

Alarming projections for polar ice sheets

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Drawing on international research, Professor Tim Naish from Victoria University of Wellington's Antarctic Research Centre took the second Pacific Climate Change Conference, co-hosted by Victoria and the Secretariat of the Pacific Regional Environment Programme, through some of the alarming latest projections for the polar ice sheets.

"There it is," said Naish, looking at one of the slides in his PowerPoint, "the 20cm global mean level sea rise that's occurred in the 20th and 21st centuries [...] this increase of sea level is unprecedented in the last few thousand years".

He emphasised that sea level doesn't rise equally, with the level in Pacific island regions rising up to 15mm a year between 1992 and 2009, while in other regions it dropped.

In tectonically active New Zealand, if there is 3mm annual subsidence in the lower North Island combined with 3mm annual [sea level rise](#), in effect that is 6mm sea level rise.

"We often talk about global mean sea level but how it manifests itself locally is critically important," said Naish.

"We need specific local predictions."

Causes of sea level rise include heat from [global warming](#) that has gone into the ocean ("unsurprisingly that heat has caused the ocean to expand") and mountain glaciers (which "still have a bit to give and will

probably give most of it before the end of this century").

But "the elephant in the room" is the polar ice sheets, said Naish.

"For Antarctica," he said, showing another PowerPoint slide, "it's very much in that red area of west Antarctica where we're seeing significant contributions; in fact, east Antarctica, if anything east Antarctica ice sheets are gaining a bit of mass."

The [polar ice sheets](#) will be the dominant contributor to sea level rise in the second half of the 21st century and beyond, said Naish.

In 2013, the Intergovernmental Panel on Climate Change (IPCC) estimated that in the worst case scenario there would be about a metre sea level rise by 2100.

"Science wasn't mature enough at the time of the IPCC report to really deal with what the Antarctic [ice sheet](#) contribution would be, so they largely left it out as a dynamic contribution," said Naish.

"If Antarctica does something a bit surprising it could be tens of centimetres more by 2100."

Antarctica is trickier to predict than Greenland, on which modelling has "a better handle".

That is because so much of Antarctica's ice sits below water, unlike in Greenland where the ice sheets sit on top of land.

"This is where the science [in Antarctica] is really focused at the moment – in trying to estimate what it will do and when it will do it," said Naish.

"There's the potential of 20 metres of [global sea level](#) rise [over the millennium ahead] in the bits of the ice sheets that are sitting below sea level and are vulnerable to a warming world and a warming ocean."

Ice shelves are like buttresses on a cathedral, said Naish – "take away the buttresses and the walls fall down; take away the [ice shelves](#) around Antarctica and the ice sheets fall into the ocean and cause rapid sea level rise".

And when ice shelves collapse they can do so catastrophically, he said, showing one that "within a month went from being an ice shelf to not being an ice shelf. Being a bunch of icebergs".

Naish said: "Maybe there is some hope. Maybe there is a threshold in the system that somewhere around 1.5 to two degrees [Celsius in global warming], if we can stay under that we will save the ice shelves [...] But it's very hard to assess this science at the moment and it's very hard to know exactly how 1.5 or two degrees actually expresses itself around Antarctica."

Global warming is currently tracking at 2.7 degrees Celsius if all Paris climate agreement commitments are delivered, he said, and at 3.6 degrees Celsius under existing policy settings.

"So we're nowhere close to that [reduction to] two degrees at the moment. There's some ambition that is required and very, very quickly in terms of the ice sheets."

Provided by Victoria University of Wellington

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