Changing Sea Ice Requires Rapid Buoy Modifications

Testing, calibrating, and modifying equipment to improve IABP data accuracy

Narrator: March 2013. Barrow, Alaska — the northernmost point of the United States.

Ignatius Rigor: It's as close to the Arctic Ocean as we can get without actually being on the Arctic Ocean.

Narrator: APL-UW's Ignatius Rigor is in Barrow to work with the U.S. Naval Academy's Ice Experiment. The midshipmen are here to work on arctic observing platforms and to adjust to the harsh polar climate.

Rigor: It was roughly zero degrees Fahrenheit. With wind chill it dropped to minus forty.

Narrator: Rigor is here to test, calibrate, and integrate an array of buoys deployed for the International Arctic Buoy Program.

Rigor: This test site is one of the ways we get a handle on the accuracy of our instruments so we can reliably tell how fast the Earth is warming, how fast climate is changing.

As the sea ice transitions from a multi-year ice pack to a more seasonal ice pack, we started deploying buoys that can survive better in the seasonal ice. But given the rapid changes that have been happening, we've been rapidly changing the equipment we use.

Narrator: Changes in the buoys are aimed at improving accuracy.

Rigor: One of the most important things to measure is temperature. With global warming, we want to understand how well we measure temperature.

We know these buoys measure temperature within one tenth of one degree Celsius. We know we have some errors. We want to get a handle on those errors so we can determine how conclusive we are about statements we make in our research.

To understand climate change, where the signals are in the one to two degree range over years, we want to reduce that error as much as we can.

Narrator: Key to reducing error — understanding the effect of ice and snow on sensors.

Rigor: What we're seeing is a lot of frost on that sensor. As this frost builds up and possibly covers the sensor, we're going to end up measuring an internal snow temperature rather than the air temperature, which is what we're trying to measure.

One of the anemometers we have at the site — it basically measures wind. It's designed for the warmer oceans where it doesn't get frosted over. But in arctic conditions, we're seeing riming or icing on the instrument.

As you get more ice on the propeller it can't spin as fast, so the measured wind is actually lower than the wind in the environment. We want to understand where the bias is in the wind measured by this instrument.

This is our temperature-profiling stick. We have sensors every five to ten centimeters on the low end; every ten centimeters on the high end, or basically two meters.

Some of our buoys measure surface temperature, which will be measured by these lower instruments. Other buoys measure things at one to two meters. And we want to understand how all these measurements are related to each other in the arctic environment. Using the data from the stick, we'll be able to understand how the temperature profile that we observe in the environment affects the measurement taken by our buoys.

We're going to leave them up there for at least a year, to study how well they measure temperature, pressure, winds — just about every parameter we use to monitor the Arctic Ocean.

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