

Journey to the sea ice



Honours student Sejal Pramlall shares her experience of participating in a research cruise to the Southern Ocean

My first step on the Antarctic sea ice felt like landing on the moon. A four-person 'basket' acted as the slow rocket that hoisted me from the comfort of the *SA Agulhas II* into a cold and somewhat desolate world. I stepped onto the ice, and noticed an immense silence, the only sound being the crunch of the snow under the weight of my oversized pumpkin boots. The warm polar attire bore close resemblance to a space suit, both limiting mobility but nevertheless being highly necessary.

The seemingly limitless expanse of the ice attested to the fact that I had now entered an environment that was untouched and uninhabited by man. Apart from my shipmates, human life was thousands of kilometres away, with the nearest other life forms being wild and pristine. I took a breath; the air was crisp and clean. In that instant, I realised that my past aspirations as an oceanographer were materialising at that very moment. My participation in the SCALE spring cruise 2019 had begun in earnest.

I was recruited to the SCALE research expedition as a member of the sea ice team, made up of a combination of University of Cape Town oceanographers and engineers under the supervision of Associate Professors Marcello Vichi and Sebastian Skatulla. Our goal was to perform ice-coring operations and to collect snow and water samples from the various Marginal Ice Zone (MIZ) stations. Each station began



The sea ice team in transit on the 'basket'.

with the implementation of thorough safety procedures to ensure the ice could bear the weight of the team.

The collection of samples was conducted efficiently and in accordance with sound scientific procedures. We treated each station as an opportunity to improve, surpassing the previous day's achievements at each chance we had to get onto the ice. When not on the ice, I would be on the bridge conducting ice observations, which consisted of a thorough observation of sea ice conditions every 10 minutes, rolling over every 24 hours. These *in situ* observations provide valuable information that can be used for the validation of satellite data.

Not only did I accumulate invaluable skills in the realm of sea ice data collection, but I was also exposed to numerous scientific fields during my voyage. I was fortunate enough to witness the tagging of two Ross seals, which is an exceptionally rare sighting. Down in the environmental hanger where the UCT biogeochemists dwelled, the CTD (an instrument measuring conductivity, temperature and depth) and Bongo nets were deployed. The CTD recorded data from the various ocean depths, allowing the different water masses that make up our inhomogeneous ocean to be discerned, along with the inherent chemical and biological signals within them. Through the microscope the contents of the Bongo nets were revealed – colourful krill and alien-like critters were the catch of the day, proving that an area that appeared barren to the untrained human eye was bursting with life and productivity.



Sejal Pramall (right) extracts an ice core with another member of the sea ice team.

Southern Ocean seasonal Experiment (SCALE)

SCALE is a novel interdisciplinary experiment in the south-east Atlantic sector of the Southern Ocean. It aims to advance understanding of the climate sensitivity of the Southern Ocean through improved knowledge of seasonal cycle dynamics in the upper 1 000 m of the water column, and to observe decadal changes in ocean storage of carbon, geotracers and heat.

Research is conducted under five scientific themes:

- Air-sea-ice fluxes
- Biological carbon pump
- Physics to top predators
- Decadal changes in ocean interior
- Digital technology solutions for polar engineering.

Sea ice dynamics are an integral part of each of these themes. The exchange of gases, aerosols, heat and momentum between the atmosphere and ocean through the sea ice is a key factor influencing long-term climate variability and trends. These fluxes are critical to understanding the links between carbon and climate, aerosols and albedo, and the influence of terrestrial particles on ocean biogeochemistry.

Changes in distribution of sea ice are also likely to affect the composition, abundance and productivity of phytoplankton, which could alter the efficiency of the biological carbon pump. In addition, the marginal ice zone

environment is an essential habitat for top predators such as seals and toothed whales throughout the year, and its seasonal variability influences their feeding behaviour.

Sea ice freezing and melting may play an important role in driving the Meridional Overturning Circulation that brings deep waters to the surface in the Southern Ocean. This large-scale circulation is the primary mechanism for the transport and storage of heat, carbon, salt, freshwater and nutrients between ocean basins. Lastly, the polar engineering theme seeks to optimise the engineering of ice-going vessels.

The SCALE spring cruise, which departed from the Port of Cape Town on 12 October 2019 and arrived back on 19 November, was preceded by a three-week winter cruise in July 2019.



Nine sea ice pancakes were lifted from the ocean during the cruise, so that cores and water samples could be collected.

www.scale.org.za



After removal of the cores, water samples are collected from the holes for further analyses, such as nutrient, chlorophyll *a* and salinity measurements.

SCALE has proven to be the umbrella under which numerous disciplines can thrive, as shown by the extensive cooperation between researchers from different fields. Witnessing the teams working together with the common goal of furthering our understanding of the Southern Ocean was truly inspiring. The success of the SCALE cruise confirms my belief that a multidisciplinary approach is the key to progress. This is how all science should be conducted, by exuding benevolent support and inclusivity for researchers from various backgrounds.

I am grateful to have been involved in such an expedition, where I was part of a team that became family, I learnt lessons that could only be gained through experience, and

made memories that will last a lifetime. This experience reminds me of an African proverb I have heard: "If you want to go fast, go alone; if you want to go far, go together."

Sejal Pramlall  graduated from UCT with a BSc honours degree in Ocean & Atmosphere Science, and was awarded the class medal for being the top achiever in her academic year. She is now registered for an MSc degree with the Spectral Remote Sensing Laboratory at the University of Victoria, Canada.

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Sejal Pramlall (left) with fellow UCT student Kelsey Kaplan.

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