



NO. 03 - APPLICATION NOTE - SIGNATURE55

A tool for advancing environmental academic research

Challenge

Researchers at The Institute of Oceanology in Qingdao, China, needed a tool to study the currents of the Western Pacific in connection with scientific climate studies.

And on the other side of the planet, researchers at Texas A&M University needed a current profiler that would help them understand the dispersion of oil and methane in the ocean.

Solution

Deploying the Signature55, a dual frequency long-range current profiler, to obtain complete current data sets.

End user value

“The Signature55 has advantages of longer current profiling range, it is easier to deploy and it gives us better value for money compared to other options.”

Yu Fei,
Senior Researcher, Doctor and Director at
The Institute of Oceanology, Chinese Academy of
Sciences (IOCAS)

“The information will increase the understanding and response capability in the event of deep water spill events.”

John Walpert,
Senior Research Associate and Technical
Lead at the Geochemical and Environmental
Research Group, Texas A&M University
(TAMU)

Improving the understanding of El Niño and contributing to deep water spill preparedness

Why did researchers at both the Institute of Oceanology in Qingdao, China, and at Texas A&M University decide to use the Signature55 current profiler to advance their environmental academic research?

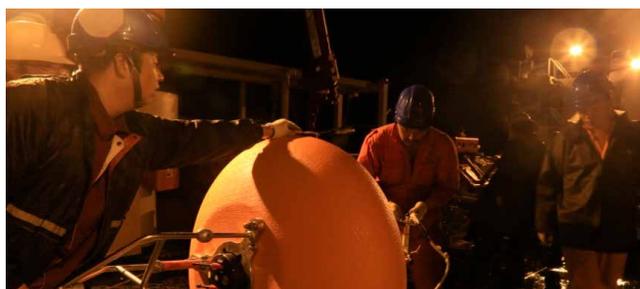
Researchers at The Institute of Oceanology in Qingdao, China, now use Nortek's Signature55 to study the circular current structure of the westward currents of the Western Pacific.

"Information about Western Boundary Currents in the lower latitudes of the Pacific and their influence on low frequency pulsing of warm currents are vital for scientific research. But so far we have had insufficient data about these patterns in connection with dynamic ocean circulation research and its relation to climate", says Yu Fei, Senior Researcher, Doctor and Director at The Institute of Oceanology, Chinese Academy of Sciences (IOCAS).

Contributing to the World Climate Research Programme

Data about the currents in these areas of the Pacific are important contributions to the World Climate Research Programme project entitled Climate and Ocean: Variability, Predictability and Change (CLIVAR).

CLIVAR's mission is to understand the dynamics, the interaction, and the predictability of the coupled ocean-atmosphere system. The program facilitates observations, analysis and predictions of changes in



The Institute of Oceanology's deployment is done with the Signature55 in a sub-surface buoy on a mooring line and the instrument is operated in a stand-alone measurement mode.

understanding of climate variability and dynamics, predictability, and change, to the benefit of society and the environment in which we live.

Revealing environmental characteristics of the Western Pacific

"We wanted to get the deep ocean current velocity of the westward currents of the Western Pacific and to reveal the hydrodynamic environmental characteristics of this region", says Yu Fei.

Therefore, it was important to obtain actual measurements in the ocean to capture the variability in the current structure. It was also important to obtain current measurement in 3D - not just 2D - in order to understand the formation and variability of low latitude Western Boundary Currents.

"At the same time, these measurements can reveal low frequency variations in the control processes of warmer waters, thus improving our understanding of the El Niño-Southern Oscillation (ENSO) and east Asia monsoon seasonal forecasting", Fei adds.

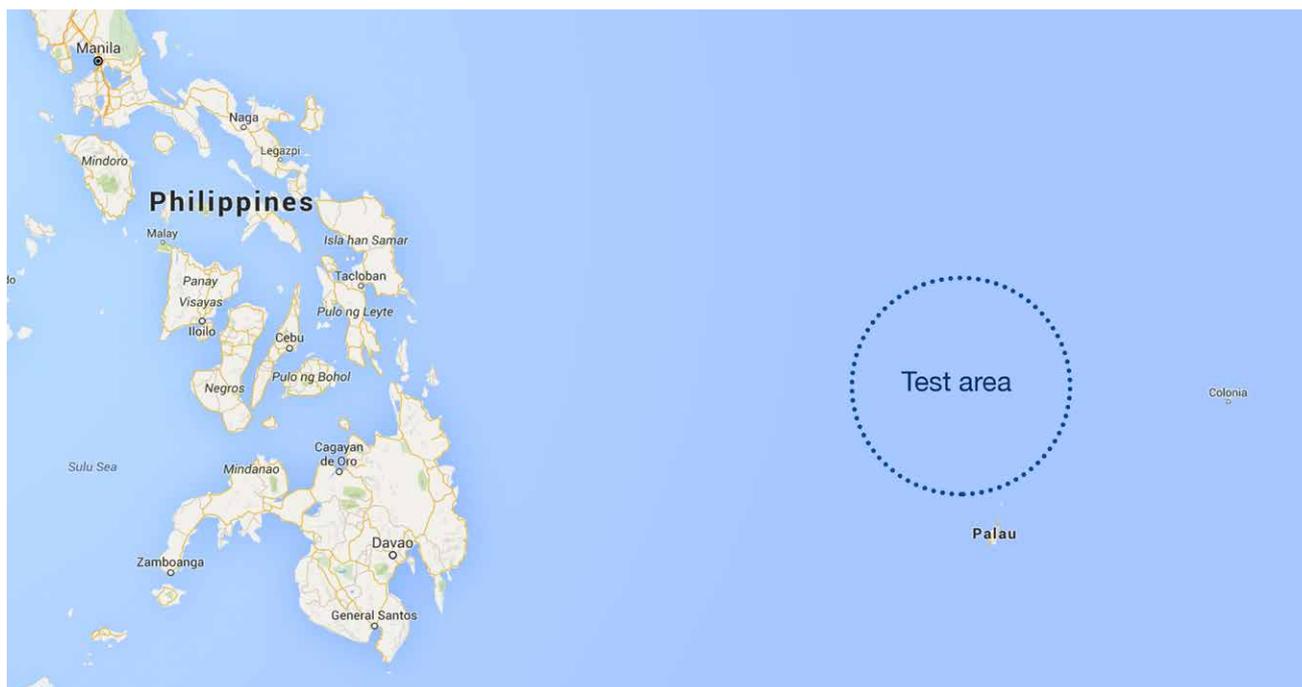
Longer current profiling range and ease of deployment

The testing area is just near East of the Philippines in Western Pacific. Scientists at The Institute of Oceanology in Qingdao will retrieve the current profiler in November 2016, after a deployment of approximately one year. The deployment is done with the Signature55 in a sub-surface buoy on a mooring line and the instrument is operated in a stand-alone measurement mode.

Yu Fei emphasizes that compared with other instruments of the same kind, the Signature55 has twice the current profile range and can profile currents up to 1000m range in the open ocean.

"The Signature55 has advantages of longer current profiling range, it is easier to deploy and it gives us better value for money compared to other options", Yu Fei concludes.

THE BACKGROUND STORY



Researchers at The Institute of Oceanology in Qingdao, China, now use Nortek's Signature55 to study the circular current structure of the westward currents of the Western Pacific. The testing area is just near East of the Philippines in Western Pacific.

Contributing to environmental research at TAMU

Meanwhile, some 13,000 km away in the Gulf of Mexico, researchers at Texas A&M University were very interested in using the Signature55 in connection with their Gulf of Mexico Integrated Spill Response Consortium (GISR).

GISR's vision is to understand and predict the fundamental behavior of petroleum fluids in the ocean environment. This capability is critical to inform decisions during response to oil spills and for development of mitigation plans, ultimately yielding significant environmental and financial savings.

"We needed full water column currents while tracking methane and oil seep bubbles from sediment to surface", says John Walpert. He works as a Senior Research Associate and Technical Lead at the Geochemical and Environmental Research Group, Texas A&M University (TAMU).

"Data from this instrument was used in this research, since we were working at seep sites in up to 1000m of water and needed full water column data", Walpert adds.

Understanding the dispersion of oil and methane in the ocean

The current data were important in helping TAMU researchers understand the dispersion, absorption

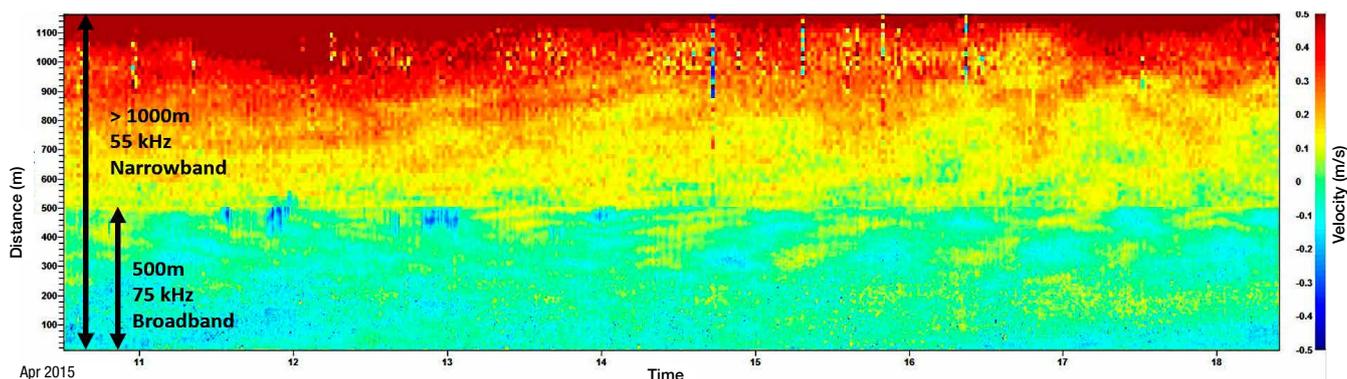
and distribution of oil and methane bubbles as the bubbles rose through the water column.

"In this application learning about the dispersion of oil at depth will lead to a better understanding of the fate of oil and methane as the oil and methane rise in the water column. This information will increase the understanding and response capability in the event of deep water spill events," Walpert says.



The Signature55 was a useful tool for TAMU researchers due to the instrument's multi frequency capability, its extended range and low power.

THE BACKGROUND STORY



A unique feature of the Signature55 ADCP is its ability to collect high-resolution and long-range data concurrently. The 75 kHz data used 5m cells, while the 55 kHz used 16m cells. Here we see the currents in the full water column, but also high resolution data closer to the instrument (data collected by TAMU).

Data collection tuned to the needs of research

John Walpert believes the Signature55 instrument proved to be a particularly useful tool for their research due to its multi-frequency capability, as well as its extended range and low power.

“The Signature55 provides ranges of up to 1000m in a moored instrument which is very attractive. Additionally, it has low power consumption that allows for long deployments, and multi-frequency operation so you can tune your data collection and deployment to the needs of your research program. The fact that it could be turned around at sea because of the auto-calibrate function of the compass was also practical.”



Researchers at TAMU were excited to use the Signature55 in connection with a research initiative supporting the work of the Gulf of Mexico Integrated Spill Response Consortium (GISR).

The Nortek Signature55 explained

The Signature55

The Signature55 is a 55/75 kHz dual frequency long-range current profiler that uses broadband processing and modern electronics to give you the most flexible current profiler available. Designed to be mounted on buoys and offshore platforms for online applications or in bottom frames and subsurface buoys in stand-alone mode, the instrument has a verified range of 1000m in the open ocean. It also comes with a host of innovative features, including a complete Ethernet interface, low power consumption, and ability to record raw magnetometer data for post-deployment compass calibration.



The blue LED light on the Signature55 confirms that the instrument is operational.



Signature55 mounted on a buoy.



Note the ability to access batteries and connectors without removing the instrument from the buoy.

True innovation makes a difference



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