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00:00:00,020 --> 00:00:04,080

Hello and welcome to a narrated tour of the 2013

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00:00:04,100 --> 00:00:08,180

Operation IceBridge campaign over the ice sheet, ice caps, glaciers

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00:00:08,200 --> 00:00:12,290

and sea ice of the Arctic.

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00:00:12,310 --> 00:00:16,350

Here to tell us a little bit more about the mission are Operation IceBridge Project Scientist

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00:00:16,370 --> 00:00:20,400

Michael Studinger and NASA sea ice scientist Nathan Kurtz. Welcome.

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00:00:20,420 --> 00:00:24,460

Studinger and Kurtz: Thank you.

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00:00:24,480 --> 00:00:28,490

Ok, Michael can you start us off and describe what we're seeing here?

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00:00:28,510 --> 00:00:32,510

Studinger: Yeah, this is a typical early morning at Thule air base in northern Greenland.

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00:00:32,530 --> 00:00:36,520

when it's still early in the year, probably some time in March.

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00:00:36,540 --> 00:00:40,550

When the sun is low in the horizon in the morning as you can see here in these images.

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00:00:40,570 --> 00:00:44,630

And we are following the vehicle here on the taxi ramp

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00:00:44,650 --> 00:00:48,730

that brings us to the airfield after we made a decision in the morning

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00:00:48,750 --> 00:00:52,760

to fly. You can see that the runway is a little icy

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00:00:52,780 --> 00:00:56,830

here, occasionally, and also an interesting change here

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00:00:56,850 --> 00:01:00,880

you see that the runway here in Thule is white. And this is not

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00:01:00,900 --> 00:01:04,920

actually snow on the runway but the runway in Thule is

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00:01:04,940 --> 00:01:08,960

actually painted with white color to keep the albedo

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00:01:08,980 --> 00:01:12,990

down during the summer in order to avoid the permafrost melting there.

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00:01:13,010 --> 00:01:17,020

Interviewer: Excellent, and so after takeoff there's usually some sort of a

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00:01:17,040 --> 00:01:21,080

transit time, is that correct? To get to the place that you're studying.

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00:01:21,100 --> 00:01:25,130

Studinger: Well, if we fly a sea ice mission we

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00:01:25,150 --> 00:01:29,170

often have half an hour or an hour to get to the

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00:01:29,190 --> 00:01:33,220

sea ice north of Thule which you can see here, but if we fly land ice

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00:01:33,240 --> 00:01:37,260

mission we often start recording pretty much right away as soon as we

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00:01:37,280 --> 00:01:41,300

are allowed to get out of the seats and walk around on the aircraft.

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00:01:41,320 --> 00:01:45,330

Interviewer: Nice. So this is one of the early sea ice missions in the campaign,

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00:01:45,350 --> 00:01:49,360

can you tell us why, why is it named CryoSat -- what does Cryosat

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00:01:49,380 --> 00:01:53,370

have to do with what we do?

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00:01:53,390 --> 00:01:57,440

Kurtz: so what this mission was trying to accomplish was to underfly a satellite called

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00:01:57,460 --> 00:02:01,520

CryoSat which was launched by ESA in 2010.

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00:02:01,540 --> 00:02:05,590

CryoSat is a radar altimeter, which measures the height

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00:02:05,610 --> 00:02:09,670

of the surface above a reference level, so in this case we're trying to measure

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00:02:09,690 --> 00:02:13,730

the height of the sea ice surface above the water level, so you can

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00:02:13,750 --> 00:02:17,780

see water in the video, so when CryoSat flies

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00:02:17,800 --> 00:02:21,820

near water, it gets a strong return from the water, it pretty much dominates

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00:02:21,840 --> 00:02:25,860

what is seen by the radar, but then when

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00:02:25,880 --> 00:02:29,910

CryoSat flies over rough sea ice, how rough

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00:02:29,930 --> 00:02:33,950

the sea ice is, you can see ridges in the sea ice, different features in the sea ice

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00:02:33,970 --> 00:02:38,020

CryoSat responds very differently to those features, and

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00:02:38,040 --> 00:02:42,100

we were trying to fly a grid pattern over the entire, it's called the

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00:02:42,120 --> 00:02:46,170

footprint of CryoSat, which is up to a kilometer and a half to cover it with

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00:02:46,190 --> 00:02:50,220

measurements to see how the CryoSat radar return looked.

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00:02:50,240 --> 00:02:54,270

Interviewer: Sounds good. And I want to point

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00:02:54,290 --> 00:02:58,310

out to everybody that the video that you're seeing right now is sped up

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00:02:58,330 --> 00:03:02,350

about three times, so the plane is, the flight is a little smoother than

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00:03:02,370 --> 00:03:06,380

it appears from some of these, and throughout the course of this video we'll play with the time

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00:03:06,400 --> 00:03:10,410

quite a bit, but sometimes show it at the real pace too. And Nathan,

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00:03:10,430 --> 00:03:14,460

do we, do you care much scientifically, have much interest

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00:03:14,480 --> 00:03:18,540

in the sea ice that is in these fjords and is sticking

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00:03:18,560 --> 00:03:22,620

close to the coast or are you mainly concerned about the main

51
00:03:22,640 --> 00:03:26,680
kind of ice packs out in the ocean?

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00:03:26,700 --> 00:03:30,730
Kurtz: we're mainly concerned with the ice in the main ice pack. Now,

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00:03:30,750 --> 00:03:34,770
there is interest in the ice in the fjords

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00:03:34,790 --> 00:03:38,810
and how it interacts with the ice shelves, because

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00:03:38,830 --> 00:03:42,840
sea ice around can dampen ocean waves, things like that

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00:03:42,860 --> 00:03:46,850
these are really poorly understood processes.

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00:03:46,870 --> 00:03:50,880
So there is a branch of scientists who are, who do

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00:03:50,900 --> 00:03:54,890
like to study the sea ice. A lot of the sea ice

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00:03:54,910 --> 00:03:58,970
studies that are done, say at NASA Goddard, are more focused

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00:03:58,990 --> 00:04:03,030
on the more central pack, because that's the

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00:04:03,050 --> 00:04:07,090
larger climatological feature that we want to see changing.

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00:04:07,110 --> 00:04:11,140
Interviewer: moving on to the next mission, there's one here called

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00:04:11,160 --> 00:04:15,200

Laxon Line. Another sea ice mission, is that right?

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00:04:15,220 --> 00:04:19,220

Studinger: yes, that's correct. And this is actually one out of the two most important

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00:04:19,240 --> 00:04:23,270

sea ice flights that we have since it's

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00:04:23,290 --> 00:04:27,290

covering the entire Arctic Ocean from an area a little

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00:04:27,310 --> 00:04:31,300

bit north of Alert all the way down to the coast of Alaska.

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00:04:31,320 --> 00:04:35,320

So we get a profile over the entire

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00:04:35,340 --> 00:04:39,330

Arctic Ocean there which is a tremendous data set. And we are doing this on two

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00:04:39,350 --> 00:04:43,370

lines. One in the north is called the Laxon Line.

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00:04:43,390 --> 00:04:47,410

And we also fly back from Fairbanks along

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00:04:47,430 --> 00:04:51,430

a transit or profile slightly south of it to get a second

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00:04:51,450 --> 00:04:55,440

sample of the sea ice across the entire Arctic Ocean there.

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00:04:55,460 --> 00:04:59,480

Kurtz: so what we see in terms of the sea ice is, around Greenland,

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00:04:59,500 --> 00:05:03,490

the ice is very thick and north of Canada. That's where we see the

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00:05:03,510 --> 00:05:07,500
thickest ice that stays around all year. As you head

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00:05:07,520 --> 00:05:11,570
towards the Alaskan coast and towards the Russian

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00:05:11,590 --> 00:05:15,660
Arctic, the ice gets thinner. It's ice that only stays around

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00:05:15,680 --> 00:05:19,740
once season. It's called first year ice. So what we're doing is profiling

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00:05:19,760 --> 00:05:23,790
the thick ice because the thicker that is the

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00:05:23,810 --> 00:05:27,840
changes in the thickness of the ice determine in part how long

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00:05:27,860 --> 00:05:31,890
it will stay around. Can it survive a summer melt?

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00:05:31,910 --> 00:05:35,920
The thickness of the ice north of Alaska and Canada has been changing

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00:05:35,940 --> 00:05:39,940
quite a bit we've seen it decrease in thickness by almost half, whereas

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00:05:39,960 --> 00:05:43,960
the thickness in the first year ice areas hasn't been changing quite as much

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00:05:43,980 --> 00:05:48,040
but again, by getting a profile we can learn quite a bit about the

87
00:05:48,060 --> 00:05:52,100
sea ice in these regions.

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00:05:52,120 --> 00:05:56,160

Interviewer: so, we're moving in for a landing here in Fairbanks, Alaska. So is

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00:05:56,180 --> 00:06:00,220

sea ice the reason why we're going all the way to Fairbanks?

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00:06:00,240 --> 00:06:04,260

Studinger: yeah, that's correct. Starting last year we have expanded our

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00:06:04,280 --> 00:06:08,300

activities from Fairbanks quite a bit, and the reason for the

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00:06:08,320 --> 00:06:12,320

this is because we can reach the Chukchi and Beaufort

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00:06:12,340 --> 00:06:16,350

sea from Fairbanks which we can't do from Thule

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00:06:16,370 --> 00:06:20,360

in Greenland. And those are fairly important areas

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00:06:20,380 --> 00:06:24,370

for the people who live in Alaska, for the

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00:06:24,390 --> 00:06:28,440

population there, also for industry like oil companies

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00:06:28,460 --> 00:06:32,480

so that's scientifically of course a very interesting area but it also

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00:06:32,500 --> 00:06:36,540

really impacts people working there on the sea ice or having to deal

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00:06:36,560 --> 00:06:40,610

with sea ice on a daily basis.

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00:06:40,630 --> 00:06:44,650

Kurtz: and profiling the thickness, which IceBridge does over those regions is very important because

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00:06:44,670 --> 00:06:48,680

it's those areas that used to be what's called

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00:06:48,700 --> 00:06:52,710

multi-year ice, the ice used to stay around there all year, and

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00:06:52,730 --> 00:06:56,760

in recent years the ice has been seasonal, so it comes and goes

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00:06:56,780 --> 00:07:00,770

in the summer it melts away and by

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00:07:00,790 --> 00:07:04,830

determining how thick it is, which IceBridge is measuring,

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00:07:04,850 --> 00:07:08,890

it gives us an indication what's happening in the climate, why is it thinning, why is it going away?

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00:07:08,910 --> 00:07:12,910

in the summer.

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00:07:12,930 --> 00:07:16,970

Interviewer: Excellent, and so I understand this is leaving Fairbanks.

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00:07:16,990 --> 00:07:21,020

Can you tell us what's different about this image?

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00:07:21,040 --> 00:07:25,060

Studinger: yeah, when we take off in Fairbanks and fly back to Thule, because of the

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00:07:25,080 --> 00:07:29,080

I think 5 or 7 hour time difference between Thule and

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00:07:29,100 --> 00:07:33,100

Fairbanks we actually have to take off around midnight in Fairbanks

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00:07:33,120 --> 00:07:37,110

in order to land in Thule before

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00:07:37,130 --> 00:07:41,180

4 o'clock in the afternoon when they close the airport there. And that means we are flying

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00:07:41,200 --> 00:07:45,250

the first almost two and a half, almost three hours in complete darkness

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00:07:45,270 --> 00:07:49,290

Interviewer: well, here we are, we're going to close out the video here with

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00:07:49,310 --> 00:07:53,340

the North Pole Transect, so I think we're

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00:07:53,360 --> 00:07:57,400

leaving land here, and heading

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00:07:57,420 --> 00:08:01,430

back out to see, so what do we have right below us right now?

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00:08:01,450 --> 00:08:05,470

Kurtz: so below right now is some of the thickest ice that we see in the Arctic.

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00:08:05,490 --> 00:08:09,500

Actually in the world, thickest sea ice. And that's because

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00:08:09,520 --> 00:08:13,510

the circulation of the Arctic Ocean is such that the

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00:08:13,530 --> 00:08:17,530

ice gets pushed down toward the Greenland coast towards Canada

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00:08:17,550 --> 00:08:21,620

and when it gets pushed down it gets compacted. And you see those large

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00:08:21,640 --> 00:08:25,680

ridges which are down below and that makes this ice very very

126
00:08:25,700 --> 00:08:29,750
thick. So it's this really thick ice that forms what's also called

127
00:08:29,770 --> 00:08:33,810
the multi-year ice pack. And so what we're flying here is we're

128
00:08:33,830 --> 00:08:37,850
flying up towards the North Pole, so we're sampling the thickest ice.

129
00:08:37,870 --> 00:08:41,890
We're trying to see how thick is that ice and as we get

130
00:08:41,910 --> 00:08:45,920
towards the North Pole we start to get near the boundary of where the seasonal ice

131
00:08:45,940 --> 00:08:49,950
and this multi-year ice area is and so

132
00:08:49,970 --> 00:08:54,010
we start to see a decrease in the thickness of the ice as we go out.

133
00:08:54,030 --> 00:08:58,080
And how quickly the ice thickness decreases

134
00:08:58,100 --> 00:09:02,160
out towards this area tells us something about how long can

135
00:09:02,180 --> 00:09:06,230
this ice survive? What's happening to the ice in terms of

136
00:09:06,250 --> 00:09:10,280
a changing climate? Because we've had submarine measurements

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00:09:10,300 --> 00:09:14,320
in the past few decades which have historically

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00:09:14,340 --> 00:09:18,360

profiled quite a bit along this region near the North Pole, and there's

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00:09:18,380 --> 00:09:22,380

also lots of historical interest in the North Pole

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00:09:22,400 --> 00:09:26,410

region itself, there's camps, people put buoys out

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00:09:26,430 --> 00:09:30,430

lots of measurements around the actual North Pole itself so this transect

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00:09:30,450 --> 00:09:34,440

is very important because it tells us, you know, how is the ice

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00:09:34,460 --> 00:09:38,520

changing from the thickest out into that seasonal ice region.