



U.S.
DEPARTMENT
OF
COMMERCE

National
Oceanic
and
Atmospheric
Administration



*Office of Ocean
Engineering*

NDBO

NOAA Data Buoy Office

History of NDBO

Recognizing the need for a comprehensive Data Buoy Development program, the Ocean Engineering Panel of the Interagency Committee on Oceanography, in 1966, suggested the creation of a National Data Buoy system to replace numerous individual and relatively ineffective buoy development programs then underway. Following a ten month feasibility study by Travelers Research Corporation, Congress, in 1966, enacted legislation endorsing the concept of a National Data Buoy System, and the United States Coast Guard established a National Data Buoy Development Project (NDBDP) in December of 1967. Upon creation of the National Oceanic and Atmospheric Administration (NOAA) in October 1970, the NDBDP was transferred to NOAA and moved to NASA's National Space Technology Laboratories where it continues to function as the NOAA Data Buoy Office (NDBO).

As of September 12, 1976, NOAA has established an Office of Ocean Engineering, which will include the existing NOAA Data Buoy Office, the Office of Manned Undersea Science and Technology, and certain functions of the former National Oceanographic Instrumentation Center.

Mission...

As a center of environmental data buoy technology for marine sensors, buoy platforms and power systems, data reduction and transmission techniques, and environmental data buoy applications for government, scientific and industrial users: NDBO is dedicated to the development and deployment of reliable unmanned automatic data buoys to acquire, transmit, and record marine environmental information. Working toward this goal NDBO is conducting a continuing research into the engineering technology of automatic data buoy acquisition and transmission and receiving systems to increase the reliability of its product.

NOAA Data Buoy Office

National Space Technology Laboratories

Bay St. Louis, Mississippi 39529

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Deep Ocean Moored Buoys

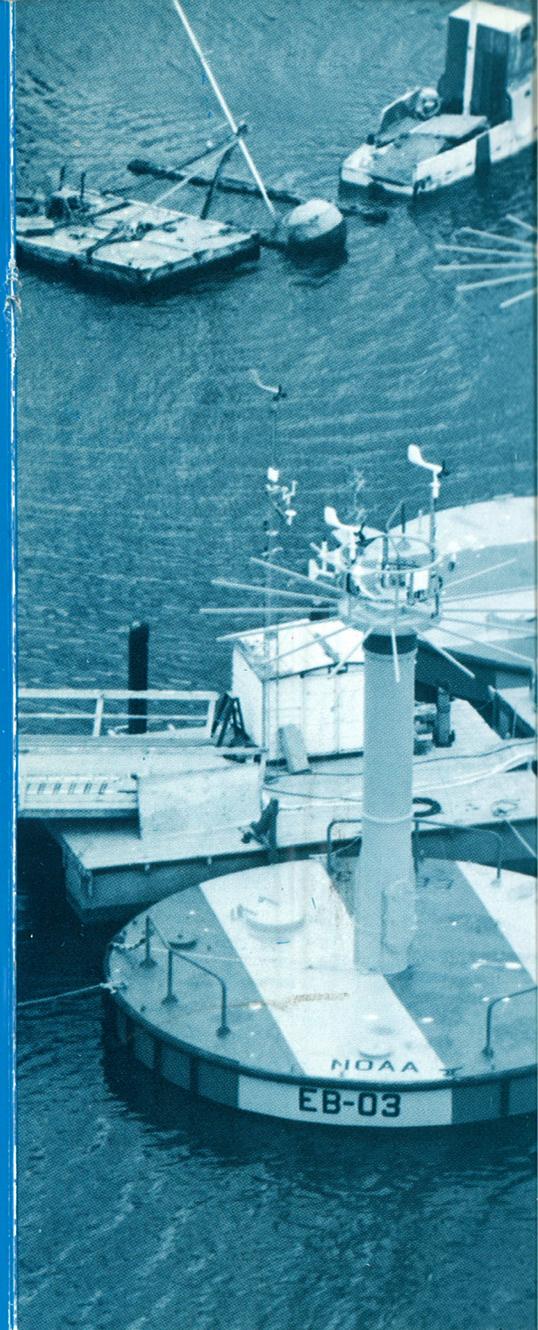
NDBO has engaged in a continuing data buoy development process based on its experience and technological expertise gained through the design, fabrication, deployment, and maintenance of large environmental data buoys. Through this process, NDBO has succeeded in developing a basic network of highly reliable environmental buoys for deep ocean applications. These new buoys and buoy payloads require considerably less service and maintenance than previously deployed buoy systems.

Since deployment of the prototype environmental buoy in July of 1975, this deep ocean network has been expanded to a total of eight buoys. Six of these buoys are deployed in the Northern Pacific and Gulf of Alaska, while two of the systems are in the Atlantic, east of the Carolinas and Virginia capes. Another buoy is scheduled to replace the Weather Station "Hotel" vessel

in October 1977. Major technological advances incorporated in this buoy design resulted in:

- o Replacement of diesel electric generators with three-year life battery power
- o Reduced frequency of on-site service from once every three months to once a year
- o Addition of reliable UHF satellite communications to previously HF-only systems

NDBO hopes to make these buoys the technological basis for continued efforts to advance data buoy reliability and cost effectiveness. In addition, they will serve as platforms for the development of new technology in the areas of ocean temperature profiling, upper air measurement, and ocean current measurement.

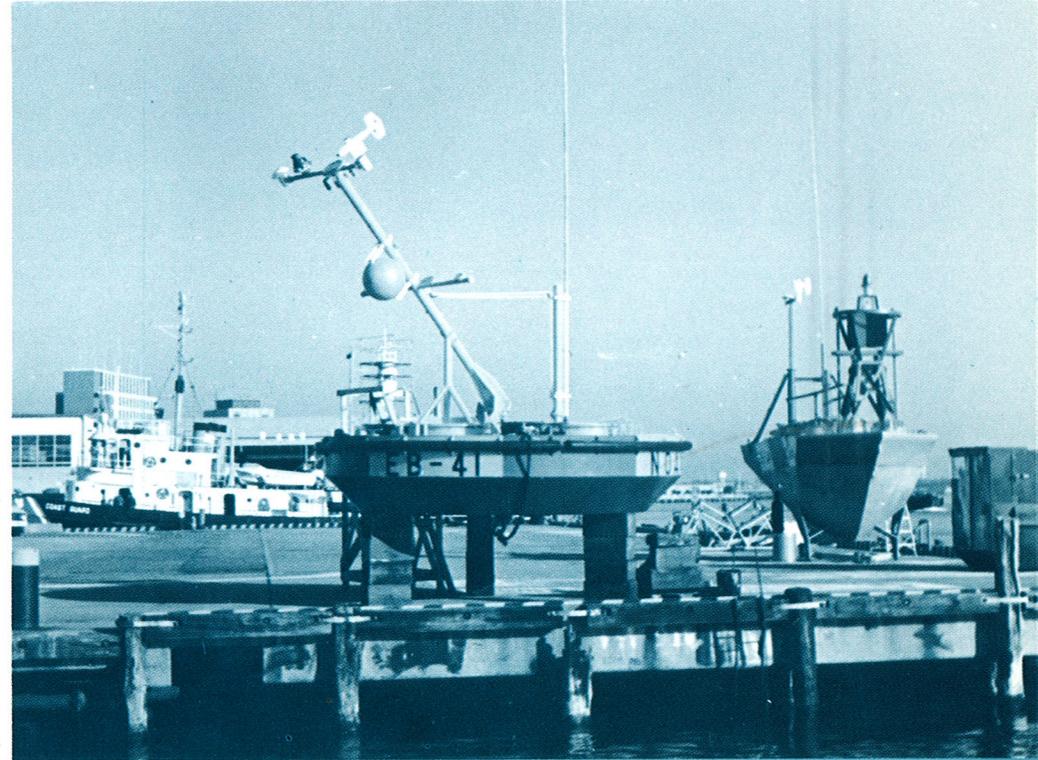
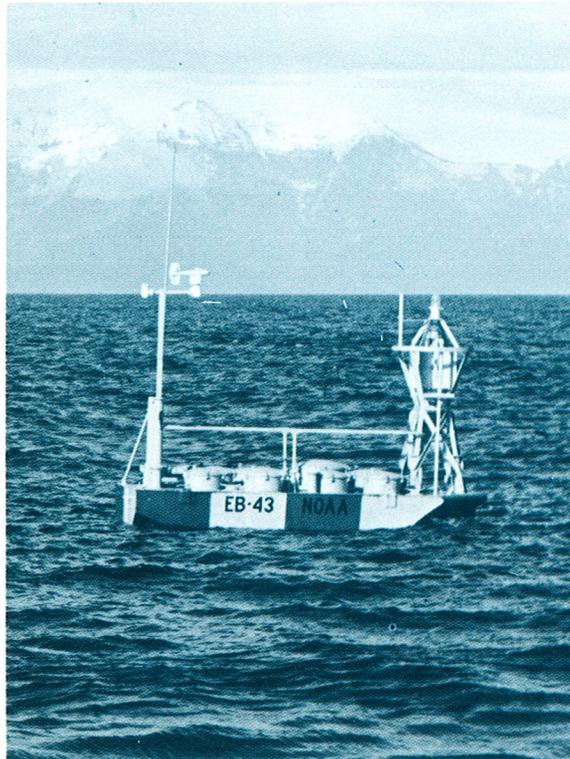
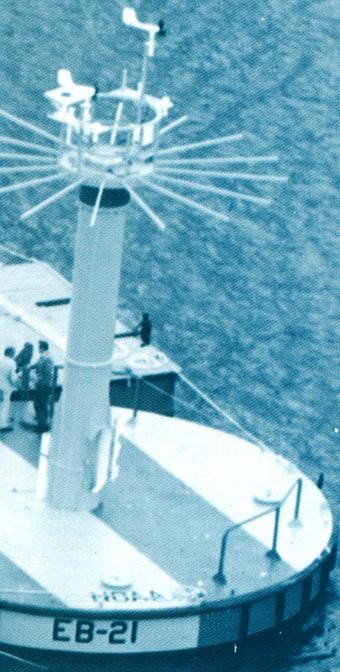




*Continuing
Mooring
Program*



Continental Shelf Moored Buoy Programs



These buoys are two of a group of buoys used for gathering environmental data from the waters of the United States Continental Margin to further the understanding of the meteorological forcing functions that affect the ocean dynamics over the Continental Shelf. The data acquired from these buoys are used in support of environmental studies being conducted by the Environmental Research Laboratory of NOAA for the Bureau of Land Management. This class of buoys measures and reports wind speed and direction, barometric

pressures, air temperature, and surface water temperature. They can also be equipped to measure significant wave height, wave period, and wave spectral density estimates. Data are collected and transmitted every three hours in near real time to a Miami, Florida, shore station via HF radio link or to the National Meteorological Center in Suitland, Maryland, via satellite using the GOES system. The buoys also have the capability to collect and report data on an hourly basis if required.

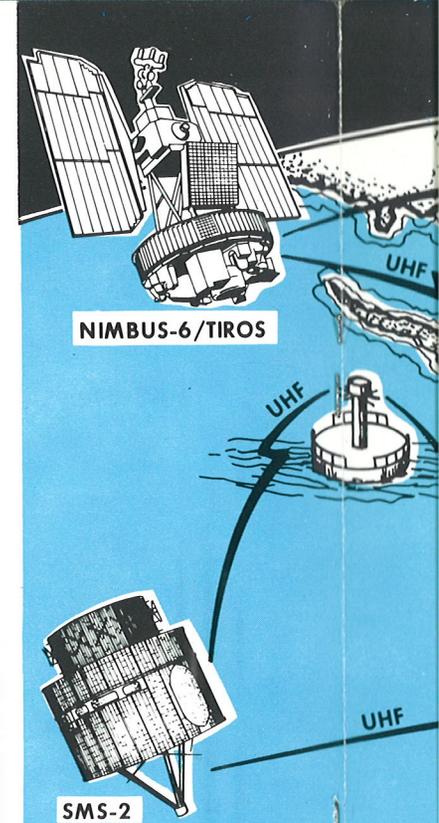
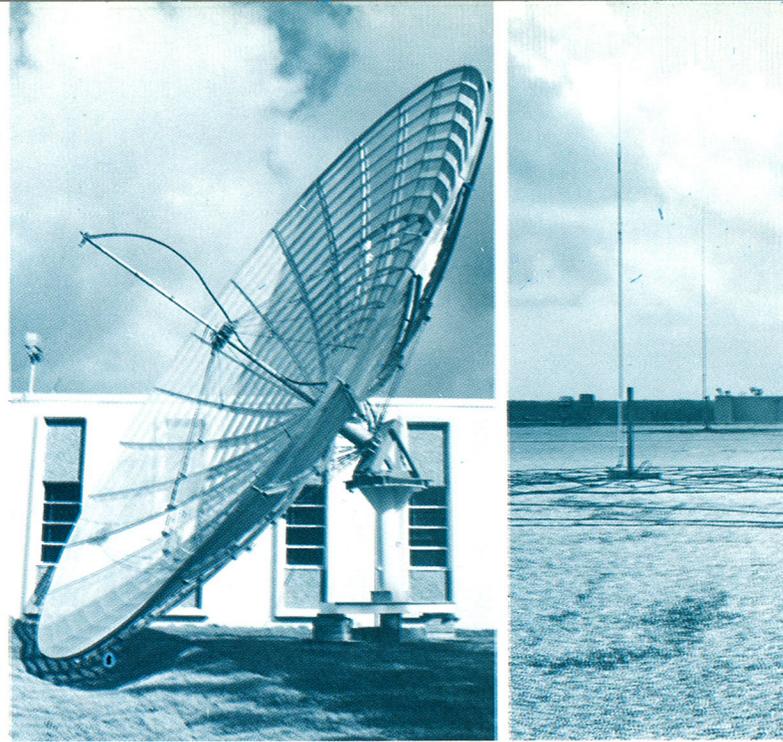
Communications

A complete communication network is in place to receive and disseminate data acquired from buoys and to monitor and control buoy operations. In order to increase efficiency and control costs, NDBO utilizes existing Government-owned facilities, supplementing these facilities and sharing costs as appropriate. Most moored buoys now communicate in near real-time via HF radio through the Coast Guard radio station at Miami and San Francisco.

NDBO is in the process of converting to UHF communication for these buoys. This new communication system will utilize the GOES satellite system and other facilities operated by NESS and NASA. Considerable savings and increases in reliability are expected.

Data received from buoys is compiled, processed and transmitted in near real-time to the National Weather Service for further dissemination to users. The data is also sent to the Environmental Data Service for archiving.

Small drifting buoys report position and data at UHF frequencies via the polar-orbiting NIMBUS-6 satellite. The NIMBUS spacecraft transmits the information to Anchorage, AK, where it is relayed by landline to NASA/Goddard for processing and further distribution. The data is available to the user at least once a day.

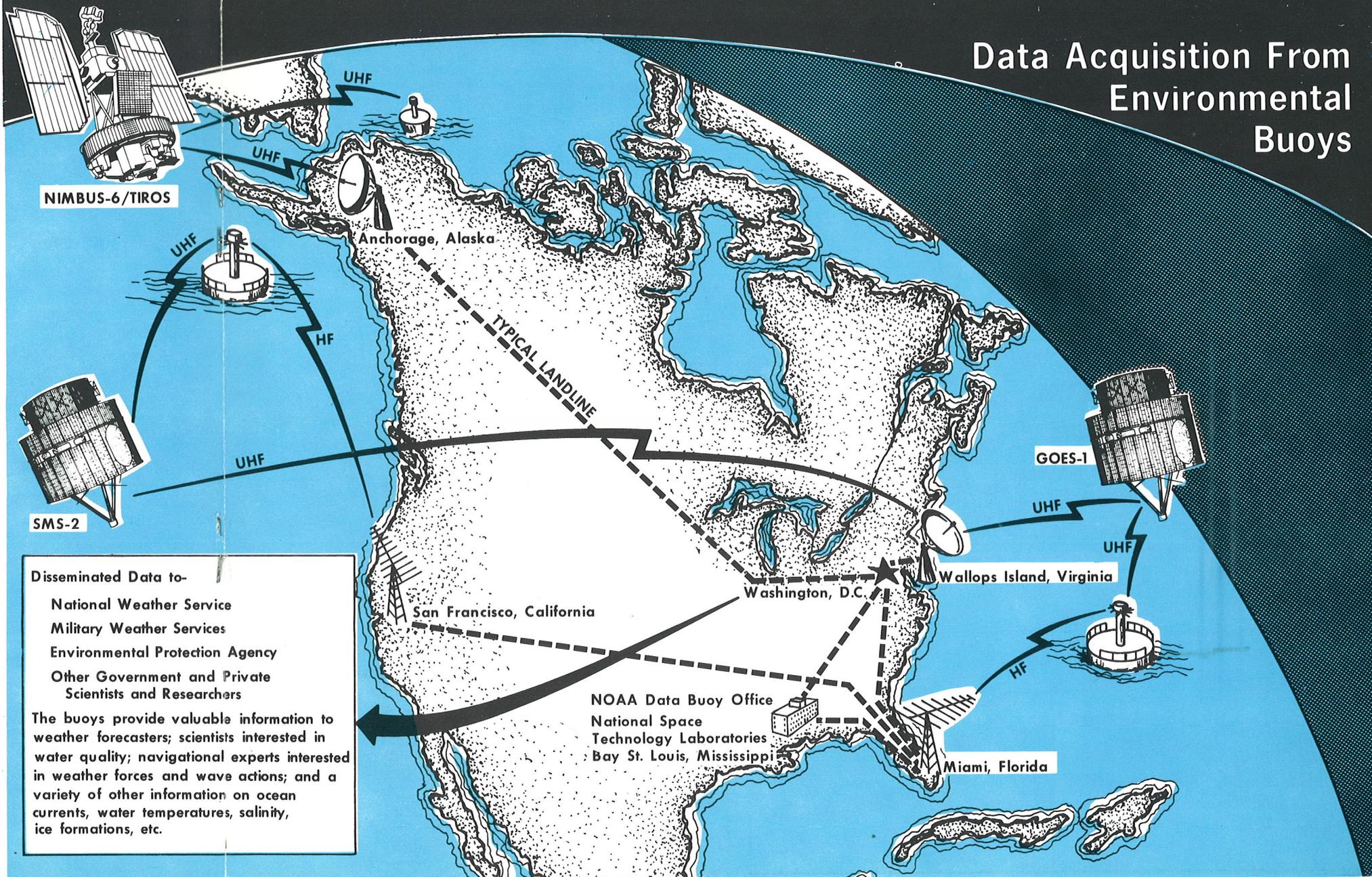


Disseminated Data to-

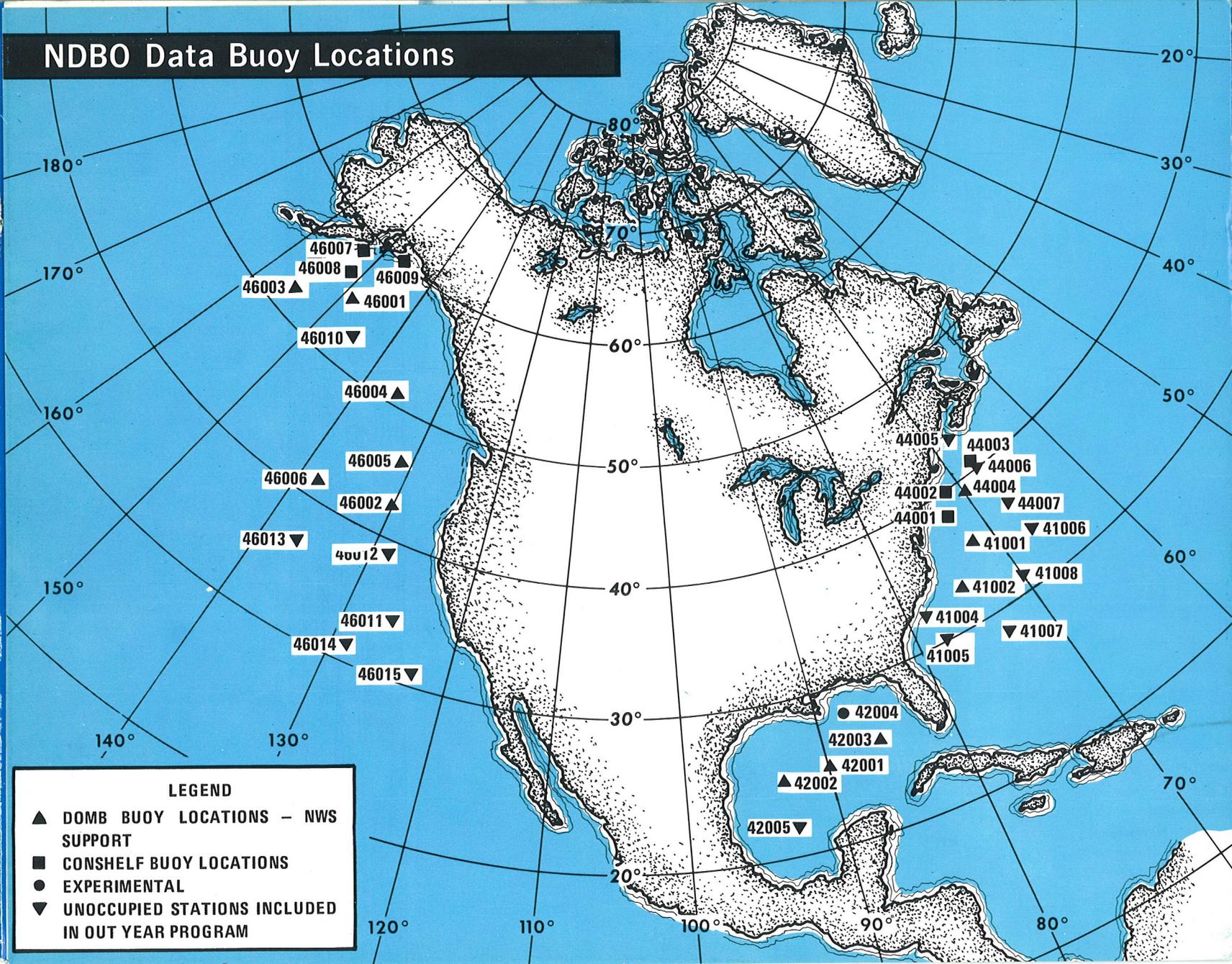
- National Weather Service
- Military Weather Services
- Environmental Protection Agency
- Other Government and Private Scientists and Researchers

The buoys provide valuable information to weather forecasters; scientists interested in water quality; navigational experts in weather forces and wave actions; variety of other information on ocean currents, water temperatures, salinity, ice formations, etc.

Data Acquisition From Environmental Buoys

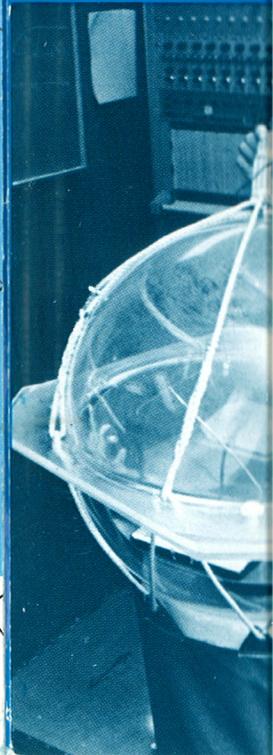


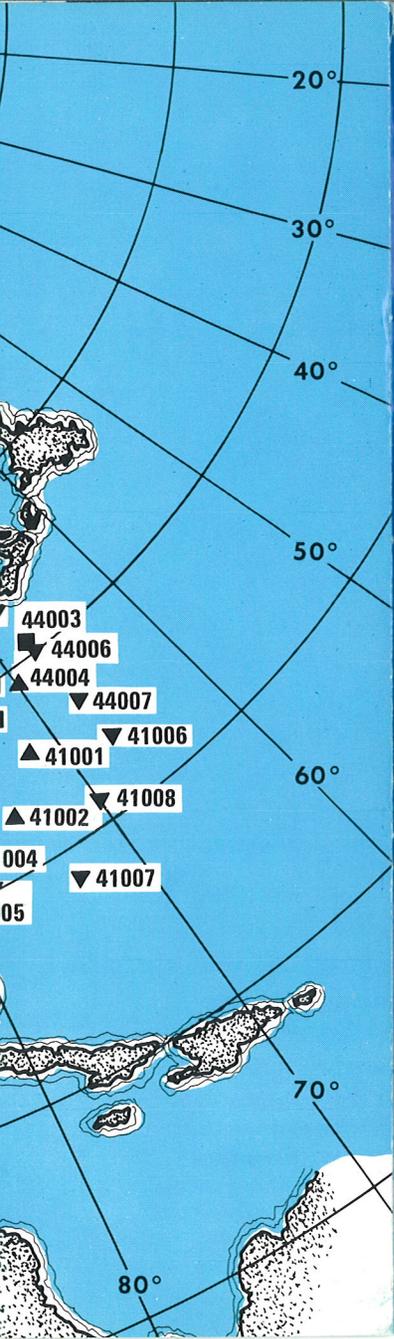
NDBO Data Buoy Locations



Drifting Buoy Program

AIR DROPPABLE





Drifting Buoy Programs

Drifting buoys are the most versatile of all NDBO's buoy systems. They have the capability to fix an exact geographical position. Some 12 different types of buoys are currently in use, with over 100 of these buoys.

Drifting buoys are capable of measuring a simple set of meteorological and oceanographic parameters. Communication and data transmission via the NIMBUS-6 and the future geostationary orbiting satellites, provide world-wide capability for these systems. For meteorological parameters, wind speed, barometric pressure, surface water temperature measurements are made. Work is continuing on the develop-

AIR DROPPABLE ICE BUOY



DRIFTING BUOY



Sensor System Development

Sensor R&D objectives are to improve performance and reliability of existing sensor subsystems and to obtain those data that cannot now be obtained. For example, a project is currently underway to provide integrated temperature profiles of the atmosphere from the surface to an altitude of 4,000 to 6,000 meters by use of remote sensors located on the buoy deck. Plans are to investigate proven satellite technology and to adapt satellite-type sensors to buoy use.

NDBO is working toward improvement of the quality of wave spectral data and addition of direction to the data output. Also, an effort is underway to develop an ocean temperature sensor to obtain sea water temperature profiles from the surface to at least 300 or 400 meters. Experimental hardware from these latter two projects will be experimentally deployed along with an evaluation array of ocean current measurement systems in a "Cluster" experiment. This experiment has as its goal the evaluation of several current measurement systems with state-of-the-art current sensors and an acoustic telemetry system. In addition to the testing of current sensors, the experiment is designed to test the concept of transferring data from a remote underwater sensor system to a surface buoy, with the ultimate potential for providing data in near real time.

Future Programs & Projects

NDBO has an on-going Research and Development program designed to provide observational tools for national and international users where present technology is inadequate. The R&D program focuses on major new problem areas in which NOAA is involved including:

- o Need for improved weather prediction
- o Climate related studies
- o Continental Shelf and energy related problems
- o Applied oceanography

NDBO recognizes that the potential role of buoys in monitoring programs greatly exceeds the present state-of-the-art and new systems concepts are being evolved through the use of proven off-the-shelf hardware components. The end objective is to develop and demonstrate stable or specialized buoys for individual application. Through its R&D program NDBO plans to:

- o Develop and demonstrate a responsive water quality monitoring system
- o Evaluate operational wave directional system
- o Test and demonstrate ocean temperature systems
- o Test upper air temperature profiling systems
- o Demonstrate specialized buoy systems

The NDBO Ocean Test Platform (OTP), which has been operating in the Gulf of Mexico since the winter of 1974, provides an in situ evaluation facility for testing of sensors and newly developed meteorological and oceanographic systems and subsystems.

are the most versatile and lowest in cost of buoy systems. They are also unique, in that capability to fix and report their geographical location. Some 12 different organizations have used these buoys.

are capable of measuring and reporting a meteorological and oceanographic parameter. Communication and position determination, US-6 and the future TIROS-N polar-orbiting systems, provide world-wide deployment capabilities. For meteorological applications, barometric pressure, air temperature and water temperature measurements can be reported. The development of drifting buoys

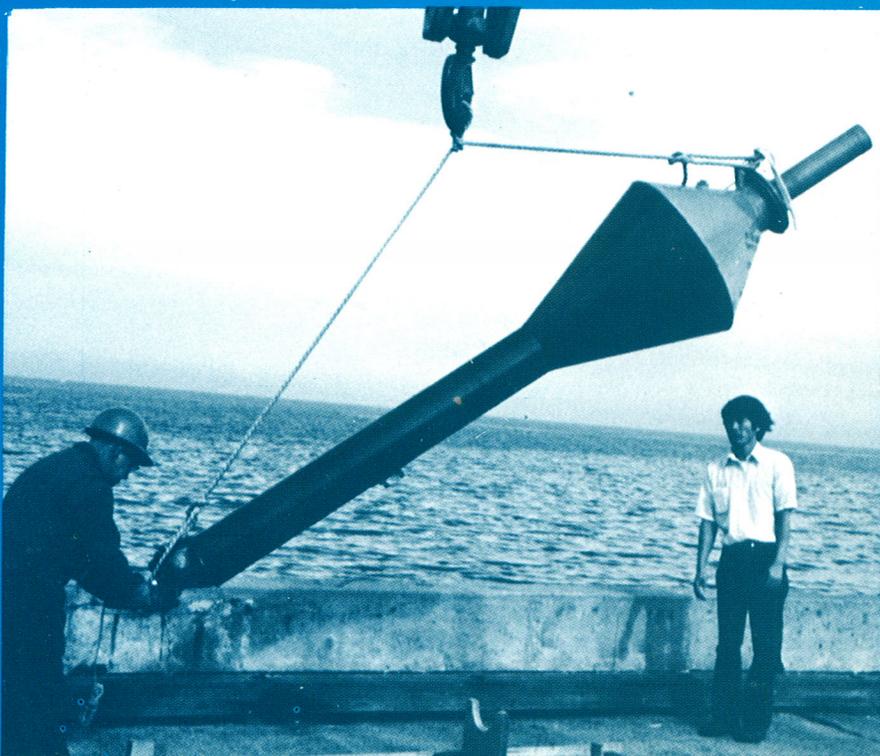
that can measure other oceanographic parameters such as subsurface water temperature.

The drifting buoy, equipped with a drogue, is a popular oceanographic tool for mapping ocean currents using Lagrangian tracking techniques.

Ice buoys which use the same electronics equipment as a drifting buoy, have been developed to support scientific programs with the objective of reaching a better understanding of the interaction of sea ice with the environment.

One of the ice buoy types is capable of being deployed by parachute into otherwise inaccessible areas.

DRIFTING BUOY ↙

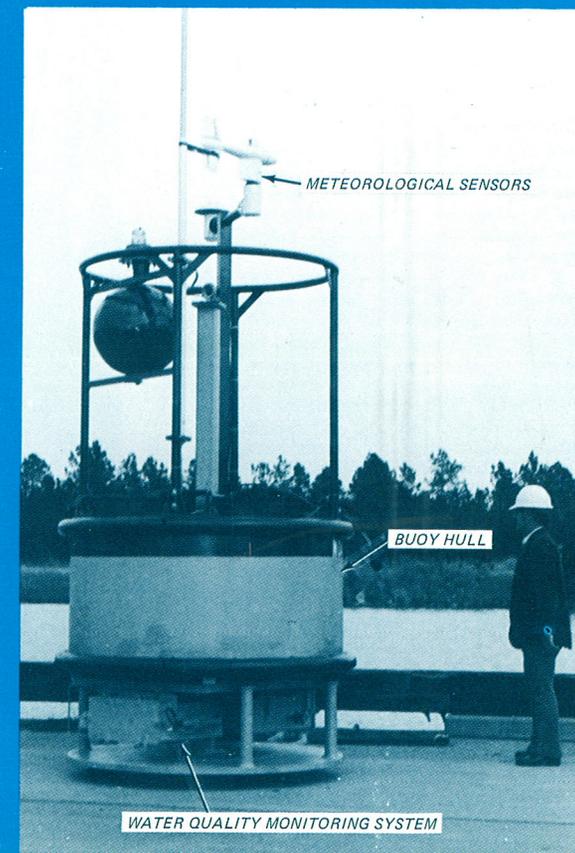


Low Cost Buoy Payload

In order to provide more buoy stations to users on an economical, reimbursable basis, NDBO has developed a program for a low-cost payload configured for ready adaptation to hulls of opportunity. The payloads will report meteorological parameters consisting of wind speed, wind direction, air pressure, air temperature, and sea surface temperature. Also, data input ports will be provided for future sensor additions, including a wave measurement system and a multi-element thermistor line. The buoy, which will be battery powered, will use UHF-GOES satellite communications only. A system having a mean-time-between-failure of one year is the reliability goal.

Water Quality Buoys

NDBO has developed an experimental water quality monitoring system. This system measures the following parameters: Chlorophyll, conductivity, dissolved oxygen, pH, water temperature and turbidity. It is compact, light weight, has low power consumption and can be installed on a small buoy. The data from the system is relayed ashore by radio at preset intervals in near real time. The buoy reports meteorological parameters at the same time. Further development of this type is dependent on user's needs.



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