"A Celebration of Unusual Ice" Excerpt Transcript

Excerpt from February 10, 2017 episode of Science Friday.

IRA FLATOW: This is Science Friday. I'm Ira Flatow. We're going to be talking now about frazil, frazil ice, that is. That's not ice that's extremely stressed or harried. No, it's just one of many kinds of ice you might find forming in the seas at our poles.

Mariners and scientists that spend time in the sea ice, they have more than two dozen names for the types that they see. We thought we'd celebrate a bit with a tour of the unique features of our polar ice.

Ted Maxim is an associate scientist at Woods Hole Oceanographic Institute in Woods Hole, Massachusetts. Welcome to Science Friday.

TED MAKSYM: Thanks for having me, Ira.

FLATOW: You're packing for a trip to Antarctica, even as we speak where there's a lot of ice?

MAKSYM: Yes, I am. We're going down to Antarctica this austral winter, so it's sort of our summer. By the time we get there in mid May, it's going to be 24 hours of darkness.

FLATOW: Having been down there in the summertime, I can only imagine what wintering over must be like while in the dark. Let's talk about some of the ice that's down there. This thing I mentioned, frazil ice. What is that?

MAKSYM: Yes, so frazil ice is really just a term for loose crystals of ice. It can be in the ocean or it could be in a river. It's kind of a little bit like a snowflake in the water, I guess, and that forms because the water is turbulent. And you get lots of this in Antarctica because if you know your geography, in Antarctica, it's surrounded by the stormiest ocean on the planet, more or less.

And so you get these big waves traveling through it. So it's really hard to form a solid sheet of ice, as you can imagine. So it has to form loose crystals first. This forms a soupy mass of frazil crystals, and eventually they start to agglomerate together as it damps out the waves.

FLATOW: And we have all kinds of ice. I mentioned there were a dozen. What is pancake ice?

MAKSYM: So pancake is the next stage of ice. So as you get a lot of this frazil in the ocean, it looks kind of like a soupy mass of slush. Now what that does, it sort of damps down the waves a little bit, and as it does that, things can start freezing together. But the waves are really big there, so it's hard to damp them down right away.

So these soupy masses sort of stick together and bang against each other, and so you get these tiny little pans-- well, tiny, maybe three to 10 feet across-- that are just banging into each other like a bunch of pucks on an air hockey table, if you will. And they form these round shapes that people thought looked like pancakes, but they got kind of rough edges because they're always crashing into each other.

FLATOW: And then you have ridges, and nilas, and shuga. Tell us about these.

MAKSYM: Right, so-- yeah, kind of like Eskimos with all their words for snow. Because things take different forms, you want to be able to describe it in a concise way. So shuga is actually a kind of ice you don't see very often. It's when the frazil kind of glomps together, almost like snowballs floating around in the ocean. Nilas is sort of the opposite of frazil ice. It's when you have fresh ice forming, and I think everybody who's been in cold weather is familiar with this, you see it as a very thin veneer of ice on top of a lake.

On the ocean it looks a little bit different because that is a little bit salty, so it tends not to be as clear as it would on the lake. So that has to form-- you can imagine you need really calm conditions for that. No waves. So that forms sort of in the interior of the pack. Once you've got pack ice, if you've got any cracks or openings, nilas can form in there, and that's quite thin.

And then it starts to thicken because it's Antarctica, it's really cold, and as the ice continues to move around, that can sort of pile up as big plates of ice crashed together. We call them ice floes, crash together, and bits break off and sort of pile up into these big sort of walls of ice, if you will, that can be many feet thick. In the Arctic, because forces are so large there, you can get ice piled up to tens of feet thick.

FLATOW: How are the oceans different? How is the ice in Antarctica different from the Arctic ice up north?

MAKSYM: Right. Well, I should say that they used to be quite different. They're getting more and more alike. In the Arctic, the ice-- because the Arctic is sort of this enclosed basin, the ice doesn't escape the Arctic Ocean very easily. So it can circulate there because ice drifts around. It can circulate there for many years and get thicker and thicker. So you have ice there that used to average maybe 10 feet thick, and it can get quite thick because the ocean doesn't have-- the deep ocean heat has trouble getting up to the ice and melting it.

In the Antarctic, things are very different. It's wide open sea that it's exposed to. So it's always buffeted by the waves, and deep beneath the surface of the ocean there's actually some really warm water that gets stirred up really easily, and that keeps ice very thin. So actually, most ice, unless it's ridged, rarely gets more than a few feet thick in the Antarctic, which is convenient for those of us who want to drive our ice breaker through there. But it makes it for a very different environment.

The Arctic has this thick ice with big thick ridges. The Antarctic has thin ice with more pancake ice, and things are moving around much more rapidly. But that's all sort of changing a little bit because we've seen, over the past decade, that in the summer in the Arctic almost half of the ice has been disappearing. We're getting about half of what we used to have, say back in the 1980s. So the Antarctic is sort of an interesting analog for what might expect to see in the Arctic. And actually, about a year and a half ago, we were up there and we saw this extensive field of frazil and pancake ice, that really haven't been seen in the high Arctic before.

FLATOW: Wow, things are changing. We have to say goodbye because we are running out of time. Fascinating. Ted Maxim is associate scientist at the Woods Hole Oceanographic Institute in Woods Hole.

What are brinicles?

from "A Celebration of Unusual Ice"

IRA FLATOW: We've had people on Twitter asking us about the brinicles, icy fingers. There's a wonderful YouTube video on this that looks just like a CGI. It's so spooky looking, but have you ever seen one? Describe what's going on there.

TED MAKSYM: So this is an interesting thing about ice, or sea ice. It's not like other types of ice in that it's a composite material. Because the ocean is salt water, of course, but it's hard to freeze that salt into the ice. So what it does is it traps ice in little-- I mean, sorry-- salt in little pockets of brine in the ice, and that really determines the properties of that ice.

Now, when you get the salt trapped in there, it doesn't like staying in there. So it tries to drain out through this porous network within the ice. There's all these little channels of brine, and so when you get ice thick enough, and the salt starts draining out, it sort of drains out kind of like in a little river going down vertically.

Now, in Antarctica sometimes, like you mentioned McMurdo Sound Area, you can get these sort of rivers of brine coming down into water that's at the freezing point. But that brine is much colder. So as soon as it hits that water, it freezes. So it starts forming this kind of icicle going down into the ocean below, except it's hollow. So it can have this brine coming out down through this tube. And some of these tubes can be many feet long, and in that video it's kind of cool.

You have this drainage happen very rapidly, and when that brine hit the bottom of the ocean, that is what-- it's in a state we call supercooled. So it's actually colder than the freezing point. As soon as it hits something where it can start nucleating ice, it starts to freeze, and you saw that spread along the ocean bottom. It's really cool because you saw all these sea stars trying to run away from this thing, get trapped in the ice.

FLATOW: It's a great little video. It's great to see that