

Northern Climate ExChange

Independent Information - Shared Understanding - Action on Climate Change

NCE Update March 3, 2010

Article Headlines:

- 1. Catlin Arctic team brave thin ice and polar bears to monitor acid oceans**
- 2. Understanding Global Climate Change Through New Breakthroughs in Polar Research**
- 3. DNA from rare polar bear fossil sheds light on species' history**
- 4. Research team breaks the ice with new estimate of glacier melt**
- 5. Massive icebergs drift from Antarctic coast**
- 6. ICESat's Notable Moments In Science**
- 7. Homes in Alaska village could get eco-update**
- 8. Scientists say 'ice arches' a concern in northeastern Canada**

Quick Links

[NCE Website](#)
[What's New](#)
[About NCE](#)
[Climate Change North Website](#)
[Impacts & Adaptation](#)

Distribution List

[Join Our Mailing List!](#)

Announcements

- 1. TONIGHT: Adaptation and Activism: Climate Change Lecture Series -**

Coping with a Changing World: Adaptation and Plasticity in Kluane Red Squirrels by Meghan Larivee

The **Northern Climate ExChange**, **Yukon College** in association with the **MacBride Museum of Yukon History** will be hosting a series of speakers to present talks on Climate Change. This will proved an opportunity for the public to learn about climate change research and related work through informal yet informative lectures.

The '**Adaptation and Activism: Climate Change Lecture Series**' will run every Wednesday night from **7:00 - 8:00 pm at the McBride Museum** from **February 3rd until March 3rd 2010**.

- **March 3: Meghan Larivee - Coping with a Changing World: Adaptation and Plasticity in Kluane Red Squirrels**

To view bios of presenters and descriptions of the lectures please visit McBride's website at: www.macbridemuseum.com

For more information please contact Meghan Larivee, NCE Communication and Outreach Coordinator, at 456-8694 or mlarivee@yukoncollege.yk.ca.



2. Yukon Climate Change Secretariat Office: Open House - March 4th

The **Yukon Climate Change Secretariat** is holding an **Open House** at their new location -**205 Rogers St.** (behind the North Dragon Restaurant).

The Open House will take place on **Thursday, March 4th** and is open to the public from **12 noon to 2 pm**. There will be a few local goodies and beverages to sample and Secretariat staff will be on hand to show how they've set up the office to "walk the talk" while taking action on climate change.

This occasion is an opportunity to celebrate the work done over the past year since the Yukon government released the **Climate Change Action Plan**.

To learn more about the **Yukon Climate Change Secretariat** and the **Climate Change Action Plan** all Yukon government departments and agencies are working on, visit our website: www.environmentyukon.gov.yk.ca

3. March Polar Week 2010: *What Happens at the Poles Affects Us All*

IPY March Polar Week 2010 runs from **March 15 to 19th**. March Polar Week will provide an opportunity for researchers, educators, early career scientists, and students from across the globe to celebrate the partnerships, outreach, and scientific outcomes IPY has enabled regionally, nationally and internationally as well as to explore the many changes in polar regions.

Click on the following links for; [classroom activities](#), [virtual balloon launches](#), [public lectures](#), [events](#) and [links and resources](#)!

Download the [March Polar Week flyer](#) (pdf 491 kb)

www.ipy.org

4. UNEP Year Book 2010: New Science and Developments in Our Changing Environment - Feb 23, 2010

"The UNEP Year Book 2010 reports on new environmental science and recent developments in our changing environment. It looks at progress in environmental governance; the effects of continuing degradation and loss of the world's ecosystems; impacts of climate change; how harmful substances and hazardous waste affect human health and the environment; environmentally related disasters and conflicts; and unsustainable use of resources. The chapters correspond to UNEP's six thematic priorities".

Click [here](#) to download the UNEP Year Book 2010

Click [here](#) to download Chapter 4 - Climate Change

www.unep.org

5. On-line Survey: Whitehorse Green Guide Survey 2010

Whitehorse Green Guide Survey 2010

The Whitehorse Green Guide Survey is now available! If you are a business or organization that offers green products or services in Whitehorse, click here to fill out the survey!

Emphasis is placed on attributes and certifications which support increased energy efficiency, reduction of greenhouse gas emissions, waste, and toxins.

Information collected in the survey will be used to develop an on-line search tool to green products and services available in Whitehorse.

The survey link for the first edition will close on March 15th.

Whitehorse Green Guide Partners: Northern Climate ExChange (Yukon College), City of Whitehorse, Energy Solutions Centre (Energy, Mines, and Resources, Yukon Government), Climate Change Secretariat (Yukon Government), and the Yukon Federal Council.

<http://taiga.net/nce/>

Articles

1. Catlin Arctic team brave thin ice and polar bears to monitor acid oceans

Scientists to set up ice base in northern Canada to examine impact of ocean acidification on the region's animals and plants

By Adam Vaughan
The Guardian
February 25, 2010

Scientists and explorers will brave polar bears, thin ice and frostbite within the next fortnight as they embark on an Arctic expedition to examine the impact of an acidifying ocean on the region's animals and plants.

The Catlin Arctic Survey will set up an "ice base" in northern Canada for the scientists while a separate team of adventurers will undertake a 500km trek across sea ice off Greenland. Both will investigate the impact of ocean acidification on marine life, while the explorers will also measure variations in sea ice thickness. Last year's Catlin Arctic Survey showed the Arctic ice was thinner than expected.

The expedition will also be the first to take water samples from the sea ice in winter, as all previous Arctic measurements have been taken from ships in open water in summer.

As well as taking water samples, the scientists will collect plankton, sea butterflies, a type of swimming sea snail, and other local marine life and examine their reaction to increasing levels of acidity and also test how much CO₂ passes through sea ice from the air into the sea.

Globally, oceans have seen an 30% increase in acidity on pre-industrial levels, the fastest rate of change in 55 million years. The Catlin scientists aim to establish the acidity of the Arctic ocean, which appears to be acidifying faster than the rest of the world's oceans because cold water absorbs more CO₂.

Marine life that depends on calcification such as coral, crustacea and molluscs are particularly sensitive to changes in acidity because the calcium carbonate that form their shells or skeletons dissolves in more acidic

water. A type of snail known commonly as sea butterflies (pteropods), which are an important part of the marine food chain, are among the organisms potentially at risk.

Pen Hadow, the director of the survey who also led last year's expedition, said the Arctic ocean's vulnerability motivated the trip. "We know that disappearing ice cover and the potential impacts of acidity are parts of some big ocean changes. Since ocean acidification is widely viewed as a bellwether for wider global change, it is important we understand better what is happening."

The ice base on the western shore of Ellef Rignes Island in Canada will be home to a team of six scientists who will work on the ice protected by two guides armed with guns and bangers to ward off curious polar bears attracted by the smell of humans. They will also face hazards such as breaking ice and the risk of frostbite as they undertake the fiddly work of drilling for water samples.

Helen Findlay of Plymouth Marine Laboratory, one of the international team heading to the base, admitted that although she had been to the Arctic before, she had never been in winter. "It's a challenging place to carry out science, though I've been too busy preparing to be nervous," she said.

The three-strong team of explorers led by Ann Daniels, who took part in last year's survey, will face even more extreme conditions with wind-chill bringing temperatures down to -75C. An analysis of the data collected will be published in late 2010 or 2011.

www.guardian.co.uk

[back to top](#)

2. Understanding Global Climate Change Through New Breakthroughs in Polar Research

ScienceDaily
March 2, 2010

The latest findings from research on Antarctica's rich marine life are presented this week at the American Association for the Advancement of Science (AAAS). Marine Biologist Huw Griffiths from British Antarctic Survey (BAS) is involved in a major international investigation into the distribution and abundance of Antarctica's vast marine biodiversity -- the Census of Antarctic Marine Life (CAML).

Griffiths presents results from the census -- which began in 2005 -- and describes how the investigation provides the benchmark for future studies on how the extraordinary and diverse range of sea-floor creatures living in Antarctica's chilly waters will respond to predicted environmental change.

More than 6,000 different species living on the sea-floor have been identified so far and more than half of these are unique to the icy continent. A combination of long-term monitoring studies, newly gathered information on the marine life distribution and global ocean warming models, enable the scientists to identify Antarctica's marine 'biodiversity hotspots'.

Griffiths describes how krill populations (the shrimp-like invertebrates eaten by penguins, whales and seals) are reducing as a result of a decrease in sea-ice cover. A much smaller crustacean (copepods) is dominating the area once occupied by them. This shifts the balance of the food web to favour predators, like jellyfish, that are not eaten by penguins and other Southern Ocean higher predators. Sea-ice reduction is also affecting penguins that breed on the ice.

Griffiths says, "The Polar Regions are amongst the fastest warming places on Earth and predictions suggest that in the future we'll see warming sea surface temperatures, rising ocean acidification and decreasing winter sea ice -- all of which have a direct effect on marine life.

"Marine animals spent millions of years adapting to the freezing, stable conditions of the Antarctic waters and they are highly sensitive to change. This means that from the scientist's perspective they are excellent indicators of environmental change. The polar oceans are rich in biodiversity. If species are unable to move or adapt to new conditions they could ultimately die out. The loss of any unique species is therefore a loss of global diversity."

www.sciencedaily.com

[back to top](#)

3. DNA from rare polar bear fossil sheds light on species' history

Ancient DNA from rare fossil reveals that polar Bears evolved recently and adapted quickly

Pennsylvania State University
March 3, 2010

A rare, ancient polar bear fossil discovered in Norway in 2004 is yielding a treasure trove of essential information about the age and evolutionary origins of the species.

A paper published in the current issue of the Proceedings of the National Academy of Sciences by researchers at Penn State, the University at Buffalo, the University of Oslo and other institutions is filling in key pieces of the evolutionary history of polar bears and brown bears, including their response to past climate changes. Images can be found at <http://www.science.psu.edu/news-and-events/2010-news/Schuster2-2010> online.

"Our results confirm that the polar bear is an evolutionarily young species that split off from brown bears some 150,000 years ago and evolved extremely rapidly during the late Pleistocene, perhaps adapting to the opening of new habitats and food sources in response to climate changes just before the last interglacial period," said Charlotte Lindqvist, research assistant professor in the Department of Biological Sciences at the University of Buffalo and lead author on the paper with Stephan C. Schuster at Penn State's Center for Comparative Genomics and Bioinformatics.

"Very few polar bear fossils have been found, leading to widely varying estimates of exactly when and how polar bears evolved," said Oystein Wiig, polar bear expert and co-author at the University of Oslo's Natural History Museum. "Because polar bears live on the ice, their dead remains fall to the bottom of the ocean or get scavenged. They don't get deposited in the sediments like other mammals." In 2004, an Icelandic geologist found a rare, well-preserved, 110,000-to-130,000-year-old, fossil jawbone and canine tooth in the Svalbard archipelago of Norway. This specimen subsequently was sent to Wiig for analysis.

Lindqvist, who was working at Oslo's Natural History Museum as a postdoctoral researcher, extracted DNA from the sample after drilling into the bone and tooth to obtain the powder to analyze. When she arrived at the University of Buffalo in 2008, she obtained tissue samples from modern polar bears and brown bears and began analyzing them at the university's New York State Center of Excellence in Bioinformatics and Life Sciences after starting the collaboration with Schuster at Penn State.

This work resulted in the sequencing of the complete mitochondrial genome of the fossil; the scientists then used that information to develop mitochondrial sequencing of the other bears and to construct phylogenies showing that the ancient polar bear evolved within the lineage of brown bears. "Since the brown bears from Alaska's Admiralty, Baranof and Chichagof Islands are the polar bears' closest relatives, it was crucial to include them in our study in order to more precisely date when polar bears appeared as a distinct species," Lindqvist said. "The fact that our ancient polar bear lies almost directly at the splitting point between this unique group of brown bears and polar bears -- that is, close to their most recent common ancestor of the two species -- was very intriguing. It provided an ideal opportunity to ultimately settle the time of polar bear origin."

"This is, by far, the oldest mammal mitochondrial genome to be sequenced," said Schuster. "It's about twice the age of the oldest mammoth genome that has, to date, been sequenced."

The mitochondrial genome refers to all the DNA in the mitochondrion, the energy-producing component of most complex cells. Lindqvist explained that ancient DNA studies have tended to focus on the mitochondrial genome because it generally reveals characteristics useful for evolutionary analyses and allows for DNA to be retrieved from ancient samples most easily.

To conduct their analyses, the researchers used a variety of techniques including isotope analysis, high-

throughput genomic sequencing, bioinformatics and phylogenetic analysis, which traces evolutionary relationships among species. While their data demonstrate how adaptive polar bears have been historically, the scientists caution against assuming that the polar bears, therefore, also will be able to adapt to current and future changes in the Arctic.

"We have found that polar bears actually survived the interglacial warming period, which was generally warmer than the current one," Lindqvist said, "but it's possible that Svalbard might have served as a refugium for bears, providing them with a habitat where they could survive. However, climate change now may be occurring at such an accelerated pace that we do not know if polar bears will be able to keep up."

Ultimately, she said, the polar bear species may prove less adaptive.

"The polar bear may be more evolutionarily constrained because it is today very specialized; morphologically, physiologically and behaviorally well-adapted to living on the edge of the Arctic ice, subsisting on a few species of seals," she said.

Lindqvist and Schuster are seriously considering working on sequencing the nuclear genome of the ancient polar bear, work that they expect will reveal even more about polar bear evolution.

The work was funded by the Gordon and Betty Moore Foundation, the University of Buffalo's College of Arts and Sciences, the Natural History Museum at the University of Oslo and the U.S. Geological Survey Alaska Science Center. In addition to Lindqvist, Schuster and Wiig, additional co-authors on the paper are Yazhou Sun, Ji Qi, Aakrosh Ratan, Lynn P. Tomsho, Lindsay Kasson and Webb Miller at Penn State; Sandra L. Talbot of the U.S. Geological Survey's Alaska Science Center; Olafur Ingolfsson at the University of Iceland; Jon Aars of the Norwegian Polar Institute; and Eve Zeyl and Lutz Bachmann of the Natural History Museum, University of Oslo.

For more information, contact Schuster at scs@bx.psu.edu or 814-441-3513; Lindqvist at cl243@buffalo.edu, 716-881-8216 or 716-645-4986; or Barbara Kennedy, Penn State press officer, at science@psu.edu or 814-863-4682.

To read "*Complete mitochondrial genome of a Pleistocene jawbone unveils the origin of polar bear*" [abstract](#) and [full text](#) doi: 10.1073/pnas.0914266107

www.live.psu.edu/

[back to top](#)

4. Research team breaks the ice with new estimate of glacier melt

Northern Arizona University
February 22, 2010

The melting of glaciers is well documented, but when looking at the rate at which they have been retreating, a team of international researchers steps back and says not so fast.

Previous studies have largely overestimated mass loss from Alaskan glaciers over the past 40-plus years, according to Erik Schiefer, a Northern Arizona University geographer who coauthored a paper in the February issue of Nature Geoscience that recalculates glacier melt in Alaska.

The research team, led by Étienne Berthier of the Laboratory for Space Studies in Geophysics and Oceanography at the Université de Toulouse in France, says that glacier melt in Alaska between 1962 and 2006 contributed about one-third less to sea-level rise than previously estimated.

Schiefer said melting glaciers in Alaska originally were thought to contribute about .0067 inches to sea-level rise per year. The team's new calculations put that number closer to .0047 inches per year. The numbers sound small, but as Schiefer said, "It adds up over the decades."

While the team looked at three-fourths of all the ice in Alaska, Schiefer noted, "We're also talking about a

small proportion of ice on the planet. When massive ice sheets (such as in the Antarctic and Greenland) are added in, you're looking at significantly greater rates of sea-level rise."

Schiefer said the team plans to use the same methodologies from the Alaskan study in other glacial regions to determine if further recalibrations of ice melt are in order. These techniques use satellite imagery that spans vast areas of ice cover.

Previous methods estimated melt for a smaller subset of individual glaciers. The most comprehensive technique previously available used planes that flew along the centerlines of selected glaciers to measure ice surface elevations. These elevations were then compared to those mapped in the 1950s and 1960s. From this, researchers inferred elevation changes and then extrapolated this to other glaciers.

Two factors led to the original overestimation of ice loss with this method, Schiefer said. One is the impact of thick deposits of rock debris that offer protection from solar radiation and, thus, melting. The other was not accounting for the thinner ice along the edges of glaciers that also resulted in less ice melt.

Schiefer and his colleagues used data from the SPOT 5 French satellite and the NASA/Japanese ASTER satellite and converted the optical imagery to elevation information. They then compared this information to the topographical series maps of glacial elevations dating back to the 1950s.

While the team determined a lower rate of glacial melt during a greater than 40-year span, Schiefer said other studies have demonstrated the rate of ice loss has more than doubled in just the last two decades.

"With current projections of climate change, we expect that acceleration to continue," Schiefer said. This substantial increase in ice loss since the 1990s is now pushing up the rise in sea level to between .0098 inches and .0118 inches per year-more than double the average rate for the last 40 years.

Working on the Alaskan glacial melt revision with Schiefer and Berthier were Garry Clarke of the University of British Columbia, Brian Menounos of the University of Northern British Columbia and Frédérique Rémy of the Université de Toulouse.

www4.nau.edu

[back to top](#)

5. Massive icebergs drift from Antarctic coast

CBC News
The Associated Press
February 26, 2010

An iceberg about the size of Luxembourg that struck a glacier off Antarctica and dislodged another massive block of ice could lower the levels of oxygen in the world's oceans, Australian and French scientists said Friday.

The two icebergs are now drifting together about 100 to 150 kilometres off Antarctica following the collision on Feb. 12 or 13, said Australian Antarctic division glaciologist Neal Young.

"It gave it a pretty big nudge," Young said of the 97-kilometre-long iceberg that collided with the giant floating Mertz Glacier and shaved off a new iceberg. "They are now floating right next to each other."

The new iceberg is 78 kilometres long and about 39 kilometres wide and holds roughly the equivalent of a fifth of the world's annual total water usage, Young told The Associated Press.

Experts are concerned about the effect of the massive displacement of ice on the ice-free water next to the glacier, which is important for ocean currents.

This area of water had been kept clear because of the glacier, said Steve Rintoul, a leading climate expert. With part of the glacier gone, the area could fill with sea ice, which would disrupt the ability for the dense and cold water to sink.

This sinking water is what spills into ocean basins and feeds the global ocean currents with oxygen, Rintoul explained.

As there are only a few areas in the world where this occurs, a slowing of the process would mean less oxygen supplied into the deep currents that feed the oceans.

"There may be regions of the world's oceans that lose oxygen, and then of course most of the life there will die," said Mario Hoppema, chemical oceanographer at the Alfred Wegener Institute for Polar and Marine Research in Germany.

The icebergs, weighing 780 billion tonnes and 635 billion tonnes respectively, are located in water over the Antarctic Continental Shelf, Young said.

"We expect them to head west along the Antarctic coastline," he said.

Young said it was not likely they would reach as far north as Australia, and noted icebergs are very slow movers.

Oxygen levels being fed into the world's ocean currents have changed "and the overturning circulation currents will respond to that change," Rintoul said. Observing what happens "will ... allow us to improve predictions of future climate change," he added.

www.cbc.ca

[back to top](#)

6. ICESat's Notable Moments In Science

NASA

February 24, 2010

Over the last decade, NASA has launched a series of satellites to monitor the health of our planet. One such satellite -- the Ice, Cloud and land Elevation Satellite (ICESat) -- has provided a sustained, big-picture look at ice thickness at Earth's polar regions.

Now, after seven years in orbit and 15 laser-operation campaigns, ICESat has stopped collecting science data. The last of three lasers on the satellite's Geoscience Laser Altimeter System (GLAS) ceased emitting light on Oct. 11, 2009. Attempts to restart the lasers have ended, and NASA is pursuing options for satellite decommissioning.

"ICESat's loss is disappointing and it comes at a critical time," said Tom Wagner, cryosphere program manager at NASA Headquarters in Washington. "But we can't lose sight of the fact that ICESat and its team of talented scientists and engineers helped us see the Earth's polar ice caps in a new way. Those observations are feeding a new generation of models to help us figure out where the planet is headed."

As the world's first laser-altimeter satellite, ICESat has measured Earth's surface and atmosphere in "unprecedented 3-D detail," said Jay Zwally, ICESat's project scientist at NASA's Goddard Space Flight Center in Greenbelt, Md. "ICESat has been an outstanding success, despite disappointing limitations in the laser lifetimes. Scientific advances have been made in measuring changes in the mass of the Greenland and Antarctic ice sheets, polar sea ice thickness, vegetation-canopy heights, and the heights of clouds and aerosols."

In the Arctic, for example, scientists used ICESat to map Greenland's dramatic surface elevation, rising to 4,000 meters above sea level. They watched as thin, seasonal sea ice replaced thick, older sea ice as the dominant type in the Arctic Ocean. In Antarctica, scientists achieved a comprehensive inventory of lakes that actively drain or fill under the ice. At both poles, they have tracked glaciers along the coast of the Greenland and Antarctic ice sheets as they empty into the sea.

Learn more about the satellite's early days and subsequent discoveries in this [Flickr image gallery](#).

Despite the end of ICESat's mission, NASA's observations of Earth's polar regions continue. [Operation Ice Bridge](#) began in 2009, becoming the largest airborne survey of Earth's polar ice ever flown. For the next five years, instruments on NASA aircraft will target areas of rapid change to yield an unprecedented 3-D view of Arctic and Antarctic ice sheets, ice shelves, and sea ice. The mission will bridge the gap in satellite data until the launch of ICESat-2, planned for 2015.

"Operation Ice Bridge is allowing us to get much higher resolution data over smaller, targeted regions," said Lora Koenig of NASA Goddard, and acting project scientist for the Ice Bridge mission.

Targeted information from aircraft combined with the broad and consistent coverage from satellites contribute to a more complete understanding of Earth's response to climate change, helping scientists make better predictions of what the future might hold.

www.nasa.gov

[back to top](#)

7. Homes in Alaska village could get eco-update

By Alex DeMarban
The Tundra Drums
Daily News-Miner
February 28, 2010

Houses in Quinhagak, Alaska, battered by decades of fierce wet winds might soon be replaced by a new model that hearkens back to traditional Native sod houses.

At a meeting earlier this month, village leaders in the Southwest Alaska community accepted a preliminary plan for an energy-efficient home that could be a prototype for other houses in the village.

The octagonal floor plan, created by experts with the Cold Climate Housing Research Center in Fairbanks, stemmed from comments by the town's mayor, Willard Church.

He suggested the center's designers build a circular building, perhaps even a yurt, something similar to the soft-edged, partly underground dugouts the area's Yup'ik elders once lived in.

The cornerless shape would shed gusts that have knocked the village's blocky houses off their foundations. It would also reduce the snow drifts that pile against walls.

So the center's design team unveiled an octagonal design, a not-quite-circular compromise designed to allow for strong walls that hold beefy insulation while still cutting the wind, said Aaron Cooke, with the research center.

Church likes the concept.

"I think it's a good plan because it integrates both modern building technology and traditional design."

The need for new housing in the village of 660 leaped into the spotlight last fall, following engineering reports that a sample-test of 55 houses built in the 1970s showed that many were "unsafe for occupancy" because of such problems as rotting beams and moldy walls.

Now, village leaders hope to replace those houses, and they're looking for a relatively inexpensive model that outlasts the Bering Sea winds from the south and Arctic gusts from the north.

They're also hoping it's relatively cheap to heat.

"We want to have a house that lasts 30 years and uses less electricity and heat," said Church. "There's not

many job opportunities out here, so if we can reduce the cost of heating fuel and use less electricity, that would go a long ways in helping folks out here."

That's where the research center comes in.

The village housing authority acquired money for the prototype and asked the center to design it, said Cooke.

The center hopes to follow the same pattern it used last year when building an energy-efficient home in the North Slope's Anaktuvuk Pass, using local muscle and knowledge and producing a home for much less than the usual cost, said Cooke.

In the details, the house in Quinhagak could differ markedly from the one in Anaktuvuk Pass.

"Our M.O. is to make the house fit the place, so it will reflect the area's unique environment and culture," Cooke said.

It won't be surrounded by an earthen berm, because flooding from the moist soil would be a problem, he said.

It likely won't require as much insulation.

And there'll be no garage where people can tinker on snowmachines. Costs need to stay low because so many homes must be built, he said.

In the Quinhagak prototype, a long arctic entryway will wrap around half the house, acting as a "shield" against rot from the soggy Bering Sea weather. The entryway will sit slightly lower than the living quarters, creating a natural cold trap for a storage area, another idea taken from traditional homes, said Cooke.

The three-bedroom, one-bath home, at 950-square-feet, will consist of a simple design to minimize materials and allow for construction in three weeks, keeping labor costs low, Cooke said.

Careful planning should prevent materials from being wasted and allow for a single barge shipment, another money saver.

"Our target is under \$200,000," said Jack Hebert. The cost would be about half the price of some recently built homes in the village.

Best of all, perhaps, each house will use only a fraction of the heat that's normally consumed, slashing monthly bills that soar into the hundreds of dollars each winter, Cooke said.

The center will help train locals on how to build the prototype.

At the community meeting, residents refined the design, making slight changes, said Cooke.

Within weeks, he and others on the center's design team will present a final plan. If the community approves, the next step will be planning and ordering the building materials and lining up a barge shipment, he said.

"We hope to build in July," he said.

www.newsminer.com

[back to top](#)

8. Scientists say 'ice arches' a concern in northeastern Canada

By Randy Boswell
Canwest News Service

The Gazette

March 1, 2010

TA team of international scientists is sounding alarms about the state of a natural ice dam in northeastern Canada that has historically prevented older, thicker Arctic Ocean sea ice from drifting south through a narrow passage along Ellesmere Island and melting in warmer waters.

A study by U.S. and Danish researchers - including NASA's leading experts on the polar ice cap - describes how the Nares Strait "ice arches" failed to form during the winter of 2007 in the 35-kilometre gap between Ellesmere and the northwest coast of Greenland.

Sea ice typically consolidates in distinctive, curved structures at the north end of the strait - not far from Hans Island, the subject of a decades-old territorial dispute between Canada and Denmark.

But when the blockage failed to materialize as usual in 2007 - the same year a record-setting Arctic thaw first raised global concern about polar warming - the central Arctic Ocean discharged double the average annual amount of sea ice through Nares Strait, the researchers found.

"We don't completely understand the conditions conducive to the formation of these arches," said NASA ice expert Ron Kwok, lead author of the study published in the latest issue of the journal *Geophysical Research Letters*. "We do know that they are temperature-dependent because they only form in winter. So there's concern that if climate warms, the arches could stop forming."

While most central Arctic sea ice exits through the 400-km-wide Fram Strait between Greenland and the Svalbard Islands, the researchers found that ice flushing through Nares Strait in 2007 - according to a 13-year satellite record of polar ice cover - amounted to a record 10 per cent of the total loss.

"Until recently, we didn't think the small straits were important for ice loss," Kwok said in a summary of the team's research. "If indeed these arches are less likely to form in the future, we have to account for the annual ice loss through this narrow passage. Potentially, this could lead to an even more rapid decline in the summer ice extent of the Arctic Ocean."

The Canadian Ice Service recorded the 2007 absence of the ice arches and has also observed "quite unusual" ice movement each year since along the strait.

"One of our most important goals is developing predictive models of Arctic sea ice cover," said NASA researcher Tom Wagner. "Such models are important not only to understanding changes in the Arctic, but also changes in global and North American climate. Figuring out how ice is lost through the Fram and Nares straits is critical to developing those models."

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[back to top](#)

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Northern Climate ExChange

[back to top](#)

The next Update from the Northern Climate ExChange will be sent out Wednesday, March 10, 2010