clocking greenland's glaciers

ice-sheet-wide velocity mapping

Narrator: In Greenland, glaciers are very much on the move.

Ian Joughin: What we're seeing in Greenland is a pretty strong trend right now. I mean the glaciers have sped up over broad areas in the west and southeast by about 30 percent over the last decade or so. And that's quite a big speed up. That's a lot more ice going into the ocean now. Certainly a cause for concern.

In Greenland about half the ice melts each year and half breaks off into the ocean and forms icebergs.

Narrator: The key question: velocity. How fast is glacial ice moving to the sea?

Joughin: Jacobshavn, which is this large glacier – the fastest, biggest producer of icebergs – it's since the late nineties way more than doubled its speed. It's spewing that much more ice in the ocean.

Glaciology traditionally has been a very data-limited science.

Narrator: To gather badly needed data on seasonal velocities, the APL-UW team pioneered and perfected satellite radar interferometry methods — comparing two images from satellite-based synthetic aperture radar to generate maps of surface deformation accurate down to a single centimeter.

Joughin: What you get is an image that looks a lot like a photograph of the ice sheet, except it's coming from radar wave lengths. And we can use that data then by comparing an image from one time period to the next, we can actually observe how much the glacier shifted.

Narrator: The APL-UW team uses images from several satellites to create a map of most of the Greenland ice sheet, which is then made available to all through the National Snow and Ice Data Center.

Benjamin Smith: The thing about the record is we're not detecting a trend, exactly. We're seeing a lot of kind of spotty behavior in a lot of glaciers in a lot of different places. It's not like you can just draw a line through the data and eventually decide that line is significant. What we're seeing is different areas of the ice sheet are active in these years. And different glaciers have a period of activity when nothing happens for awhile. Then there's another period of activity.

Joughin: It's not a simple extrapolation. If we could just freeze climate where it is right now, maybe we could extrapolate. But we really can't at this point. So that's where the models come in. The models give you a more informed and more objective way to actually make projections into the future. And they're projections. They're not predictions. You won't be able to say the sea level will rise by 40.3 centimeters over the next century because there is always going to be a range. But the goal is to reduce that range and the uncertainty as well.

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Smith: The ice sheet is going to be evolving further in time. And I don't think there's ever going to be a point at which we'll say we're done collecting velocity data. So I think this is going to be a monitoring effort that could go on for some time.

Joughin: The big picture is developing models that can predict sea level in 100, 200, 300 years for the entire ice sheet.

Here at the UW right now, we're focusing a little bit more on how the models actually work, rather than producing whole ice sheet-wide estimates.

We have the advantage of having a lot of data to work with. And so we're trying to understand more of the physics that should go into the model and what model is the appropriate model to use — what approximations you can use to make the thing run faster on a computer.

this is apl — the applied physics laboratory at the university of washington in seattle