Climate Lessons: Deciphering the messages of melted ice

Dr Natalie Robinson, Niwa marine physicist • 05:00, Sep 16 2019

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In *Climate Lessons*, a scientist explains what their research has taught them about climate change.

The Weddell Seal pops his head up through the hole in the floor of the shipping container – for the fourth time today. The shipping container is one of several making up our field camp on sea ice, 40km from Scott Base.

It feels as remote as anywhere. The frozen ocean surface stretches white for miles in every direction, and the distant chain of the TransAntarctic Mountains fills the westward horizon.

comfort of our warm shelter, whatever the weather.

CLIMATE LESSONS RESEARCHERS SHARE WHAT THEY'VE LEARNED ABOUT CLIMATE CHANGE

This water is as cold as our ocean gets. So cold that, through a quirk of the pressure effect, it arrives at our site 'supercooled'. That means it's cold enough that it could have frozen, but so far it has remained liquid.

It's a clear indication that we're looking at melted ice shelf - glacial ice whose story began as fallen snow eons ago, somewhere in the middle of the Antarctic continent. Since then it's been slowly flowing northward.

When it reached the coast, it kept flowing out over the water, melding with other glaciers, to form the huge platform of floating ice known as the Ross Ice Shelf. It's a peaceful sleeping giant - twice the area of New Zealand, varying between 300 and 700m thick.

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The Ross Ice Shelf stems the flow of ice streams that drain 20 per cent of the Antarctic continent. For now, it's thought to be stable. But it's highly sensitive to the water that circulates beneath it, and intrusions of warm water are generating a lot of melting.

This connects the fate of Antarctica to the global ocean and to our changing climate. That connection is complex, indirect and intricate. But the fundamental chemistry and physics of man-made climate change are simple and have been known about for over a century:

1) when organic fuels are burnt, Carbon (C) and Hydrogen (H) atoms are separated from each other and instead join with Oxygen (O) atoms present in the air we breathe, to create CO_2 and H_2O.

2) These two products are both what are known as 'greenhouse gases' because they have a similar effect in the atmosphere as the glass in a greenhouse: they allow all the visible light in but prevent some of the heat from getting out again.

know that these changes are a result of human activity since the dawn of the industrial revolution.

All of the rest of the research in the very broad field of climate change is aimed at quantifying this effect and understanding the incomprehensibly large array of interactions and feedbacks that this fundamental change has had, is having now, and will have in the future.

SUPPLIED

Marine physicist Natalie Robinson has worked on understanding how the ocean affects sea ice, and how that connects to climate change.

Although our everyday experience of 'climate' is with the atmosphere, an enormous part of the story is in the ocean. The ocean makes up 70 per cent of the surface of the Earth and provides habitat for most of its life.

And it's an extremely powerful agent for distributing heat around the globe. Just like the atmosphere, the ocean has major arterial highways that it moves heat along, with smaller circulation cells and storms (known as eddies) that move into every corner.

However, the ocean can hold as much heat in just its top 3m as the whole atmosphere stacked above it. And when you consider that the ocean averages 4km in depth, it becomes apparent what an enormous potential heat store those watery depths are.

As of 2015, the global ocean had absorbed 93 per cent of the additional heat in the climate system resulting from human activity since the dawn of the industrial revolution. This compares with just 1 per cent taken up by the atmosphere over the same period.

Without the oceans, the atmosphere would have retained almost all of this additional heat, and the air we breathe would already be 30-50 degrees warmer. Too hot for human habitation.

So, the oceans have bought us time, but have also committed us to change over the very long term as they slowly release that heat back to the atmosphere. Or it is used to melt ice.

So here we are – six people in a shipping container in the middle of nowhere, deciphering a message of recent ice melt, coded into temperature and salinity changes in the ocean water. We're trying to better understand exactly how the ocean affects the ice so we can better predict how the melt might speed up in the future.

NATALIE ROBINSON/SUPPLIED

Walter the Weddell seal became a frequent visitor to Natalie Robinson's Antarctic shipping container.

It's clear he likes it. He's taken to sleeping jammed against the sides of the hole with his face under the flow of warm air, which we've been pumping downwards in order to keep the hole itself open.

It is a privilege to work in this pristine wilderness, and to witness this sentient voyager of the deep so comfortable in our presence. In this untouched wilderness, he has never seen humans as a direct threat to his survival. But I find myself pondering the silent threat humans pose to Walter's future generations, as well as my own.

** Dr Natalie Robinson is a marine physicist with Niwa.*

Covering Climate Now

This story is part of Covering Climate Now, a global collaboration of more than 250 news outlets to strengthen coverage of the climate story.

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