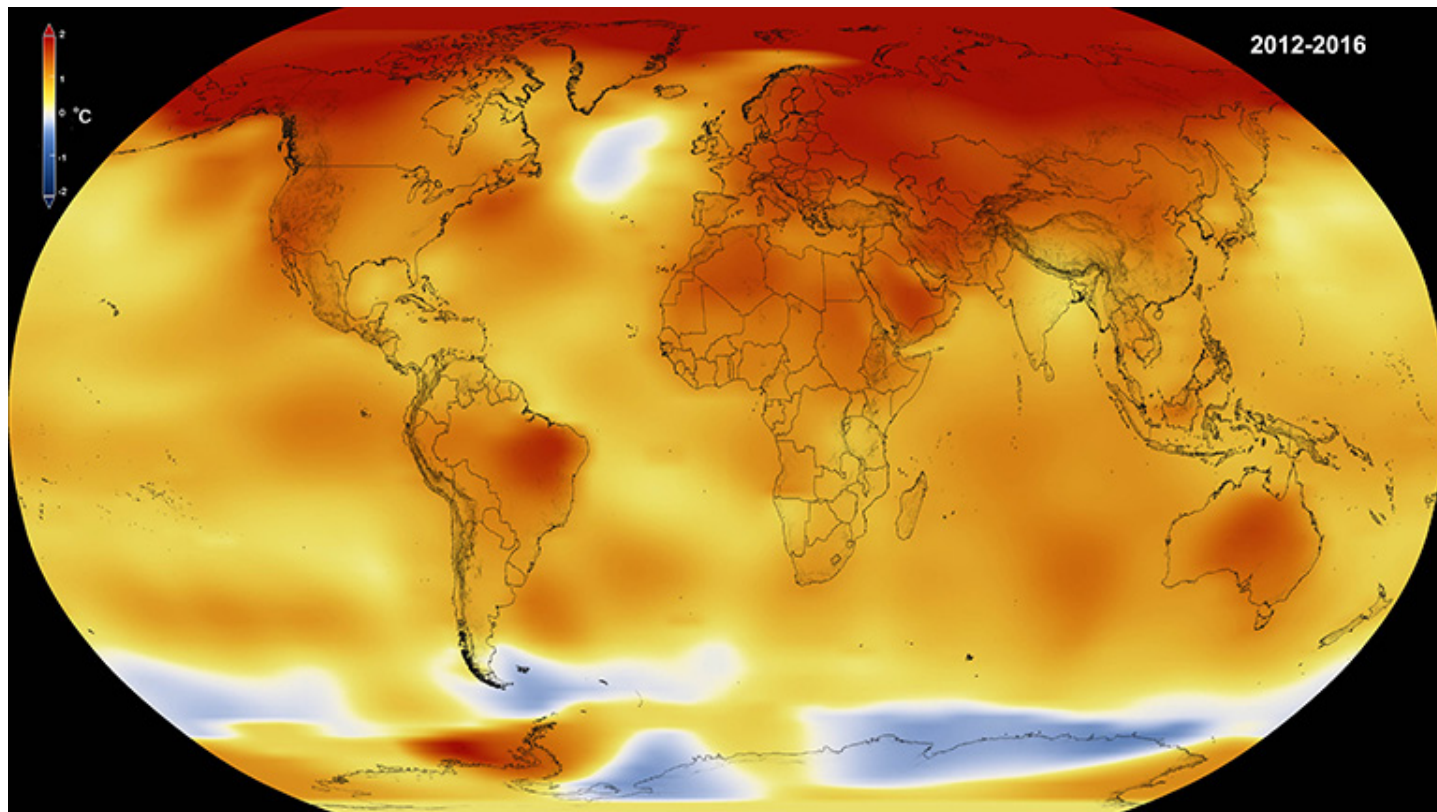




*"Science is an intensely human, intensely creative enterprise. Science presents society with tremendous opportunities and tremendous challenges. It is exciting and perplexing, disturbing and enlivening."* **Dr Eric Albone**



Global Temperature changes 2012 to 2016 | Source: NASA Goddard's Scientific Visualization Studio

Australia's involvement in Antarctic Science has a long and substantial history. It started with Mawson's expedition in 1911 and continues today via a dedicated band of researchers and research organisations including the AAD, IMAS, CSIRO and ACE CRC. The same spirit that drove Mawson's intense curiosity about Antarctica and its secrets spurs thousands of men and women today in Antarctic and Southern Ocean research.

### Human impact and Climate Change

The problem of climate change is well known: the concentrations of 'greenhouse gases' in the atmosphere are now well above their pre-industrial levels, primarily due to our use of fossil fuels (coal, oil, and natural gas) but also due to deforestation and agricultural practices. As greenhouse gases accumulate in the atmosphere, more heat energy from the Earth's surface is intercepted before escaping into space, thereby causing the atmosphere to warm.

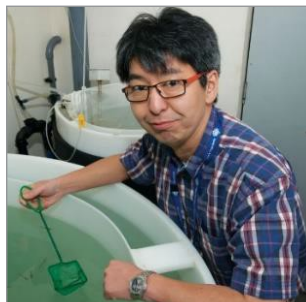
There are also natural variations in climate that occur on a range of different timescales. Antarctica hasn't always had the climate that it has now. In the geological past Antarctica has been much warmer, and fossil evidence indicates that at various times it was largely tree covered. But for at least the last 6 million years, ice has covered most of the continent.

Past variations in climate due to natural causes are now far better understood than they used to be, and this allows us to better assess changes caused by humans. Research conducted in Antarctica is vital to our understanding of Earth's climate and ocean systems. Locked in its four kilometre-thick ice sheet is a record of our planet's past climate and the key to predicting our possible future climate. As Antarctica holds about 90% of all the ice on the planet, any changes in the climate in and around Antarctica will have a major impact on the rest of the world.

**AAD** - Australian Antarctic Division, **IMAS** - Institute for Marine and Antarctic Studies, **CSIRO** - Commonwealth Scientific and Industrial Research Organisation, **ACE CRC** - Australian Climate & Ecosystems Cooperative Research



## Antarctic Researchers



### Dr. So Kawaguchi

#### *Licensed for Krill*

**Occupation:** Krill Biologist

**Fields:** Krill Biology, Ecology, & Fisheries

**Organisation:** AAD

**Enjoys:** Skiing

When Dr So Kawaguchi is not skiing in Japan, you might find him conducting scientific experiments on an icebreaker in the middle of the Southern Ocean, tending krill in the Australian Antarctic Division's krill aquarium or crunching fisheries data on his computer. Krill are a vital part of the marine ecosystem forming one of the main bases of the food chain. A decline in krill would have a significant impact on the many other species such as penguins, seals, whales, birds and fish that use them as a food source. The planet Earth would be very different without Krill.



Antarctic krill | Photo: Stephen Brookes

### Quick Facts

- The AAD is the only place in the world where live Antarctic krill are studied.
- Krill can revert back to their "younger" form.
- The "biomass" of krill is far greater than all the worlds whales combined.
- Krill are the major food source for whales, penguins and seals.



### Dr. Alex Fraser

#### *Drones on Ice*

**Occupation:** Remote Sensing Specialist

**Fields:** Glaciology; remote sensing; sea ice; Antarctic ice sheet.

**Organisation:** ACE CRC

**Enjoys:** Flying drones for Science

Dr. Alex Fraser works with visible, infra-red, and microwave-observing satellites, as well as drones, to study glaciology in Antarctica. Drones play a large part in Dr. Fraser's sea ice research, allowing him to take low-altitude aerial photographs of the ice, giving observations of smaller ice floes that most satellites can't resolve. Dr. Fraser's research has contributed to baseline knowledge of the characteristics of the Antarctic ice: without accurate characterization of the current state of sea ice and the Antarctic ice sheet, computer models of the future state of the ice would have a much greater uncertainty.



Drone in Antarctica | Photo: Kathleen Gavahan

### Quick Facts

- Completed a double degree in science (physics major) and computing.
- Uses satellites and drones to observe the "cryosphere" in Antarctica
- Has worked with Biologists and Oceanographers



## Antarctic Researchers



### Jaimie Cleeland

#### Bird Botherer

**Occupation:** PhD Candidate

**Fields:** Ecology, Marine biology

**Organisation:** IMAS

**Enjoys:** Laughing lots

Jaimie Cleeland is currently a PhD candidate at IMAS (UTAS). She has studied and worked with albatross both at a desk and out in the field. Her current project looks at the statistics and population trends of four species of southern albatrosses, including an investigation into their relationships with key climate variables, fisheries, and breeding habitat change. The aim is to quantify the sensitivity and response of albatross to change and predict population viability in realistic scenarios.



Wandering Albatross | Photo: Jaimie Cleeland

### Quick Facts

- Worked as a penguin ranger on Phillip Island.
- Tracks marine predators via Geolocation devices.
- Albatross can live for 50 years



### Dr. Andrew Klekociuk

**Occupation:** Atmospheric Physicist

**Fields:** Atmospheric measurement and modelling

**Organisation:** AAD

**Enjoys:** I get to build and use some cool equipment and work in amazing places.

After growing up and studying in Tasmania, Antarctica has been my workplace for over 30 years. I have helped develop Light Detection and Ranging (LIDAR) instruments that use powerful lasers to measure properties of the Antarctic atmosphere, from clouds near the surface, to temperatures at the edge of space. I have used these measurements to obtain new information on how the atmosphere circulates over Antarctica, and how it is responding to climate change. My current work involves modelling the healing that is now taking place of the Antarctic ozone hole and how this is affecting climate. Antarctic stratospheric ozone will take another 30-40 years to fully recover, but the action that the international community started taking over 30 years ago to protect our vital ozone layer is working.



Lidar at Davis | Andrew Klekociuk

### Quick Facts

- Each pulse from our most powerful laser contains ~1 billion billion photons of green light
- If the stratospheric ozone layer was at the Earth's surface, it would be about 3 mm thick.
- Temperatures inside the Antarctic ozone hole at about 18 km above Antarctica can be as low as -110 C.

## Antarctic Researchers



### Merel Goedegebuure *Antarctic Biker*

**Occupation:** PhD Student

**Fields:** Ecosystem Modelling,  
Marine Ecology, Biology

**Organisation:** UTAS, IMAS,  
ACE CRC, AAD

**Enjoys:** Solving puzzles

Merel is a PhD student working with scientist from IMAS, ACE and the AAD. She usually spends all of her time learning about how to represent the energy use (eating, moving, raising pups) of southern elephant seals in computer models. She also spent a season at Mawson station in Antarctica studying Adélie penguins. Here she rode around on a quad bike to different penguin colonies to count the birds and check on the chicks.



Quad bike | Photo: Paul Craig

### Quick Facts

- Male southern elephant seals can weigh 4,500 kg
- Adélie penguins lay two eggs

### Want to know more?

- <http://www.antarctica.gov.au/science>
- <http://www.imas.utas.edu.au/research>
- <http://acecrc.org.au/project/>
- <http://www.cmar.csiro.au/>
- <http://www.antarctica.gov.au/about-antarctica/environment/climate-change>

### Activity:

- Use the links on the left to write your own "Researcher Profile".
- How do researchers study climate change in Antarctica?

< Researcher photo >

### Researcher's Name *A catchy tagline*

**Occupation:**

**Fields:**

**Organisation:**

**Enjoys:** (about their work)

About their work...

< Photo of their work >

Caption | Photo Credit:

### Quick Facts: