



1

00:00:00,020 --> 00:00:04,040

The lakes forming on the surface of Greenland are storing a large amount

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00:00:04,060 --> 00:00:07,290

of meltwater throughout the season.

3

00:00:07,310 --> 00:00:12,480

Sometimes you see really shallow, kind of lagoon, almost snow swamp sort of thing,

4

00:00:12,500 --> 00:00:17,160

all the way up to lakes that are almost 30 feet in depth.

5

00:00:17,180 --> 00:00:20,200

As a glaciologist, I am looking at this and

6

00:00:20,220 --> 00:00:24,240

I see bright ice, some darker ice,

7

00:00:24,260 --> 00:00:28,280

that happens to have more dust in it. I see really bright snow

8

00:00:28,300 --> 00:00:31,350

I see the lakes. You can see kind of a network structure

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00:00:31,370 --> 00:00:34,600

where they are draining together.

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00:00:34,620 --> 00:00:41,030

So intuitively, you see this beautiful blue color, and you know the darker the blue, the deeper the lake.

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00:00:41,050 --> 00:00:44,120

Which is nice, but we want to be able to quantify that.

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00:00:44,140 --> 00:00:48,220

So imagine that you're a little beam of light. You get emitted by the sun,

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00:00:48,240 --> 00:00:53,730

you hit the surface of the lake. As the light goes through the lake, some of it is absorbed by the water

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00:00:53,750 --> 00:00:56,340

and a little bit of it gets scattered back.

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00:00:56,360 --> 00:01:00,830

Then the light hits the bottom of the lake and a bunch gets return reflected,

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00:01:00,850 --> 00:01:04,680

goes back through the column of water in the lake,

17

00:01:04,700 --> 00:01:07,260

and that is what Landsat can see.

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00:01:07,280 --> 00:01:13,500

So we need to be able to understand how much energy is being absorbed by the water

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00:01:13,520 --> 00:01:17,630

what the reflectance of the bottom of the lake is,

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00:01:17,650 --> 00:01:22,350

and what proportion of light is being scattered back by the water.

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00:01:22,370 --> 00:01:25,090

Once we have those three pieces of information

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00:01:25,110 --> 00:01:28,640

and what the brightness that particular pixel is,

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00:01:28,660 --> 00:01:33,290

then we can say how deep the water is in the lake there.

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00:01:33,310 --> 00:01:36,920

These lakes are darker than the ice around them so they are going to start absorbing

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00:01:36,940 --> 00:01:39,340

more energy from the sun and melt more.

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00:01:39,360 --> 00:01:41,590

A little bit of melt concentrates in one place,

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00:01:41,610 --> 00:01:46,440

and then melts more, which melts more, and it's a feedback mechanism.

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00:01:46,460 --> 00:01:50,490

And when the lakes get big enough they can force open fractures

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00:01:50,510 --> 00:01:54,050

that then drill all the way down to the bed of the glacier,

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00:01:54,070 --> 00:01:59,320

transporting this water to the base where it can temporarily speed up the flow of the ice.