# Professor explores Greenland's impact on weather systems

February 21 2007

FAAM aircraft. Image: Kent Moore

Science doesn't always happen at a lab bench. For University of Toronto Mississauga physicist Kent Moore, it happens while strapped into a four-point harness, flying head-on into hurricane-force winds off the southern tip of Greenland.

Moore, chair of the chemical and physical sciences, headed to Greenland Feb. 18 as part of the Greenland Flow Distortion experiment (GFDex), an International Polar Year research project involving Canadian, British, Norwegian and Icelandic scientists. Moore, a professor of atmospheric physics, is leading the Canadian contingent.

GFDex will provide the first evidence of the role that Greenland plays in distorting atmospheric flow around its massive land and ice mass,

affecting European and Asian weather systems. Moreover, the findings may reveal how sea and atmospheric interactions in the Arctic and North Atlantic areas influence climate.

At the heart of GFDex are wind patterns known as “tip jets.” Greenland, an icy obstacle more than three times the size of Texas, forces air to go around its bulk and creates regions of high wind speeds. Tip jets travel east from the tip of Greenland towards Iceland at speeds of 30 to 40 metres per second. Just as wind blows heat away from the body, making windy winter days feel even colder, tip jets blow heat away from the surface of the ocean. This cooler, denser water sinks, affecting currents of circulating warm and cool water within the ocean.

About two years ago, Moore discovered a different kind of tip jet, one that blows west towards Labrador. Now known as reverse tip jets, these also force circulation of water over the Labrador Sea to the west of Greenland. “We’ve seen these things in satellite imagery but no one’s ever actually observed them,” Moore said. “We’ll be making the first in situ observations of these jets. It’s kind of exciting.”

The data will help scientists understand how the flow of air around Greenland affects weather downwind. “If things are happening near Greenland today, probably two days from now that [air mass] will move down over Europe,” said Moore. “Two or three days after it’s affected Europe, it affects Asia and then ultimately comes around and affects North America. So Greenland ultimately affects the whole Northern Hemisphere … our knowledge will potentially help improve forecasts.”

Moore is also hoping the findings will clarify the climate processes affecting Greenland’s glaciers, which have shrunk significantly in the past few years. “There’s evidence that the ice cap is retreating quite dramatically. In 2003, a cyclone came up on the east side of Greenland and there was a huge melting event,” Moore said. “It’s one of my hopes

that we'll be able to understand a bit more about the processes that determine the mass balance of the Greenland ice cap."

Making these observations requires both advanced technology and a cast-iron stomach. Moore and his colleagues, along with graduate students and post-doctoral fellows, will be making 17 flights into the tip jets in a British research aircraft called FAAM (facility for airborne atmospheric measurements). Pods and sensors stud the outside of the aircraft.

In order to get the best data, the researchers need to fly just 100 feet above the heaving seas, in winds of more than 140 kilometres per hour. "In these conditions and at these levels, the turbulence will be quite severe," Moore said. "Once, on a similar flight in the Arctic, the lens of my glasses popped out!"

Source: University of Toronto