Setting sail with Greenpeace

September 7 2009

A pioneering Greenpeace arctic expedition has joined forces with a University of St Andrews academic to investigate the impacts of climate change.

Dr Richard Bates, a geophysicist specialising in environmental geosciences, joined glaciologists and the Greenpeace crew aboard the Arctic Sunrise as they navigated the waters around Greenland to analyse the deterioration of the Petermann glacier. Sailing further north than the global campaign group has ever attempted before and led by polar explorer Eric Philips, the scientists have spent the last few months studying the break up of one of Greenland's largest glaciers.

As a landscape of ice rivers, water vortices and eternal arctic sunshine is facing damaging environmental change, the scientists developed ground-

breaking new techniques to gather data and measure ice that is melting at an extraordinary rate.

"The trip happened as the other scientists involved with this project and I were getting together up here to study glaciers this summer anyway," Dr Bates explained. "Greenpeace was organising this campaign to highlight the situation in the Arctic and offered us a fantastic opportunity. It was timely as we believe that some major ice calving events are likely to happen this summer and so we wanted to record these."

The team took measurements to track different parts of the glacier and used time-lapse cameras and measurements of daily melt cycles to record glacier structural changes.

Large cracks have been forming over recent years, and now observations suggest that a piece the size of Manhattan Island is likely to break off very soon. The effect of this would be to 'unleash' the glacier - described as being like taking a cork out of a champagne bottle.

Dr Bates explains the urgency of the investigation: "Above normal temperatures in the Eastern Arctic during June have caused the break-up along the western shore of Greenland to start earlier than usual. Over the last two weeks, major rifts have opened up on the Petermann together with small fracture events where sections 2-3 kilometers square have broken loose. This could herald a major release event"

The scientists also discovered a large whirlpool about 25 kilometers away from the sea near the centre of the glacier. Fed by a surface river that the team estimate runs at 100 cubic meters per second - a rate which could fill an Olympic-sized swimming pool in less than a minute - the water and very large chunks of ice churn in the pool before being sucked beneath the glacier.

Measurements there have shown that at around 60 meters depth, the salinity of the water rises - indicating that warm ocean currents from further south in the Atlantic are accelerating the ice melt at a rate much faster than on the surface.The break up of the Petermann glacier has implications for rising sea levels across the globe as well as for the Greenland ice sheet, as potential larger releases of frozen fresh water floods into the ocean.

Dr Bates continued, "While the Petermann has not had a major breakup yet we have managed to observe and make measurements on some features that have not been seen before like the whirlpools and the upwellings. In addition we have managed to get information on the water movements infront of, within and below these glaciers. This information is absolutely critical to understanding how the systems work and therefore trying to assess how much they are changing."

Aquiring data in places never before attempted by scientists, the team used techniques developed for work in other parts of the world - including some developed in Scotland and found themselves developing new techniques to be able to measure new features as they saw them.

Having just returned to Scotland, Dr Bates will be able to apply the arctic experience to work on local climate change back home.

"There's an important link to Scotland in what sea level rise and the increase of fresh water from the Greenland ice cap into the ocean circulation might do to our way of life. It's an issue for any country where people live and work near the coasts and much of the economy is associated with coastal industries."

"Greenpeace certainly gave us a fantastic opportunity to gather data in a very remote place that is becoming a critical place for our understanding of potential impacts of climate change. We are only now just scratching

the surface of an understanding in terms of the mechanisms of glacier melt."

Provided by University of St Andrews