# Focus on Arctic Sea

## Current and Future States of a Diminished Sea Ice Cover

***Narrator:***
The annual cycle of sea ice growth and melt in the Arctic is marked each September when the ice shrinks to its yearly minimum. And each September the question arises: *Will a new record minimum be set?*

Axel Schweiger and other polar scientists at the Applied Physics Laboratory of the University of Washington agree: the sea ice volume is undeniably on a downward trend. There is less ice. And what ice there is, is increasingly vulnerable to dramatic losses in the future.

***Axel Schweiger:***
We've been interested in sea ice volume largely because we know that the sea ice has been shrinking. We also know that it's been thinning.

***Narrator:***
For decades, APL-UW polar scientists have studied the Arctic sea ice, gathering data from under the ice, on the ice, and over the ice.

***Ignatius Rigor:***
Basically, we deploy buoys on the Arctic sea ice. And these buoys measure all kinds of things from air pressure, air temperature, ice temperatures, ocean salinities and temperatures.

We'll deploy them from ships going up into the Arctic. We throw them out of airplanes.

This animation shows where all our buoys are. These red dots are the buoys – the actual positions of the buoys. As I start this animation, we'll see that the buoys drift around the Arctic Ocean and the ice tends to drift out to the right here into the North Atlantic.

One of the things we've learned is that temperatures are definitely important in driving the melt of Arctic sea ice. But what is also important and part of global climate change and global warming is that the changes in the wind changes where the ice goes around the Arctic Ocean.

So one thing we're seeing now that we're in a younger, thinner ice regime, is that the ice moves a lot quicker. It can be blown out of the Arctic a lot quicker. It doesn't have as much mass to survive a summer melt season. More sunlight is absorbed in summer, which makes it harder for ice to grow during the fall.

***Bonnie Light:***
My main focus is understanding how sunlight penetrates through sea ice. Some of that solar radiation is reflected back to the atmosphere. Some of it penetrates into the ice column where it's absorbed. The light that manages to get all the way through the ice column then is available to warm the mixed layer of the ocean below the sea ice.

There's a kind of 25-thousand dollar word know as albedo. And it's kind of just a fancy word for reflectivity.

This is an ice core. It is very milky. And that's because of the numerous inclusions of seawater. That's what gives sea ice its high albedo, or its brightness.

So these melt ponds turn out to be really important to the thermodynamics of the ice in summer and really important to understanding ice albedo – how much light is reflected from the ice. They're dark so they knock the albedo way down.

***Axel Schweiger:***
From year to year over the past 32 years, we've lost about 280 cubic kilometers of sea ice. How much energy does it take to melt that amount of ice? It happens to be just about as much as the U.S. consumes in energy in any one year.

***Narrator:***
Schweiger is focused on improved computer models of the Arctic climate. A key, he says, to predicting the future.

***Axel Schweiger:***
These predictions about the future help us assess the likely impacts on shipping, ecosystems, and other economic activities in the Arctic.

***Kristin Laidre:***
Probably the best-known species or the icon of the Arctic is the polar bear. We immobilize bears and attach transmitters. These transmitters allow us to track bears' movements over the ice year-round.

***Harry Stern:***
We find that the sea ice extent is decreasing in the region that polar bears inhabit. And we're finding that the spring break-up of the ice is coming earlier and the fall freeze-up is coming later. So the polar bears have less time that they are able to spend on the ice hunting.

Scientists are trying to understand the role of warming temperatures and changing circulation and how they contribute to the ice loss. We know it has an effect on polar bears, whatever the causes.

***Narrator:***
Experts at APL-UW are dedicated to ongoing research to track, understand, and help predict the dramatic changes in Arctic sea ice and what they tell us about global climate change.