WELLINGTON FACULTY OF SCIENCE
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Wellington, 30 Oct 2026

PhD opportunity: Unlocking a Century of Antarctic Sea-Ice Change

Location: Te Herenga Waka—Victoria University of Wellington, New Zealand
Start date: 1 March 2027
Study mode: Full-time
Supervisors: Professor Nancy Bertler, Dr Matt Harris and Dr Andrew Pauling

Antarctic sea ice is changing rapidly, but the short satellite record makes it difficult to determine how exceptional these changes are, what is driving them, and what they mean for the future.
We are seeking an enthusiastic PhD candidate to reconstruct and investigate more than a century of sea-ice variability in the Ross Sea region using a high-resolution ice core from Whitehall Glacier. The project will combine ice-core geochemistry, advanced statistical and data-science approaches, atmospheric reanalysis, and global and regional climate modelling to explore the drivers, feedbacks, and consequences of Antarctic sea-ice change.

The Project Goal
Satellite observations show that Antarctic sea ice exhibited a modest overall expansion between 1979 and 2015, driven largely by increasing sea ice extent in the Ross Sea region. Since 2016, however, Antarctic sea ice has undergone an abrupt and unprecedented decline. Over just three years, circum-Antarctic sea ice loss was equivalent in magnitude to approximately three decades of Arctic sea ice decline. Between 2014 and 2025, the mean circum-Antarctic sea-ice edge retreated by ~120 km, marking a fundamental shift in Southern Ocean sea-ice behaviour.

Our capacity to project future Antarctic sea-ice variability and its broader climate and ecosystem impacts remains limited. Sea ice exhibits high temporal and spatial variability, observational records are short, and the skill of free-running, fully coupled climate models, including those contributing to the Coupled Model Intercomparison Project (CMIP) and underpinning Intergovernmental Panel on Climate Change (IPCC) assessments, remains poor in the Southern Ocean. This limits confidence in both attribution of recent changes and projections of future sea-ice evolution.

This PhD project builds on an existing 100-year sea-ice reconstruction developed in 2006 from the Whitehall Glacier ice core, a site shown to be highly sensitive to changes in Ross Sea sea-ice conditions, and will compare the reconstructions with relevant modelling outputs. The project will provide new insight into the natural variability, drivers, and consequences of Antarctic sea-ice change, with a particular focus on sea-ice dynamics in the Ross Sea region. This work will help to inform interpretation of recent extreme changes by providing a natural baseline and improve the contextual understanding needed to evaluate model performance and future projections.

The Project Outline
The candidate will:

- Reconstruct past sea-ice, atmospheric, oceanographic and marine productivity changes from the Whitehall Glacier ice core;
- Use statistical and data-science methods, potentially including water-isotope diffusion modelling and atmospheric back-trajectory analysis;
- Compare the reconstruction with reanalysis products and global climate-model simulations;
- Work with outputs from the high-resolution P-SKRIPS regional coupled sea-ice–ocean–atmosphere model; and
- Potentially help extend the record using a new Whitehall Glacier ice core planned for recovery during the 2027/28 Antarctic field season.

The project is built around an existing, well-dated ice-core record and established modelling datasets, providing a strong and low-risk foundation for the PhD. A new core would offer the exciting possibility of extending the reconstruction through 2006–2027, capturing some of the most dramatic changes observed in the Antarctic sea-ice system.

Training and Research Environment
The candidate will join the interdisciplinary **Antarctic Sea-Ice Switch (ASIS)** programme and work across the Antarctic Research Centre within Te Herenga Waka—Victoria University of Wellington and the National Ice Core Facility at Earth Sciences New Zealand.
The PhD project is design around four objectives that will be finalised with the successful candidate based on their skill sets and specific interests.

These include:

- Objective 1: Reconstruct and Interpret Environmental Variability from the Whitehall Glacier Ice-Core Record
- Objective 2: Evaluate Model-Reconstruction Agreement and Investigate Drivers of Antarctic Sea-Ice Change
- Objective 3: Determine drivers of past and current sea ice change and their regional and global consequences.
- Objective 4: Stretch Goal – Extend the Reconstruction Using a New Whitehall Glacier Ice Core to be collected in 2027.

The successful candidate will gain experience in:

- Antarctic ice-core science and multiproxy interpretation;
- Advanced statistical analysis and climate-model evaluation;
- High-resolution ion chromatography;
- Ice-core processing and continuous-flow stable-isotope analysis;
- Interpretation of modelling outputs, and
- Collaborative research across observational, palaeoclimate and modelling teams.

Who Should Apply?
We welcome applicants with a strong background in data sciences with a particular interest in Earth, environmental, atmospheric, ocean, and climate, or a related discipline. The ideal candidate will bring curiosity, quantitative confidence, strong communication skills, and enthusiasm for

collaborative Antarctic research. Previous experience in ice-core science and/or Antarctic research is welcome but not essential.

Why this PhD?
This project offers a rare opportunity to connect Antarctica's climate history with the rapid changes unfolding today. The results will provide vital context for interpreting modern sea-ice extremes, testing climate models, and improving understanding of the future of the Southern Ocean and Antarctic climate system.

To apply: Please send a CV, academic transcript, brief statement of research interests, and contact details for academic referees to **Nancy.Bertler@vuw.ac.nz** by **30 Nov 2026**.

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