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S6E6: How do changing conditions in the Arctic affect Maine?

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Changes in the Arctic affect Maine, despite them being separated by more than 1,000 miles. Several scientists from the University of Maine study these shifting conditions of the climate and environment in the region and their impacts. In 2018, the UMaine Arctic Initiative was formed to build on their work and enhance collaboration in the campus community and with outside stakeholders.

In this episode of “The Maine Question” podcast, scientists Karl Kreuz and Kristin Schild from UMaine Arctic and the UMaine Climate Change Institute discuss their research, and elaborate on the region and its shifting conditions influence the state.

Transcript

[background music]

Karl Kreuz: The spot in the Arctic which always holds a special place for me, is a place called the Eclipse Icefield. That’s in the St. Elias mountains, which are on the border of Alaska and the Yukon and basically sit right next to the Pacific Ocean. There’s a lot of reasons why I find it so special.

One of them is that when you’re on the Eclipse Icefield you’re looking directly at Mount Logan. Mount Logan is the highest spot in Canada, and the Mount Logan massif. In other words, the entire mountain itself is, by any calculation, probably the largest single thing on the face of the earth.

When you’re sitting at the Eclipse Icefield looking at Mount Logan, you truly get a sense of how small you actually are with respect to our planet and the processes that shape our planet. I’m always awed by that.

Ron Lisnet: That’s Karl Kreuz, director of UMaine School of Earth and Climate Sciences, talking about one of the many spots in the Arctic that he has worked in over the past few decades, exploring the Earth’s climate, and the factors that affect it. I’m Ron Lisnet, and this is the “Maine Question” podcast.

The rugged beauty of that place Karl describes looking at that massive block of stone that makes up Mount Logan, as a professor in the climate change Institute it's one of the many dramatic scenes that he, many researchers, and students at UMaine have been fortunate enough to visit as they document the Earth's past climate, assess its present condition and try to map out where our planet is headed.

For many, the idea of what the Arctic is likely assumes that it's a blank-white frozen wasteland that is very far away, and doesn't have much to do with our lives in the lower 48. In fact, the Arctic is far from a monolithic frozen tundra. What happens there affects our lives and the environment in Maine in many ways.

Warming rising seas or changing Maine's coastline, the lobster fishery is being affected. We've learned new terms like the polar vortex, which has wreaked havoc with the weather as far away as Texas. For decades, people who study Earth and Climate Science that you may have been working in remote corners of the world.

Recently, much of that work has been brought together in a new effort called UMaine Arctic. Formed in 2018, it brings together the people at UMaine who have an interest in our planet's high latitudes.

That work encompasses much more than the climate and other environmental topics, politics, business, mining, military operations, and many other issues or focus areas for the four dozens of faculty who are part of UMaine Arctic.

Beyond that, UMaine is also part of the University of the Arctic or UArctic, a cooperative network of some 20 colleges, universities, and research institutions. Their mission statement talks about enhancing human capacity in the north, promoting communities in the region, sustainable economies, and global partnerships.

We talked about all of this and more with Karl Kreuz and with Kristin Schild, an Assistant Professor of Earth and Climate Science who helps direct UMaine Arctic. We wanted to get an idea of what it's like in the Polar Regions to live and work there, what the research shows is happening there, and how that radiates to the rest of the planet.

In short, the main question for this episode, how does the Arctic affect our lives in Maine? Thank you both so much for joining us. We appreciate you taking the time. The Arctic, everybody knows about it from just general interest, history, or stories that they've heard and things. You guys know, obviously, a lot more about what it's like up there.

Maybe you can paint us a picture. What is it like there? Is it more than just a frozen white wasteland that many people might think is the case? Karl, maybe start with you.

Karl: Most certainly is much more than just a frozen white wasteland. I've had the good fortune of traveling in many different parts of the Arctic. What you find has everything

from the open Arctic Ocean, which is its own dynamic landscape, up to the high mountains across the tundra, up onto the Greenland ice sheet and other icecaps.

There is a lot of white up in the Arctic, but there's so many other colors as well. Blues, shades of grey, shades of white, greens. It's a rich landscape up there, for sure. It's definitely not just a frozen white wasteland. It's an amazing place to travel.

You see so many different things. Interesting wildlife, that of course, we're not familiar with down here in the mid-latitudes necessarily. You see lots of different plants and animals up there. I think oftentimes, one of the things that strikes me, particularly in these remote places, is how quiet it is.

That makes an impact, at least on me, just how quiet it can be and how peaceful. At other times, the weather gets nasty up there for sure. Kristin and I and many others who work up there have experienced some wild conditions. I'd say it's a very dynamic place. That is for sure. Not just a frozen white wasteland.

Ron: Kristin, what impressions has it left on you?

Kristin Schild: It's a great question. A lot of the same impressions it's left on Karl. It's beautiful. It's gorgeous up there. You see the beauty as much as you see the fury.

I think one of the most exciting parts to me is also to be able to interact and to become part of some of the communities up there. It's not just wildlife. It's also people that live there in these environments. Being able to experience their culture and be in their communities, it's rich and exciting. It's great. I love going to the Arctic.

Ron: People think it's a faraway place and doesn't have much relevance or pertinence to their lives. Can you make the case that it's important and does affect our everyday life, in terms of weather or any other number of factors?

Kristin: It's easy to say, "Oh, those glaciers, those icebergs. The Arctic Ocean, it's so far away." It is. It is far away. It's also connected to our ocean and our atmosphere. These winds come from someplace, they go someplace else. Same with the ocean.

A lot of the warming that we're seeing in the Arctic is trickling down into different things that we value here in Maine. For instance, the lobster populations or coastal erosion. Our beaches, our shorelines. Those are things that make Maine unique. Those are also being impacted by changes directly from the Arctic.

Ron: Kristin, is this one of the fastest-changing regions on the planet? What's happening there in terms of ice being lost?

Kristin: Absolutely. The Arctic and the Antarctic are changing rapidly. I study glaciers that end in the ocean that discharge these large icebergs that are contributing to sea-level rise. They've more than doubled their contribution within the last two decades.

Just the glaciers themselves in relation to sea-level rise are certainly changing dramatically. That has a big impact on atmospheric circulation, ocean temperatures, ocean freshening, which also impacts the circulation. It starts a whole number of different feedback loops, where we see warming in the Arctic can change one variable like glacier speed.

They'll make glaciers go faster, which then can lead to ocean freshening, which then can lead to not as much heat being stored and more heat being released. It gets in this nasty feedback loop of a little bit of warming there can lead to increased warming there.

Ron: The ironic thing, of course, is that warming in the Arctic, it can make potentially the weather in the lower 48 worse. Is that the polar vortex, Karl? Can you explain to us how that works?

Karl: The polar vortex, people have probably heard that term by now. In fact, if you were shoveling the snow out of your driveway over the past couple of weeks like I was, you definitely are familiar with the idea of the polar vortex.

The idea is that if you look at the distribution of temperatures across the Earth's surface, of course, we all know it's warmer at the equators. It's very much colder at the polar regions, like the Arctic. As Kristin said, because the Arctic is warming so rapidly, that difference in temperature between low latitudes and the Arctic is becoming less.

When you do have a big difference in temperatures, that affects how fast the winds are swirling around the globe and the high latitudes. That's what's basically known as the polar vortex. The low latitudes are warm. The Arctic is very cold. Those winds are very strong. That tends to keep all that cold air locked up in the Arctic.

What we've seen happening recently, as the Arctic is warmed, is that the difference in temperature is becoming less. The jet stream, that circle of winds around the high latitude, is becoming a lot more wavy. The wavy pattern in the polar vortex is what's bringing these blasts of cold air down to lower latitudes. What happened in Texas last winter was a great example of it.

There's good evidence now that the strength of winter storms...If you look at some of these storms that have been coming through most recently, giving these large dumps of snow, the strength of those winter storms might be linked to this polar vortex idea.

Kristin was talking about impacts of the warming Arctic and the impacts those have on us here in Maine and in the mid-latitudes. This polar vortex idea is one of those big impacts. It's a big area of study right now.

Ron: Places that aren't used to getting that weather, like Texas, like you mentioned, or the Carolinas, they're having to get used to storms they haven't ever seen, right?

Karl: Absolutely. It's this idea of an increase in extreme weather. Be it snowstorms, be it heavy rainfall, temperature change. You're right. Places that aren't necessarily used to those extremes are having to deal with it. Adaptation and resiliency are big words in the scientific community right now, and for us as well.

Adapting to these big storms. Now it's warm outside, the snow is melting. These are all extreme things that are becoming more and more common.

Ron: Let's do a little bit of a lightning round. There's so many issues we can touch on here that are of interest. Some that are affected by changes in the Arctic. First of all, some are scientific and some are affected by science.

Changes that might be happening up there, Kristin. Are we going to see a time when there is no freezing and you can travel through the Arctic around the globe? Is that possibly in the future?

Kristin: Yeah. The Arctic passage, yeah, through the Arctic Ocean where we wouldn't see sea ice. Certainly, for shipping purposes, it's a much faster way, or a more direct route, I should say. It comes with a lot of challenges.

If sea ice moves in and those shipping vessels get stranded, who's in charge of search and rescue up there? If they run aground, how are we going to do oil spill mitigation up there? Certainly, the Arctic is already experiencing a lot of changes with their sea ice coverage.

I know that shipping is one of those hot topics of now that there's not as much sea ice, maybe we can successfully clear some routes through there.

Ron: Karl, obviously, there's the science, but it crosses over into politics, geography, and everything else. For issues like mining and energy extraction, are those going to be complicated issues we're going to have to face in the future?

Karl: Yeah. I think they're going to be complicated issues. Resource extraction up in the Arctic as we lose ice cover and things are exposed. There are resources up there that are being exposed, or at least are becoming more accessible. Mineral resources, oil resources, companies, governments have their eye on those resources.

Figuring out who is going to extract them, when, how, and who controls those things. These are all important issues, as Kristin said, too. Economic issues, but then environmental issues. If you're going to extract those resources, if something happens, who deals with that?

The geopolitics of what's happening up in the Arctic, those are interesting and fast-changing topics, too. Yes, we know the climate and the weather is changing up there, but so is everything else that goes along with it.

Ron: Is that happening at even more of a base level, in terms of who owns what piece of property or what section of the Arctic? Is that a contentious issue now as well?

Karl: It is. Kristin and I and others do work in Greenland. The ownership issues, the politics of all these boundaries, how they're changing, and who's moving where when, these are complicated topics. A lot is at stake. [laughs] Fights going on and fights to be had. I'd say yeah, for sure.

Ron: You both can maybe comment on this. Does UMaine have a pretty long history of working in the Arctic region?

Karl: UMaine certainly does. Stretches back certainly to the 1960s when folks like Kristin and I are familiar with. Started doing work on ice and changes in ice up in the Arctic, across the Arctic. Lots of places through Scandinavia, Alaska, Greenland.

We then moved into a lot of work studying past climate changes up in the Arctic by recovering ice cores as part of big international programs. UMaine's Arctic program has expanded dramatically over the past 10 to 20 years.

It started probably with respect to the physical climate system and past climate changes in the Arctic, but now it just encompasses everything from ecology, to economics, to politics, business, law. The list is ever-expanding. UMaine's Arctic presence started a long time ago, but continues to grow considerably.

Ron: Kristin, there's now a group called UMaine Arctic. What is that about? Why was it formed?

Kristin: It was formed very recently, summer 2018. The goal of it was to bring together all of this Arctic knowledge, Arctic research, Arctic interest across campus. As Karl mentioned, we now have a lot of different departments that are interested in either Arctic or Arctic impacts.

The UMaine Arctic Initiative now has over 20 different departments. It may very well be the most interdisciplinary initiative on the UMaine campus. It might be. Not totally sure. It has over 40 faculty members just in a short time. Like Karl said, it's everything from history, law, forestry, anthropology, or science, political science.

It covers a wide range of disciplines, but all folks that are interested in Arctic research and what's going on in the Arctic environment. The UMaine Arctic Initiative was formed in

2018. Brought together all these researchers across campus with the goal of being able to collaborate to do more interdisciplinary work.

We meet every month. We have seminar series. We just got our first seed grant off the ground and continuing interdisciplinary collaboration.

Ron: In academia, we love our acronyms. We have UMaine Arctic, which you just described. Now there's UArctic, which is another group. How is UMaine involved in that organization, Karl?

Karl: It's sometimes a little confusing to keep these things separate. Yes. UArctic stands for the University of the Arctic. This is an organization. It's a consortium of about over 200 mostly academic institutions, but there are some nonprofits involved as well. A range of institutions that have interest in the Arctic.

The organization was founded as an offshoot of the Arctic Council about 20 years ago. The organization exists to promote collaboration across all these institutions in the Arctic. It's mostly related to education. Education, not only for Arctic climate and Arctic ecosystems, but northern communities and northern populations as well. Trying to draw that all that together.

We, at University of Maine, joined UArctic, back in 2015. Our involvement has been growing ever since then. Again, primarily, there is research interaction that's involved, but our involvement is based around student education. Trying to get involved in student exchange programs, both for undergraduate students and graduate students, and trying to share knowledge.

Ron: I know there's a major meeting happening of UArctic in Maine this year. Can you talk about what's going to go on there?

Karl: UArctic is having what they call an assembly meeting, which is primarily a business meeting for UArctic. Representatives from all the different institutions come to these assembly meetings to do the business of UArctic. There's a lot of collaboration and interaction that goes on as well.

This year, the UArctic assembly meeting is going to be at Portland, Maine. June 1st to the 3rd. It's being hosted in Portland by all the different UArctic members that exist in New England. That's ourselves University of Maine, the University of New England, University of Southern Maine, Dartmouth College, and the University of New Hampshire.

Those five organizations are co-hosting the event. It physically is going to be in Portland, but the five New England, UArctic members are co-hosting this meeting.

Ron: Let's look out into the future a little bit. How is UMaine's work in the Arctic going to change and evolve? Are there new areas to be explored? Is it just deepening what you've been working on thus far? Kristin, what do you see on the horizon that you get excited about?

Kristin: I absolutely see UMaine's interest in the Arctic continuing and strengthening. As the Arctic continues to change, it opens up many new research paths, research questions. We also have a recently funded NSF grant that's training graduate students.

It's training these graduate students to look at the Arctic from a system's perspective, not just from the natural sciences or social sciences, but combined. The Arctic is a system, and it acts, and it works like a system. At least some of the new horizon is training the next generation of students, scientists, and advocates to understand the Arctic.

Ron: Next 5 or 10 years, Karl, as best as you can tell, what might we expect? What are we going to see? Obviously, trends are going to continue, as we've seen, but if you had a crystal ball, and you were going to give us a careful prognostication, what do you think we'll see in 5 or 10 years up there?

Karl: I'd love to make predictions. We can expect that, as she said, the trends that we've seen recently are probably going to continue. It's hard to imagine that the Arctic doesn't continue to warm at a rapid pace and all of the ice loss and thawing doesn't continue.

There's a lot of concerns about that, not only for northern communities, but for us as well, related to the things we talked about, but also, related to the type of feedbacks that Kristin touched on.

One of the big concerns in the Arctic is the loss of permafrost up there and the changes in the carbon cycle that that might bring about. Permafrost stores a lot of carbon. As it thaws, that carbon is released into the atmosphere. There's many more times the amount of carbon stored in permafrost than exists in the atmosphere right now.

Many people are very concerned about the feedbacks that occur up in the Arctic with respect to permafrost. I think that's one of the things to keep our eyes on. As Kris had mentioned, as we look forward, as these changes are ongoing, new technologies are coming along, which are being applied up there all the time.

Not only desirability to monitor what's happening in the Arctic, both on the ground, from satellites, and other technologies improve, so does computing power. Applying artificial intelligence and other advanced techniques to try to understand what's happening in the Arctic.

Monitoring these trends, trying to put them in context, trying to understand how things are continuing to evolve in the Arctic, that's our job. That's what we're going to try to keep doing.

Ron: I don't know if Siberia is considered part of the Arctic. Certainly, part of it is. Did I hear it right, that at one point last summer, it got over 100 degrees in Siberia? It was the hottest place on the planet at one point. Am I getting that right?

Karl: Yes, you're getting that right. Kristin can correct me if I misspeak here, but I don't think I do. The highest point of the Greenland ice sheet last summer had rainfall, which is the first time, certainly in the history of recording weather at that spot, it ever happened. Probably the first time it's happened there in a very, very long time in Earth's history.

These are the extremes that we're starting to see.

Ron: Finally, just one final question. Do either of you or do both of you have a favorite place, a story, or a wildlife encounter? Something that you...it stuck with you as you were up there doing your work or what have you. Kristin, anything stand out for you?

Kristin: Wow. I think one of my favorite stories is when I was up in Svalbard, an archipelago north of Norway. I was studying the meltwater that comes out of glaciers. It's hard to see when those glaciers end in the ocean when they have meltwater coming out of them.

It was a challenging question to start with. I was out there with some biologists. We noticed, all of a sudden, these birds were just diving straight into the ocean. We were like, "What's going on?" Right near the glacier terminus.

They were like, "Oh, it's because krill are really used to saltwater. Whenever the glacier flushes out this freshwater, it stuns their system, and they float to the surface. That's when the birds can come in and get the krill." We're like, "Here we are trying to study when this meltwater comes out, and the biologist and the folks studying the birds already know the answers."

It was a really great opportunity just to see how you can come at a system from many different perspectives and continue to learn more about it. It really pushes forward this idea of a systems approach. Many different perspectives are needed in order to truly understand what's going on and how we can monitor and make changes.

Ron: Karl, how about you? Any experiences or memory from your time up there that stands out?

Karl: Lots of experiences over the course of a couple of decades of working in Polar Regions. I think what sticks with me are a few favorite places. I could go on and on about my favorite places in Antarctica.

The spot in the Arctic which always holds a special place for me is a place called the Eclipse Icefield. That's in the St. Elias Mountains, which are on the border of Alaska and the Yukon, and basically, sit right next to the Pacific Ocean.

The Eclipse Icefield, we've worked there for many years. There's a lot of reasons why I find it so special. One of them is that when you're on the Eclipse Icefield, you're looking directly at Mount Logan. Mount Logan is the highest spot in Canada.

The Mount Logan massif, in other words, the entire mountain itself, is by any calculation, probably the largest single thing on the face of the earth. That mountain, that mass of rock is the biggest thing on the face of the earth.

When you're sitting at the Eclipse Icefield looking at Mount Logan, you truly get a sense of how small you actually are with respect to our planet and the processes that shape our planet. I'm always awed by that when we do have the chance to go into that environment and get that perspective on things.

It happens to be a place where we have a new undergraduate program, taking our undergraduate students from the University of Maine. Our goal is to get them up on the Eclipse Icefield and give them that perspective for themselves. We're starting that up this spring.

It's a program called the Sea-to-Sky Experience. If any undergraduates want to learn more about it, they can talk to Kristin or I.

Ron: Now, just to put a cap on that, do they have to be upperclassmen? Do they have to be certain majors? How does that work?

Karl: It's a 400 level class. ERS 410. Sea-to-Sky Experience.

[background music]

Karl: Ideally, they'd be upperclassmen, juniors, or seniors. We in the School of Earth and Climate Sciences use it as one of our options for our capstone experience. Primarily, it will be for students from the School of Earth and Climate Sciences, but it is going to be open to other students as well who have interest and want to experience these Arctic environments with us.

Ron: Sounds like a great opportunity. Thank you both so much for sharing your stories with us. This is great.

Kristin: Thank you.

Karl: Thank you.

Ron: Thanks for joining us. To find out more about UMaine's work in the Arctic, head to umaine.edu/arctic. You can find this and all of our episodes on Apple and Google podcasts, Spotify, Stitcher, and SoundCloud, UMaine's Facebook and YouTube pages, as well as Amazon, and audible.

Send your questions and comments along to Maine Question at maine.edu. This is Ron Lisnet. We'll catch you next time on The Maine Question.

The University of Maine in Orono is the flagship campus of the University of Maine System, where efforts toward racial equity are ongoing, as is the commitment to facing a complicated and not always just institutional history. The University recognizes that it is located on Marsh Island in the homeland of the Penobscot nation, where issues of water and its territorial rights, and encroachment upon sacred sites, are ongoing. Penobscot homeland is connected to the other Wabanaki Tribal Nations — the Passamaquoddy, Maliseet, and Micmac — through kinship, alliances, and diplomacy. The university also recognizes that the Penobscot Nation and the other Wabanaki Tribal Nations are distinct, sovereign, legal and political entities with their own powers of self-governance and self-determination.