SEAREX
SEA - AIR EXCHANGE PROGRAM

Participating Institutions:
University of Rhode Island and
University of Connecticut
California Institute of Technology
Woods Hole Oceanographic Institution
University of East Anglia, United Kingdom
Scripps Institute of Oceanography
Texas A & M University
University of Miami
CEN-CNRS, France
Yale University

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MID-PACIFIC MARINE LABORATORY

REPORT OF RESEARCH ACTIVITIES

Title of Research: SEA-AIR EXCHANGE (SEAREX) PROGRAM

Chief Scientist: William Fitzgerald
(Title and Address) Marine Sciences Institute
University of Connecticut
Groton, Connecticut

Co-Investigators: Roger J. Cayer (URI), Tom Pazis (URI), Martin Hughes (URI), Robert A. Duce (URI), Barbara Ray (URI), George Schwartze (URI), Pat Harder (URI), Hal Maring (URI), Clair Patterson (CIT), Dorothy Settle (CIT), Elliot Atlas (TAMU), Kevin Sullivan (TAMU), Edward Peltzer (WHOI), and Gary Gill (UCONN).

Dates of Enewetak Investigation: 13 March - 18 June, 1979

Objectives of Research:

1. To repair damage to the SEAREX sampling facility, located on Sand Island, which had been caused by Typhoon Alice.
2. To conduct dry season atmospheric sampling for the following objectives:

   a. The quantitative measurement of atmospheric fluxes of selected heavy metals (e.g., Pb, Cd, Zn, Se, Sb, As, Cu, Hg, Ag), ^{210}Pb, and its daughter ^{210}Po and organic compounds such as the man-associated PCB, DDT, polynuclear aromatic and aliphatic hydrocarbons, phthalate plasticizers and the natural occurring steroidal and terpenoid hydrocarbons, fatty acids and alcohols, low molecular weight compounds such as ketones, aldehydes, and carboxylic acids to the ocean surface.

   b. The identification of the sources for these substances in the marine atmosphere.

   c. The investigation of mechanisms of exchange of these substances across the sea/air interface.

3. To conduct atmospheric sampling for Dr. Daniel Grosjean of Environmental Research and Technology, Inc., to be used in his investigation of particulate carbon.

4. To perform routine maintenance on some of the installation's equipment during the month of June, 1979.

Summary Report:

The first two weeks (13-29 March) were devoted to the repair of the facility on Sand Island which had been damaged by Typhoon Alice. The work performed during this period included the re-building of the tower base whch had been critically undermined when Sand Island was submerged during the typhoon, replacement of one tower anchor and four guy wires, replacement of the portable lab which had been carried approximately 100 yards by the water, re-building of the trace metal facility, building the organic facility, the laying of a new submarine cable to replace the original one which had been damaged beyond repair, re-wiring of the tower and the three support buildings, and the replacement of two deck frames.

Between the dates of 30 March-14 April, the sampling apparatus were made ready by the scientific investigators. Actual dry season sampling was begun on 15 April 1979. From that date until 23 May, when the scientific party departed Enewetak, the following samples were collected:

19 High volume air samples, 3 cascade impactor samples, 19 low volume air samples, 3 long dry fallout collections, and several small rain samples, for Texas A & M University for the investigation of anthropogenic organic compounds (e.g., DDT, PCB).

6 Glass fiber filter (GFF) samples for the investigation of particulate matter, 8 GFF plus 2 PUF-PLUG samples for the investigation of particulates and gas phase organics. These samples will be analyzed at the Woods Hole Oceanographic Institution for n-alkalines, fatty acids and fatty and/or polycyclic alcohols. Rainwater was collected for the analysis of formaldehyde, total organic carbon (TOC), and the major inorganic nutrients.

87 separate samples of Hg in air were analyzed for the University of Connecticut. Also a rain sample was collected during one major rain storm. From these collections it will be noted that (1) the major state of Hg in the atmosphere of Enewetak Atoll is gaseous with concentrations between 1-13 x 10^{-9} g/m^3, (2) particulate Hg is present in concentrations at the 10^{-12} level, (3) chemical speciation experiments designed to establish the chemical forms of Hg in the near surface open ocean atmosphere were conducted, (4) Hg flux determinations in rainfall will be made.

Air and rain samples for the further investigation of Pb by the California Institute of Technology group consisted of duplicate samples plus tower blanks for three different periods. Two rain samples of two liters and 100 millileters respectively were collected along with three dry deposition samples.

Samples collected for the University of Rhode Island for trace metal (Na, Mg, Al, Fe, etc.) analysis included 14 high volume Whatman 41 filter samples along with 13 blanks, 4 high volume cascade impactor samples along with 4 blanks, 17 low volume 47 mm Nuclepore filter samples with 28 corresponding blanks.

For the CFR/CNRS, France group, URI personnel collected the following samples for SEM-EMP analysis of trace metals and also for the analysis of particulate organic carbon (POC), 8 low volume cascade impactor samples and 1 blank, 9 low volume 47 mm Nuclepore filter samples and 9 blanks, 5 high volume

GFF samples and 4 blanks, and 2 high volume GFF cascade impactor samples and 1 blank.

The electronic system which controlled the various modes of sampling parameters (wind speed, wind direction, rain, etc.) known as ASCAS (Automated System for the Control of Atmospheric Sampling) and the microprocessor which recorded the various sampling events, MIDAS (Meteorological Intergrating Data Aquisition System) were both in operation during the period of sampling.

The following meteorological equipment was in operation during the dry season atmospheric sampling period: 1 horizontal and 1 vertical anemometer, a condensation nucleus counter, a Royco (large particle) counter, an automatic rain gauge, and an automatic psychrometer. An ozone monitor and a radon counter were present but not fully operational.

From 30 May - 18 June, the major portion of work included maintenance of the atmospheric sampling facility. During this period of time, there were neither electronic equipment nor meteorological sensors in operation. A small amount of air sampling was carried out for Daniel Grosjean of Environmental Research and Technology, Inc. The following samples were collected for the further investigation of particulate carbon: 1 high volume GFF and 1 blank, and 6 low volume 47 mm quartz fiber filters (QFF) and 6 blanks.

cc: R. Duce, Chairman, SEAREX Executive Committee
B. Ray, SEAREX Science Coordinator
V. Chisholm, SEAREX Administrative Coordinator
R. Cayer, SEAREX Coordinator