Remotely Obtaining Data from Ocean-Bottom Moored Instruments
Adaptable Bottom Instrument Information Shuttle System (ABIISS)
NOAA/AOML – CIMAS

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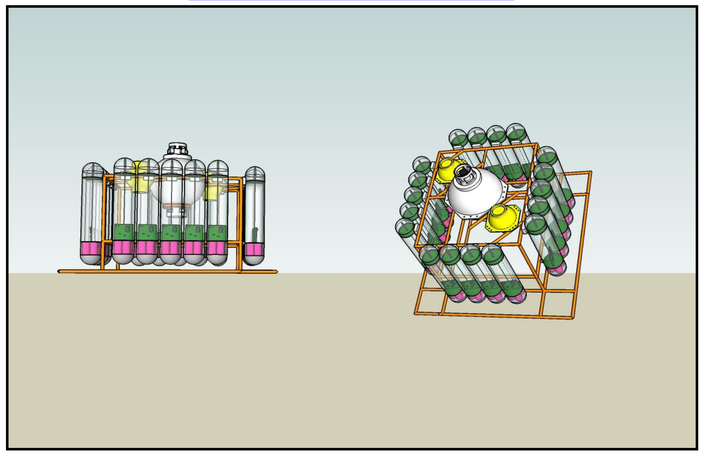
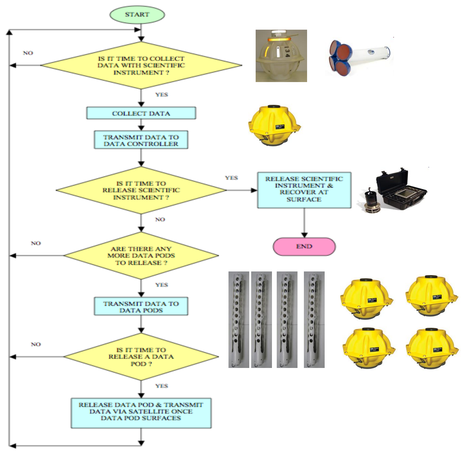
❑ Motivation

Understanding of the role of the ocean in the global climate system and ecosphere requires collecting data on key ocean currents that are not always found at the ocean surface. Measurements of important deep ocean currents are principally made via scientific instruments that are anchored on the ocean bottom for periods of two to four years. Retrieval of the critical data from these systems is often costly, requiring significant ship time on NOAA or chartered vessels. For the past several years, engineers, technicians and scientists at AOML have been developing a new system that will significantly reduce ship time needs, and hence NOAA costs, by transmitting data from subsurface moored instruments back to land via satellite.

CONCEPTUAL DRAWING WITH 18 DATA PODS



FLOW DIAGRAM FOR THE ABIISS



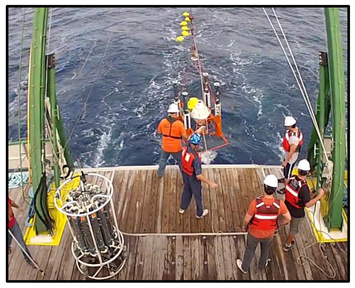
❑ Main Features & Advantages

- Preliminary estimates based on the cost of the prototype suggest that the total of an ABIISS will augment the cost of oceanographic instrument by around $70K for a system with 16 data pods (that is less than the cost of ship time on a class-1 research vessel).
- Can be modified to adapt to any oceanographic instrument that is RS-232 capable.
- Can be configured to interface to multiple scientific instruments.
- Data transmitted to land station via the Iridium satellite network.
- Data retrieval time interval is pre-programmed by user.
- Configurable to accommodate up to 16 data pods.
- All data pods and controller store data from the start of the deployment.
- Diagnostic information can be transmitted back with data string.

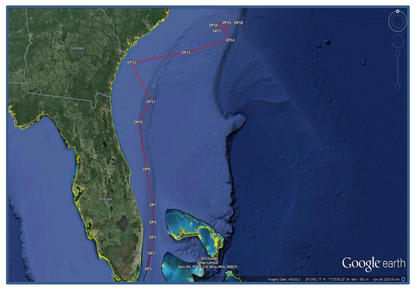
❑ Evolution Continued

1st Deep Water Deployment (800m):

The 15th of January, 2014 aboard the R/V F.G. Walton Smith, about 20 miles east of Miami in the Straits of Florida for a 6-month deployment. The system was attached to a Teledyne 300Khz ADCP.



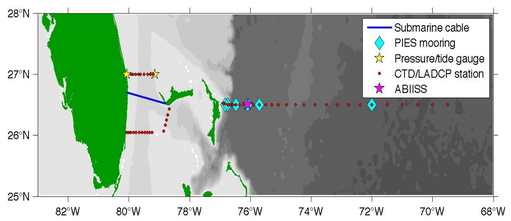
Deploying the ABIISS package



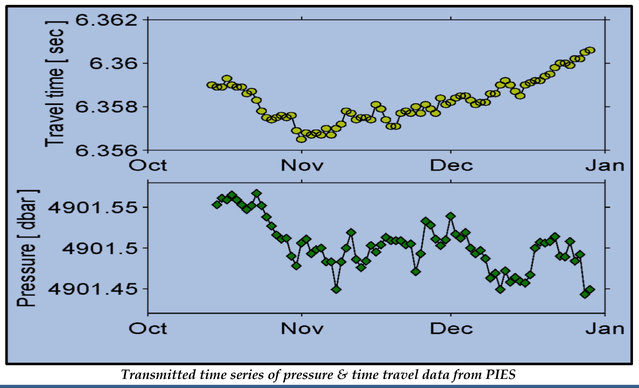
Surface trajectory of data pod released on 4/14/2014

2nd Deep Water Deployment (4760m):

The 14th of October, 2015 aboard the R/V Endeavor. The ABIISS system is presently undergoing a deep ocean 18-month test, with the system having been attached to a PIES as part of the NOAA-funded Western Boundary Time Series project that monitors the Deep Western Boundary Current and the Antilles Current east of Abaco Island in the Bahamas.



ABIISS on deck before deployment

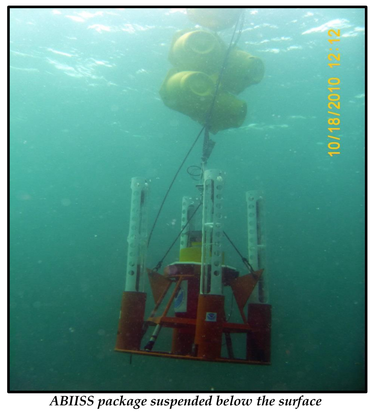


Transmitted time series of pressure & time travel data from PIES

NOAA Emerging Technologies Workshop – Silver Springs, MD – July 2016

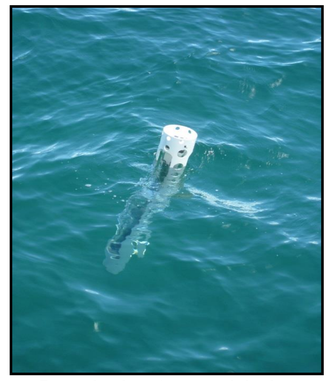
❑ Evolution

1st Test Cruise: In the Straits of Florida was completed on the 7th of September, 2010 aboard the R/V Cable. This cruise was completed to address one of the most significant issues regarding the deployment of an ABIISS system, namely how to deploy the large system in such a way that it sinks at a modest rate and settles to the ocean bottom gently



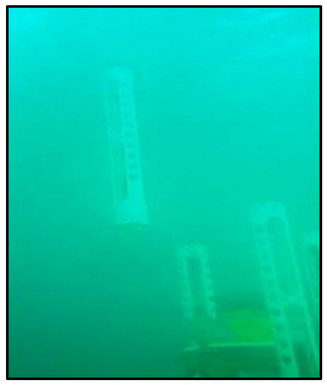
ABIISS package suspended below the surface

2nd Test Cruise : Was completed on the 14th of October, 2010 aboard the R/V Virginia K. All aspects of the planned testing were extremely successful. ABIISS with a Teledyne 300Khz ADCP was released from the surface and descended to the seafloor without any problems. The data pods all released as programmed, and once they reached the surface the data was transmitted via the Iridium Satellite Network back to land. At the end of the cruise the complete system was retrieved.



Data pod at the surface transmitting data

ABIISS with 300Khz Teledyne ADCP



Releasing data pod

3rd Test Cruise & Shallow Water Deployment: Was on the 18th of October, 2010 aboard the R/V Virginia K. ABIISS was deployed with a University of Rhode Island (URI) Pressure Equipped Inverted Echo Sounder (PIES) in shallow water (30') for the first longer-term deployment. Two data pods were released as programmed and transmitted the data via the Iridium Satellite Network back to land. ABIISS was recovered in January of 2011 after a 3 month deployment. This test confirmed the long-term seal of the data pods – crucial for future longer-term deployments.

ABIISS with URI-PIES

ABIISS package at sea bottom

Data pods recovered after 3-month deployment

Data pod frame recovered after 3-month deployment

❑ Future Plans

As part of the proposal titled "The Subtropical South Pacific Warm Pool: Dynamics of Regional Heat Convergence and Deep-Ocean Warming" that was submitted to NASA OSTST (Ocean Surface Topography Science Team), if funded, two ABIISS systems each attached to a PIES will be deployed off the coast of New Zealand to primarily monitor the evolution of the full-depth heat content and transport between the PIES.

Acknowledgments

This work was originally funded under the 2009 OAR Assistant Discretionary Fund, the NOAA Climate Program Office in FY 2011 and currently by NOAA/AOML

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