How do you ensure that 1.5 kilometres of ice stays frozen while traveling 3400 kilometres across Canada? Keep in mind this is not just any old ice. It has the potential to reveal thousands of years of changes to Earth’s climate.

Starting Thursday, the 12 ice cores that make up the Canadian Ice Core Archive will begin their journey from Ottawa to Edmonton, where they will be available for research access at the University of Alberta. Ensuring that the ice remains safely frozen while en route is of critical importance so that the samples retain their full scientific value.

“We have modified a beautiful new freezer container to act as a kind of safe haven as the ice crosses the country,” says Jeff Kavanaugh, Associate Professor at the University of Alberta. “One of the safeguards we wanted to have in place for the transportation of the ice cores is to monitor the temperature of the freezer as it crosses the country.”

Keeping close watch

In effort to closely monitor the temperature, Kavanaugh custom-built a monitoring system using open-source hardware, including an Arduino microcontroller, GPS receiver, and cellular uplink. The monitoring system - actually, twin systems for redundancy - has its own power source, but will also plug into the transport truck’s battery as backup.

He’s programmed the system, using a combination of open-source and his own code, to send him texts every hour of the cross-country journey with GPS location and ambient temperature inside the container. That information will also be tweeted hourly at @IceCoreTracker1 for those who are interested in following the journey. If the hourly texts aren’t enough to keep Kavanaugh on his toes until the ice cores arrive in Edmonton early next week, he will receive warning texts that will allow him to initiate a backup plan if the freezer temperature gets warmer than -18°C.

Once the freezer container and ice cores arrive at the University of Alberta campus, the container, a C-Can like those you see traveling on semis or trains, will be permanently installed on campus as a freezer space for bringing in and accessioning new materials to the Archive.

New destination

“In the long run, once the ice cores are here, we won’t need the GPS, but it will still be useful to have a redundant monitoring system for temperature,” says Kavanaugh. “This is all part of the risk analysis and risk assessment. There are commercially available monitoring systems, but given that I didn’t know how they would last, I just figured I’d build my own system, and this will be useful for teaching and research as well. There’s a lot of benefits to it.”

An award-winning instructor, Kavanaugh leads an environmental instrumentation course in the Department of Earth and Atmospheric Sciences and is hoping to rework the course to incorporate more of these hands-on wiring and programming techniques. Kavanaugh has a background in physics and has been tinkering with electronics and programming since he was a teenager. He’s been able to put those skills to work in his research as a glaciologist—what he calls physics in the mountains—where he tracks environmental change and glaciers’ response to the changing climate.

Follow the journey of the ice cores on Twitter at https://twitter.com/IceCoreTracker1.