of weather variability, Pacific marine ecosystems, valuable fish species, and the global carbon cycle. In California alone, the estimated cost of losses from the 1997 El Niño event exceeded $1 billion.

The TAO/TRITON Array of 70 deep-ocean moored buoys is jointly maintained by PMEL and the Japan Agency for Marine-Earth Science and Technology (JAMSTEC). To date, over 900 Atlas moorings, designed and built by PMEL, have been deployed in the tropical Pacific since the inception of the Array in 1985.

The TAO Project formed a partnership with France and Brazil in 1995 to develop the Pilot Research Moored Array in the Tropical Atlantic (PIRATA) and is currently active in developing plans for a multi-national Indian Ocean moored buoy array to support climate studies.


Atmospheric Chemistry

The PMEL Atmospheric Chemistry Program conducts field measurements to quantify the chemical, physical, and radiative properties of atmospheric aerosol particles. The goal is to develop a predictive understanding of the climate and air quality impacts of atmospheric particles.

Radiative Forcing by Tropospheric Aerosol
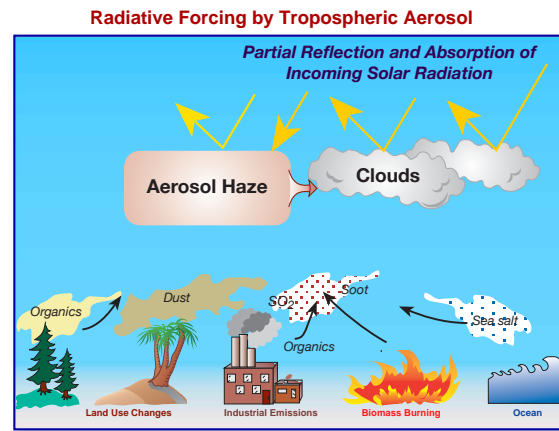
Carbon Dioxide

The PMEL Global Carbon Cycle Program focuses on the ocean's role as a sink for carbon dioxide. The goal is to provide NOAA with high quality data required to reduce the uncertainties in the estimates of both the annual and decadal changes in the oceanic carbon sink. Improved predictions will provide decision makers with the quantitative information required for making critical economic decisions regarding CO_2 and other greenhouse gases.


Land-Ocean Carbon Cycle
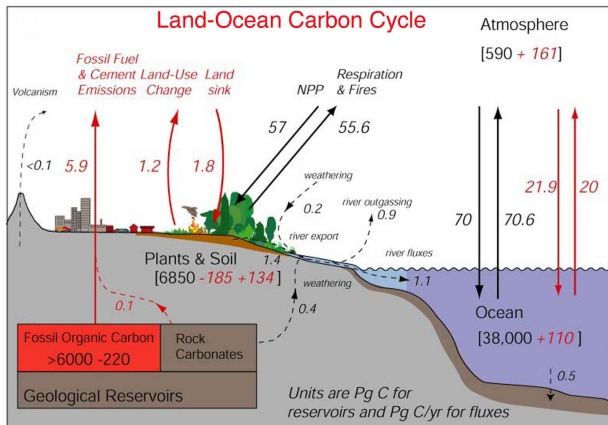
Chlorofluorocarbon Tracers

The PMEL Chlorofluorocarbon (CFC) Tracer Program uses dissolved CFC's as unique tracers of ocean circulation and mixing processes on decadal time scales. Elevated levels of these manmade compounds in the water column highlight regions of the ocean that are most active in absorbing atmospheric gases, including carbon dioxide. CFC observations are used to test and evaluate ocean-atmosphere models and can lead to improved forecasts of the role of the ocean in long-term climate variations.

Argo

Argo is an international program implementing a global ocean array of 3000 temperature/salinity profiling floats. This array is a major component of the ocean observing system. It will provide a near real-time quantitative description of the evolving state of the upper ocean including patterns of seasonal to decadal ocean climate variability. PMEL has developed a system for delayed-mode scientific quality control of Argo salinity data. It is applying this sytem to U.S. Argo data, maintaining and improving the system, and sharing it with international partners. PMEL also procures Argo floats, tests them, deploys them, and monitors their data.
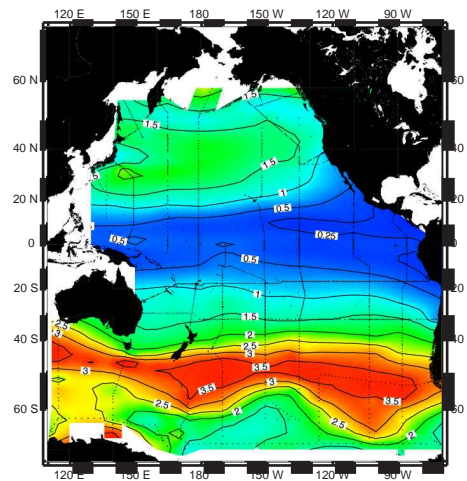
Ecosystems

VENTS Research

VENTS research assesses the chemical, thermal, and biological changes to the ocean environment caused by hydrothermal venting near ocean seafloor spreading regions. Understanding these changes will improve our ability to predict the impact of seafloor volcanism on global climate change. Vents also investigates the colonies of microbes that thrive in the vicinity of seafloor vents. These organisms have the potential to have a significant impact in the biotechnology industry and for pharmaceutical applications.
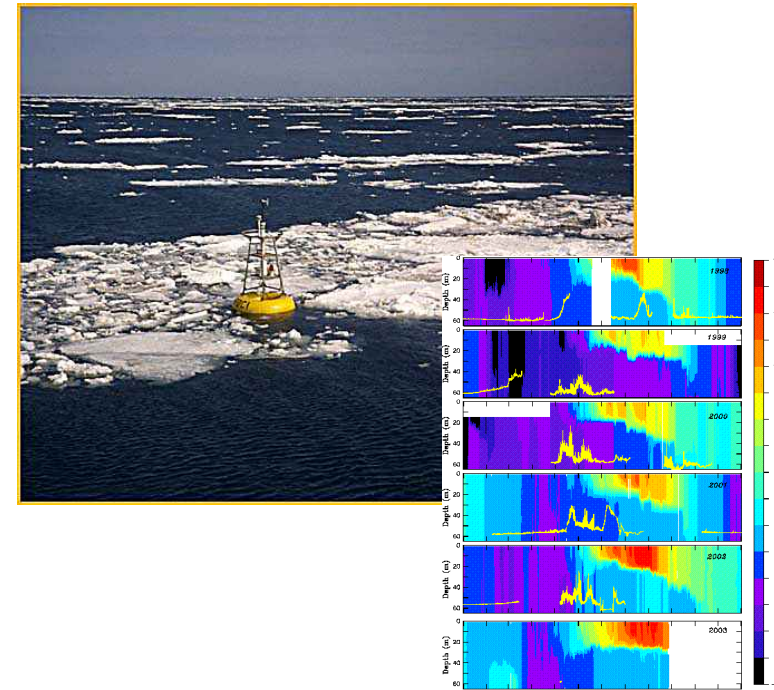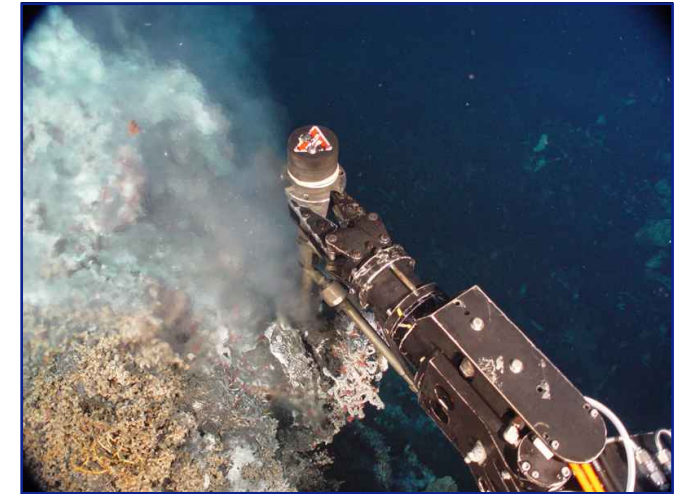
Fisheries Oceanography

Fisheries-Oceanography Coordinated Investigations (**FOCI**) is a joint research effort by NOAA scientists at PMEL and the Alaska Fisheries Science Center. FOCI's goals are to understand ecosystem dynamics and recruitment variability of commercially valuable fish and shellfish stocks in the Gulf of Alaska and the Bering Sea. To accomplish these goals, FOCI investigates linkages among climate variability, physical and biological forcing, and ecosystem productivity. From these investigations, FOCI predicts environmental changes. Such forecasts guide resource managers in reducing uncertainty in commercial fishery allocations and enable them to practice environmental stewardship to mitigate effects of climate change on marine species and coastal communities.

Weather and Water

Tsunami Research

PMEL leads efforts in applied science and engineering to reduce the loss of life and property when destructive tsunamis strike U.S. coastal communities. A deep-ocean "tsunameter" network provides NOAA's Tsunami Warning Centers with early detection and measurement of tsunamis traveling toward coastal communities. A tsunami forecasting system will integrate these measurements with advanced numerical modeling technology to quickly predict the impact of a tsunami on a threatened community. Inundation maps, developed by numerical simulation of tsunamis striking a community, are provided to coastal state Emergency Management officials as essential guidance for long-term hazard assessment, disaster planning, and mitigation.