

Northern Climate ExChange

Independent Information - Shared Understanding - Action on Climate Change

NCE Update March 10, 2010

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Announcements

1. On-line Early View - Wiley Interdisciplinary Reviews: Climate Change

"**Wiley Interdisciplinary Reviews: Climate Change** offers a unique platform for exploring current and emerging knowledge from the many disciplines that contribute to our understanding of this phenomenon - environmental history, the humanities, physical and life sciences, social sciences, engineering and economics".

"This publication has been developed in association with the **Royal Meteorological Society and the Royal Geographical Society (with IBG)** in the UK and provides an important **new encyclopedic reference for climate change scholarship and research**. It also acts as a forum for gaining a wider set of perspectives about how climate change is understood, analyzed and contested around the world".

www3.interscience.wiley.com

2. Scholarship Opportunities: Students on Ice Arctic Expedition

Scholarship opportunities are available for youth aged 14 - 18 to participate in the Students on Ice Arctic Expedition taking place from August 4-20, 2010.



"In partnership with the **International Polar Year Federal Programs Office of Canada, Inuit Tapiriit Kanatami, and First Air, Students on Ice** is proudly offering fully-funded scholarships for Canadian youth to participate on the upcoming Arctic Expedition. These scholarships are available for high school **students between the ages of 14-18**, from coast to coast to coast. Some of the scholarships will be awarded to northern Aboriginal youth, while others are available to all students from across the country.

This expedition represents a once-in-a-lifetime opportunity for youth to expand their knowledge about the circumpolar world, and to gain a global perspective of the Arctic, its wonders, and its present and future challenges.

The scholarship includes all travel expenses from home to the Arctic and return. Travel arrangements will be arranged by the Students on Ice office".

Application Deadline: Thursday, April 15th, 2010

More information [here](#).

studentsonice.com

3. CLOSES MARCH 15: 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/>

4. Pacific Climate Impacts Consortium PCIC Joint PCIC-TAO Seminar: *Using multi-model ensembles to characterize uncertainty in*

projections of future climate change

The Joint PCIC-TAO Seminar "**Using multi-model ensembles to characterize uncertainty in projections of future climate change**" will be presented by Claudia Tebaldi, Adjunct Professor, Department of Statistics, University of British Columbia.

Date: Thursday, March 25, 2010, at 10:00 am.

Location: Wright A319, University of Victoria

Download pdf of [abstract](#).

www.pacificclimate.org

Articles

1. Study: Arctic seabed methane stores destabilizing, venting

By Marmian Grimes
University of Alaska Fairbanks
March 3, 2010

A section of the Arctic Ocean seafloor that holds vast stores of frozen methane is showing signs of instability and widespread venting of the powerful greenhouse gas, according to the findings of an international research team led by University of Alaska Fairbanks scientists Natalia Shakhova and Igor Semiletov.

The research results, published in the March 5 edition of the journal *Science*, show that the permafrost under the East Siberian Arctic Shelf, long thought to be an impermeable barrier sealing in methane, is perforated and is leaking large amounts of methane into the atmosphere. Release of even a fraction of the methane stored in the shelf could trigger abrupt climate warming.

"The amount of methane currently coming out of the East Siberian Arctic Shelf is comparable to the amount coming out of the entire world's oceans," said Shakhova, a researcher at UAF's International Arctic Research Center. "Subsea permafrost is losing its ability to be an impermeable cap."

Methane is a greenhouse gas more than 30 times more potent than carbon dioxide. It is released from previously frozen soils in two ways. When the organic material--which contains carbon--stored in permafrost thaws, it begins to decompose and, under oxygen-free conditions, gradually release methane. Methane can also be stored in the seabed as methane gas or methane hydrates and then released as subsea permafrost thaws. These releases can be larger and more abrupt than those that result from decomposition.

The East Siberian Arctic Shelf is a methane-rich area that encompasses more than 2 million square kilometers of seafloor in the Arctic Ocean. It is more than three times as large as the nearby Siberian wetlands, which have been considered the primary Northern Hemisphere source of atmospheric methane. Shakhova's research results show that the East Siberian Arctic Shelf is already a significant methane source: 7 teragrams yearly, which is equal to the amount of methane emitted from the rest of the ocean. A teragram is equal to about 1.1 million tons.

"Our concern is that the subsea permafrost has been showing signs of destabilization already," she said. "If it further destabilizes, the methane emissions may not be teragrams, it would be significantly larger."

Shakhova notes that Earth's geological record indicates that atmospheric methane concentrations have varied between about .3 to .4 parts per million during cold periods to .6 to .7 parts per million during warm periods. Current average methane concentrations in the Arctic average about 1.85 parts per million, the

highest in 400,000 years, she said. Concentrations above the East Siberian Arctic Shelf are even higher.

The East Siberian Arctic Shelf is a relative frontier in methane studies. The shelf is shallow, 50 meters or less in depth, which means it has been alternately submerged or terrestrial, depending on sea levels throughout Earth's history. During Earth's coldest periods, it is a frozen arctic coastal plain, and does not release methane. As the planet warms and sea levels rise, it is inundated with seawater, which is 12-15 degrees warmer than the average air temperature.

"It was thought that seawater kept the East Siberian Arctic Shelf permafrost frozen," Shakhova said. "Nobody considered this huge area."

Earlier studies in Siberia focused on methane escaping from thawing terrestrial permafrost. Semiletov's work during the 1990s showed, among other things, that the amount of methane being emitted from terrestrial sources decreased at higher latitudes. But those studies stopped at the coast. Starting in the fall of 2003, Shakhova, Semiletov and the rest of their team took the studies offshore. From 2003 through 2008, they took annual research cruises throughout the shelf and sampled seawater at various depths and the air 10 meters above the ocean. In September 2006, they flew a helicopter over the same area, taking air samples at up to 2,000 meters in the atmosphere. In April 2007, they conducted a winter expedition on the sea ice.

They found that more than 80 percent of the deep water and greater than half of surface water had methane levels more than eight times that of normal seawater. In some areas, the saturation levels reached at least 250 times that of background levels in the summer and 1,400 times higher in the winter. They found corresponding results in the air directly above the ocean surface. Methane levels were elevated overall and the seascape was dotted with more than 100 hotspots. This, combined with winter expedition results that found methane gas trapped under and in the sea ice, showed the team that the methane was not only being dissolved in the water, it was bubbling out into the atmosphere.

These findings were further confirmed when Shakhova and her colleagues sampled methane levels at higher elevations. Methane levels throughout the Arctic are usually 8 to 10 percent higher than the global baseline. When they flew over the shelf, they found methane at levels another 5 to 10 percent higher than the already elevated arctic levels.

The East Siberian Arctic Shelf, in addition to holding large stores of frozen methane, is more of a concern because it is so shallow. In deep water, methane gas oxidizes into carbon dioxide before it reaches the surface. In the shallows of the East Siberian Arctic Shelf, methane simply doesn't have enough time to oxidize, which means more of it escapes into the atmosphere. That, combined with the sheer amount of methane in the region, could add a previously uncalculated variable to climate models.

"The release to the atmosphere of only one percent of the methane assumed to be stored in shallow hydrate deposits might alter the current atmospheric burden of methane up to 3 to 4 times," Shakhova said. "The climatic consequences of this are hard to predict."

Shakhova, Semiletov and collaborators from 12 institutions in five countries plan to continue their studies in the region, tracking the source of the methane emissions and drilling into the seafloor in an effort to estimate how much methane is stored there.

Shakhova and Semiletov hold joint appointments with the Pacific Oceanological Institute, part of the Far Eastern Branch of the Russian Academy of Sciences. Their collaborators on this paper include Anatoly Salyuk, Vladimir Joussupov and Denis Kosmach, all of the Pacific Oceanological Institute, and Orjan Gustafsson of Stockholm University.

[Abstract](#): *Extensive Methane Venting to the Atmosphere from Sediments of the East Siberian Arctic Shelf* Science 5 March 2010: Vol. 327. no. 5970, pp. 1246 - 1250 DOI: 10.1126/science.1182221

www.uaf.edu

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2. Glacier melting a key clue to tracking climate change

The world has become far too hot for the aptly named Exit Glacier in Alaska.

By David Fogarty and Yereth Rosen

Reuters
March 4, 2010

Like many low-altitude glaciers, it's steadily melting, shrinking two miles over the past 200 years as it tries to strike a new balance with rising temperatures.

At the Kenai Fjords National Park south of Anchorage, managers have learned to follow the Exit and other glaciers, moving signs and paths to accommodate the ephemeral rivers of blue and white ice as they retreat up deeply carved valleys.

"Some of the stuff is changing fast enough that we now have signs on moving pedestals," said Fritz Klasner, natural resource specialist at Kenai Fjords.

The vast amounts of water stored in glaciers play crucial roles in river flows, hydropower generation and agricultural production, contributing to steady run-off for Ganges, Yangtze, Mekong and Indus rivers in Asia and elsewhere.

But many are melting rapidly, with the pace picking up over the past decade, giving glaciers a central role in the debate over causes and impacts of climate change.

That role has come even more sharply into focus after recent attacks on the U.N.'s climate panel, which included a wrong estimate for the pace of melting for Himalayan glaciers in a major 2007 report.

The report said Himalayan glaciers could all melt by 2035, an apparent typographical error that stemmed from using literature not published in a scientific journal. Climate skeptics seized on the error and used it to question the panel's findings on climate change.

The evidence for rapid glacial melting, though, is overwhelming.

The problem is no one knows exactly what's occurring in the more remote Himalayas and parts of the Andes. Far better measurements are crucial to really understand the threat to millions of people downstream.

"There is no serious information on the state of the melting of the glaciers in the Himalayan-Tibetan complex," Kurt Lambeck, President of the Australian Academy of Science, told a climate science media briefing in late February.

The high altitude and remoteness of many glaciers in the Himalayas and Andes is the main reason.

Data in a deep freeze

To try to fill the gap, Indian Prime Minister Manmohan Singh said last month the government would establish a National Institute of Himalayan Glaciology in Dehra Dun in the north.

In Europe and North America, glaciers are generally more accessible and there are more trained people to study them.

Switzerland's Aletsch glacier, the largest in the Alps, has been retreating for about 150 years.

But the glacier, which feeds the River Rhone, still stores an estimated 27 billion tonnes of ice, according to www.swissinfo.ch. That's about 12 million Olympic-sized swimming pools.

In 2008, a total of 79 Swiss glaciers were in retreat, while 5 were advancing, the Swiss Glacier Monitoring network says.

"There are a very small number of glaciers that are monitored," said veteran glaciologist Ian Allison, pointing to less than 100 globally for which there are regular "mass-balance" measurements that reflect how much a glacier grows or shrinks from one year to the next.

Such measurements are the benchmark and several decades of data is regarded as the best way to build up an accurate picture of what's happening to a glacier.

Glaciers originate on land and represent a sizeable accumulation of snow and ice over the years. They tend to carve their way through valleys as more and more ice accumulates until the point where more is lost through melting than is gained.

That sinking feeling

"We probably know less about the total volume of glaciers than we do about how much ice there is in the big ice sheets in Greenland and Antarctic because a lot of it is in small mass areas and a lot of it is inaccessible," said Allison, leader of the Australian Antarctic Division's ice, ocean, atmosphere and climate program.

The World Glacier Monitoring Service in Switzerland analyses mass balance data for just over 90 glaciers and says their average mass balance continues to decrease.

Since 1980, cumulative thickness loss of the reference glacier group is about 12 meters of water equivalent, it says in its latest 2007/08 report.

Estimates vary but glaciers and mountain caps could contribute about 70 cm (2.3 feet) to global sea levels, a 2009 report authored by Allison and other leading scientists says.

The "Copenhagen Diagnosis" report from the Climate Change Research Center at the University of New South Wales says there is widespread evidence of more rapid melting of glaciers and ice-caps since the mid-1990s.

That means run-off from melting glaciers and ice-caps is raising sea levels by 1.2 millimeters a year, translating to up to 55 cm (1.8 feet) by 2100 if global warming accelerates.

In Nepal, the International Center for Integrated Mountain Development says "mass-balance" measurements would provide direct and immediate evidence of glacier volume increase or decrease.

"But there are still no systematic measurements of glacial mass balance in the region although there are promising signs that this is changing," the center said in a recent notice.

It said that based on studies, the majority of glaciers in the region are in a general condition of retreat.

"Small glaciers below 5,000 meters (16,500 feet) above sea level will probably disappear by the end of the century, whereas larger glaciers well above this level will still exist but be smaller," it said.

Glaciers have almost vanished from New Guinea island and in Africa and many on Greenland, the Antarctic Peninsula and West Antarctica are also melting quickly, dumping large amounts of ice into the sea.

Bamboo sticks

Part of the problem is that glaciers are fickle things to measure, said Allison, and requires legwork and lots of bamboo stakes. These are placed in holes top to bottom, a potentially dangerous job, although satellites and lasers fitted to aircraft are changing this.

After a year or so, stakes placed up high will have had snow build up on them, so you can estimate how much snow fell there.

Those down low will have lost mass due to melt and evaporation, so there would be more of the canes sticking out.

"So you can measure how much height is lowered down below, how much it's gained up top. You'll need to know the density of the snow and ice as well," Allison said.

But he said glaciers in one region can all apparently behave differently in response to the same climate signal. "Because the fluctuations that occur in the front depend on how long it takes to transfer the mass from the top of the glacier to the bottom."

"You might have an area where all the small glaciers are all rapidly retreating but big glaciers still coming forward because they are still integrating changes that happened maybe 50 years ago," he added.

For the millions that live downstream, it is the impacts that are of most concern and among them is the threat of sudden bursting of lakes created as glaciers retreat.

About 14 of the estimated 3,200 glaciers in Nepal are at risk of bursting their dams.

Ang Tshering Sherpa, from Khumjung village in the shadows of Mount Everest, said the Imja glacial lake could burst its dam anytime and wash away villages.

"When I was a child I used to take our yaks and mountain goats for grazing on grassy flat land overlooking Everest," Sherpa said.

"What was a grazing ground for yaks in 1960 has now turned into the Imja due to melting of snow," Sherpa, now a trekking and climbing entrepreneur, said in Kathmandu.

A glacial lake broke its dam 25 years ago destroying trekking trails, bridges and a hydroelectric plant in the region. Neighbouring Bhutan also faces the threat of bursting dams.

Just how much water melting glaciers contribute to major rivers such as the Ganges and Brahmaputra, though, remains unknown.

Richard Armstrong, a senior scientist of the National Snow and Ice Data Center in Boulder, Colorado, said it was nonsense to think that if glaciers melted there would be no water in the Ganges, a lifeline for millions in northern India.

"Even if the glaciers disappeared tomorrow it wouldn't have a huge impact on the water supply. The rest of the river flow comes from rain and melting seasonal snow."

He said the center has put in a proposal to NASA to use satellite data to build a better picture of the area and altitude of glaciers in the Himalayas.

"What we want to look at is what's the contribution of melting glacier ice to the downstream hydrology," Armstrong said. "It's really what's of primary importance to the socio-economic impacts of retreating glaciers."

Allison and Armstrong and many other scientists have dismissed the row over the U.N. climate panel error as overblown but said it served as a useful reminder of the gaps in global glacier monitoring and the need for a far better picture.

"It certainly brought attention to the problem," said Armstrong.

(Additional reporting by Krittivas Mukherjee in New Delhi and Gopal Sharma in Kathmandu; Editing by Megan Goldin)

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3. Musk Ox population decline due to climate, not to humans, study finds

Pennsylvania State University
March 9, 2010

University Park, Pa. - A team of scientists has discovered that the drastic decline in Arctic musk ox populations that began roughly 12,000 years ago was due to a warming climate rather than to human hunting.

"This is the first study to use ancient musk ox DNA collected from across the animal's former geographic range to test for human impacts on musk ox populations," said Beth Shapiro, the Shaffer Career Development assistant professor of biology at Penn State and one of the team's leaders. "We found that, although human and musk ox populations overlapped in many regions across the globe, humans probably were not responsible for the decline and eventual extinction of musk oxen across much of their former range."

The team's findings will be published in the early on-line edition of the journal *Proceedings of the National Academy of Sciences* during the week ending Friday, March 12.

Musk oxen once were plentiful across the entire Northern Hemisphere, but they now exist almost solely in Greenland and number only about 80,000 to 125,000. According to the researchers, musk oxen are not the only animals to suffer during the late Pleistocene Epoch.

"The late Pleistocene was marked by rapid environmental change as well as the beginning of the spread of humans across the Northern Hemisphere," said Shapiro. "During that time several animals became extinct, including mammoths and woolly rhinoceroses, while others, including horses, caribou and bison, survived into the present. The reasons for these drastically different survival patterns have been debated widely, with some scientists claiming that the extinctions were due largely to human hunting. Musk oxen provide a unique opportunity to study this question because they suffered from a decline in their population that coincided with the Pleistocene extinctions, yet they still exist today, which allows us to compare the genetic diversity of today's individuals with those individuals that lived up to 60,000 years ago."

To conduct their research, the team collected musk ox bones and other remains from animals that lived during different times -- up to 60,000 years ago -- and from animals that lived across the species' former range. From these remains, the scientists isolated and analyzed the mitochondrial DNA, which is useful for studying ancient population dynamics due to its rapid rate of evolutionary change. The scientists also isolated and analyzed the mitochondrial DNA of musk oxen that are alive today. They then used a Bayesian statistical approach to estimate how the amount of genetic diversity of the musk oxen populations changed through time.

"Over the past decade, ancient DNA studies have matured, moving away from simply identifying animals to actually giving us insights into the population size and dynamics of animals, stretching back over the last 100,000 years," said Tom Gilbert, an associate professor at the University of Copenhagen in Denmark and another of the team's leaders. "Thanks to significant computational developments made by colleagues of ours, we have the fantastic opportunity to watch what happened to the ancient populations. When did they increase, or decrease, and at what rate?"

Scientists believe that a reduction in genetic diversity of an animal's population can reflect a decrease in the size of the population. By estimating when the genetic diversity of musk oxen began to decline, the team was able to test whether the decline was due to the arrival of humans in a particular region or to some other effect. The scientists found that the genetic diversity of the musk ox was much higher during the Pleistocene than it is today. They also found that the genetic diversity of the species increased and decreased frequently over the past 65,000 years.

"The periods of growth and decline observed in the musk ox populations in this study are considerably different from those that have been reconstructed previously for musk oxen or for other species, such as bison and mammoths," said Shapiro. "While musk oxen experienced a significant population decline nearly 65,000 years ago, mammoths first began to decline only around 48,000 years ago. Bison populations remained stable until around 35,000 years ago -- a period during which musk ox populations actually were growing. As we get a better idea of the overall picture of megafaunal dynamics in the Arctic, it is becoming clear that each species is following its own population trajectory. This is a strong argument that it is

changes in habitat that are driving these population dynamics, and not a single factor such as the introduction of human hunters."

"We know from historical data that musk oxen are sensitive to changes in the Arctic environment," Shapiro continued. "While we cannot confirm exactly what climate factors are driving the changes we observe in musk oxen over the last 65,000 years, we can say with confidence that humans are not causing local extinctions. In Greenland, for example, humans and musk oxen arrived and began their expansion at the same time."

According to Gilbert, "We wonder how the current climatic instability will effect the survival of musk oxen in the near future. There's a lot in the news about the plight of polar bears, but musk ox may be similarly at risk."

This research was funded, in part, by Forsknings-og Innovationsstyrelsen and the Marie Curie Actions "GeneTime."

For more information, contact Shapiro at bus11@psu.edu or 814-863-9178, or Barbara Kennedy, Penn State press officer, at science@psu.edu or 814-863-4682. For high-resolution images associated with this story, visit <http://www.science.psu.edu/news-and-events/2010-news/Shapiro3-2010> online.

live.psu.edu

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4. Scientists find signs of 'snowball Earth'

Research suggests global glaciation 716.5 million years ago

By Steve Bradt
Harvard University
March 4, 2010

Geologists have found evidence that sea ice extended to the equator 716.5 million years ago, bringing new precision to a "snowball Earth" event long suspected of occurring around that time.

Led by scientists at Harvard, the team reports on its work in the latest edition of the journal *Science*. The new findings - based on an analysis of ancient tropical rocks in remote northwestern Canada - bolster the theory that the planet has, at times in the past, been covered with ice at all latitudes.

"This is the first time that the Sturtian glaciation [the name for that ice age] has been shown to have occurred at tropical latitudes, providing direct evidence that this particular glaciation was a 'snowball Earth' event," said lead author Francis A. Macdonald, an assistant professor in Harvard's Department of Earth and Planetary Sciences. "Our data also suggests that the Sturtian glaciation lasted a minimum of 5 million years."

The survival of eukaryotic life - organisms composed of one or more cells, each with a nucleus enclosed by a membrane - throughout this period indicates that sunlight and surface water remained available somewhere on the surface of Earth. The earliest animals arose at roughly the same time, following a major proliferation of eukaryotes.

Even on a snowball Earth, Macdonald said, there would be temperature gradients, and it is likely that ice would be dynamic: flowing, thinning, and forming local patches of open water, providing refuge for life. "The fossil record suggests that all of the major eukaryotic groups, with the possible exception of animals, existed before the Sturtian glaciation," Macdonald said. "The questions that arise from this are: If a snowball Earth existed, how did these eukaryotes survive? Moreover, did the Sturtian snowball Earth stimulate evolution and the origin of animals?"

"From an evolutionary perspective," he added, "it's not always a bad thing for life on Earth to face severe

stress."

The rocks that Macdonald and his colleagues analyzed in Canada's Yukon Territory showed glacial deposits and other signs of glaciation, such as striated clasts, ice-rafted debris, and deformation of soft sediments. The scientists were able to determine, based on the magnetism and composition of these rocks, that 716.5 million years ago they were located at sea level in the tropics, at about 10 degrees latitude.

"Because of the high albedo [light reflection] of ice, climate modeling has long predicted that if sea ice were ever to develop within 30 degrees latitude of the equator, the whole ocean would rapidly freeze over," Macdonald said. "So our result implies quite strongly that ice would have been found at all latitudes during the Sturtian glaciation."

Scientists don't know exactly what caused this glaciation or what ended it, but Macdonald says its age of 716.5 million years closely matches the age of a large igneous province stretching more than 930 miles from Alaska to Ellesmere Island in far northeastern Canada. This coincidence could mean the glaciation was either precipitated or terminated by volcanic activity.

Macdonald's co-authors on the Science paper are research assistant Phoebe A. Cohen; David T. Johnston, assistant professor of earth and planetary sciences; and Daniel P. Schrag, Sturgis Hooper Professor of Geology and Professor of Environmental Science and Engineering, all of Harvard. Other co-authors are Mark D. Schmitz and James L. Crowley of Boise State University; Charles F. Roots of the Geological Survey of Canada; David S. Jones of Washington University in St. Louis; Adam C. Maloof of Princeton University; and Justin V. Strauss.

The work was supported by the Polar Continental Shelf Project and the National Science Foundation's Geobiology and Environmental Geochemistry Program.

[Abstract](#): *Calibrating the Cryogenian*. *Science* 5 March 2010: Vol. 327. no. 5970, pp. 1241 - 1243
DOI: 10.1126/science.1183325

www.harvardscience.harvard.edu

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5. Interior Department chooses Alaska for climate center

'GROUND ZERO': UAA center set to be established in six to eight weeks.

By DAN JOLING
Anchorage Daily News
The Associated Press
March 5th, 2010

Interior Secretary Ken Salazar announced Thursday that Alaska will be the site of the first of the department's eight planned regional climate science centers.

"With rapidly melting Arctic sea ice and permafrost, and threats to the survival of Native Alaskan coastal communities, Alaska is ground zero for climate change," Salazar said in a release.

The host institution for the center, to be based in Anchorage, will be the University of Alaska. The Interior Department hopes to have Alaska's climate science center formally established in six to eight weeks.

Regional centers will provide science about climate change impacts, help land managers adapt to the impacts, and engage the public through education initiatives, Salazar said.

"In short, Climate Science Centers will better connect our scientists with land managers and the public," he said.

The centers will have startup costs of \$2 million to \$4 million, said Interior Deputy Secretary David Hayes.

The idea is to have a host institution assemble practical climate science in the region.

"If adaptation plans have to be developed, there can be coordinated action," he said.

The U.S. Geological Survey will take a lead role in the centers. Hayes said Alaska opposition to federal action on climate change, such as the state's lawsuit seeking to overturn the listing of polar bears as a threatened species because of Arctic sea ice loss, did not figure into the decision to put the first regional center in Alaska.

The lawsuit questions climate models that project additional loss of sea ice. Hayes said the centers will focus on the effects of climate change, not the cause.

"We're focusing in on what climate change is doing to our resources so we can make decisions on how to deal with those impacts," Hayes said.

Buck Sharpton, vice chancellor for research at the University of Alaska Fairbanks, said a location for the center has not been determined but it's likely to be in a midtown Anchorage rental space away from the UAA campus and near federal agencies such as the U.S. Fish and Wildlife Service.

The department will seek grant proposals for four more centers in the Northwest, Southwest, Southeast and North Central regions in the next few weeks, he said.

Salazar in September issued a secretarial order that he said put into action the department's first coordinated strategy to address current and future effects of climate change on U.S. land, water, oceans, fish, wildlife and cultural resources.

Besides regional centers, the order set out to establish "Landscape Conservation Cooperatives" that will engage local and state entities, federal agencies and the public to come up with practical strategies for managing climate change effects.

The cooperatives will focus on impacts that extend beyond single agencies or conservation units, such as the effects of climate change on wildlife migration patterns, fires, drought or invasive species.

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6. Budget deep freeze will lead to end of climate research lab

Critics say end to funding indicates Tories' skepticism of climate-change science

By Shawn McCarthy
Globe and Mail
March 9, 2010

Scientists who study climate change from a remote post on Ellesmere Island are planning to shut down their cash-strapped project after the federal government refused to refinance a key climate-change research foundation.

The Polar Environment Atmospheric Research Laboratory (PEARL) is located 1,100 kilometres from the North Pole, and collects data on the changing climate of the Far North, where global warming is found to be most intense.

But in a conference call this week, PEARL scientists were not discussing their findings but were making plans to shut down the lab, including complicated arrangements to air lift out their equipment.

In its budget last week, the Harper government provided no new money for the Canadian Foundation for Climate and Atmosphere Sciences. The foundation is the country's main fund for scientists studying everything from global climate models, to the melting of polar ice and frequency of Arctic storms, to prairie droughts and shrinking Rocky Mountain glaciers.

For many in the research community, the budget decision merely confirmed the view that Prime Minister Stephen Harper and his government remain skeptical of climate-change science and hostile to those who provide evidence that aggressive action must be taken to avert catastrophic global warming.

"It's quite clear we have a government that says they believe this is an issue but really don't care about it," said Andrew Weaver, a world-renowned climatologist from the University of Victoria.

"It's quite clear by their actions with [the climate foundation] and its lack of funding that they're basically saying, 'We don't want your science any more.'"

The foundation was endowed with \$110-million nearly 10 years ago under the former Liberal government, but will run out of money by early 2011. As a result, scientists must wind up their projects.

"There is nowhere to apply for more money," said James Drummond, a Dalhousie University physicist who is principal investigator for the PEARL project.

He said the government is financing research infrastructure but not providing support for salaries and operational expenses. His network has already lost several colleagues and more are planning to leave the country. "It's like a family that needs a new car and you buy them a Ferrari. But they can't afford the insurance, they can't afford the gas, and they can't afford the maintenance. So what good's the Ferrari?"

Environment Minister Jim Prentice insists the government remains committed to basic research on climate change. He said the foundation has been operating for 10 years and it is now time to assess its work.

"We think it is appropriate that the foundation report to the government on the progress it has made, how those dollars were invested and what we've learned from the research that was done," he said.

Mr. Prentice said the government has other avenues for financing research on climate change - including the Natural Sciences and Engineering Research Council and the government's often-touted High Arctic research station. But that facility won't be ready for several years. Climate scientists said that as the funding dries up, the country's capacity to make use of the station will be lost.

Liberal environment critic David McGuinty said the Harper government is taking its cue from the climate-change skeptics, who have seized on some embarrassing e-mails from a British university in East Anglia to suggest researchers are rigging their results.

The Liberal critic said the scientific evidence overwhelmingly indicates that man-made climate change is real and poses a serious challenge to the global community.

The funding crunch "is unfortunate at a time when we should be investigating more, getting more evidence," Mr. McGuinty said.

"If we find out it's not as bad as we thought, we take a mid-course action. If we find out it's worse than we thought, we take mid-course correction. It's a never ending quest for knowledge and understanding."

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7. Met Office analysis reveals 'clear fingerprints' of man-made climate change

Climate scientists say the 100 studies of sea ice, rainfall and temperature should help the public to make up their own minds on global warming

- [Datablog: the new data in full and visualised](#)
- [Comment: How public trust in climate scientists can be restored](#)

By Alok Jha
The Guardian

March 5, 2010

It is an "increasingly remote possibility" that human activity is not the main cause of climate change, according to a major Met Office review of more than 100 scientific studies that track the observed changes in the Earth's climate system. The research will strengthen the case for human-induced climate change against sceptics who argue that the observed changes in the Earth's climate can largely be explained by natural variability.

Climate scientists and the UN's climate body, the Intergovernmental Panel on Climate Change (IPCC), have come under intense pressure in recent months after the IPCC was forced to admit it had made two errors in its fourth assessment report published in 2007. Emails hacked from climate scientists at the University of East Anglia in November have also sparked a series of inquiries into allegations of a lack of transparency by researchers and manipulation of the peer review process.

Asked whether his study was specifically scheduled as a fightback, Peter Stott, who led the review, said that the paper was originally drafted a year ago. But he added: "I hope people will look at that evidence and make up their minds informed by the scientific evidence."

Scientists matched computer models of different possible causes of climate change - both human and natural - to measured changes in factors such as air and sea temperature, Arctic sea ice cover and global rainfall patterns. This technique, called "optimal detection", showed clear fingerprints of human-induced global warming, according to Stott. "This wealth of evidence shows that there is an increasingly remote possibility that climate change is being dominated by natural factors rather than human factors." The paper reviewed numerous studies that were published since the last IPCC report.

Optimal detection considers to what extent an observation can be explained by natural variability, such as changing output from the sun, volcanic eruptions or El Niño, and how much can be explained by the well-established increases in carbon dioxide and other greenhouse gases in the atmosphere.

According to Nasa, the last decade was the warmest on record and 2009 the second warmest year. Temperatures have risen by 0.2C per decade, over the past 30 years and average global temperatures have increased by 0.8C since 1880.

The evidence that the climate system is changing goes beyond measured air temperatures, with much of the newest evidence coming from the oceans. "Over 80% of the heat that's trapped in the climate system as a result of the greenhouse gases is exported into the ocean and we can see that happening," said Stott. "Another feature is that salinity is changing - as the atmosphere is warming up, there is more evaporation from the surface of the ocean [so making it more salty], which is most noticeable in the sub-tropical Atlantic."

This also links into changes in the global water cycle and rainfall patterns. As the atmosphere warms, it has been getting more humid, exactly as climate modellers had predicted. "This clear fingerprint has been seen in two independent datasets. One developed in the Met Office Hadley Centre, corroborated with data from satellites."

Arctic sea ice is also retreating - the summer minimum of sea ice is declining at a rate of 600,000 km² per decade, an area approximately the size of Madagascar. Again, decreasing sea ice is predicted by climate models.

Rainfall is also on the rise in the higher latitudes of the northern hemisphere and large swaths of the southern hemisphere, while in the tropics and sub-tropics, there are decreases. "The already-wet regions are getting wetter and the dry regions are getting drier," said Stott. "We now have studies that can identify this fingerprint in the observational data."

The review, published in Wiley Interdisciplinary Reviews: Climate Change, found that the natural causes of climate variation, including changing energy output from the sun and volcanic eruptions, could not explain the observed changes by themselves. "There hasn't been an increase in solar output for the last 50 years and solar output would not have caused cooling of the higher atmosphere and the warming of the lower atmosphere that we have seen," said Stott.

If the observed climate change was entirely due to solar activity, the Earth's atmosphere would have warmed more evenly - both the troposphere and stratosphere would have been affected. Warming due to the Sun would also have meant temperatures should have increased more quickly early than late in the 20th century, which is the reverse of what was actually measured.

The review is published as scientists also report a rise in methane emissions from a section of the Arctic Ocean sea floor. That study, published today in the journal *Science*, shows that the permafrost under the East Siberian Arctic shelf, once considered an safe store of methane, is leaking large amounts of the gas into the atmosphere. Release of even a fraction of the methane stored in the shelf could trigger abrupt climate warming as this is a greenhouse gas around 30 times more potent than CO₂.

"The amount of methane currently coming out of the East Siberian Arctic shelf is comparable to the amount coming out of the entire world's oceans. Sub-sea permafrost is losing its ability to be an impermeable cap," said Natalia Shakhova, a researcher at the University of Alaska Fairbanks's International Arctic Research Centre. "The release to the atmosphere of only one percent of the methane assumed to be stored in shallow hydrate deposits might alter the current atmospheric burden of methane up to three to four times. The climatic consequences of this are hard to predict."

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8. Climate panel faces major review

Move follows errors in some U.N. data

MSNBC

March 10, 2010

The world's biggest scientific guns are being called in to mop up after a trickle of unsettling errors in the reports written by the U.N. climate panel. The United Nations and the beleaguered Intergovernmental Panel on Climate Change said Wednesday that a Netherlands-based group of 15 national academies of science will study how the warming panel does its job.

The independent review will be finished by the end of August, said Robbert Dijkgraaf, co-chairman of the group, the InterAcademy Council.

"Let me be clear - the threat posed by climate change is real," U.N. Secretary General Ban Ki-moon told reporters alongside IPCC chairman Rajendra Pachauri. "Nothing that has been alleged or revealed in the media recently alters the fundamental scientific consensus on climate change."

But, he added, "we need to ensure full transparency, accuracy and objectivity, and minimize the potential for any errors going forward."

Pachauri, who has been resisting pressure from critics to resign, said he expected the review "will help us in strengthening the entire process by which we carry out preparation of our reports." Neither Pachauri nor Ban took questions from reporters.

A panel of experts created by the InterAcademy Council will try to figure out how better to catch and correct errors, Dijkgraaf said. It will also consider whether the climate panel should use non-peer reviewed literature, how governments review IPCC material, and even how the IPCC communicates with the public.

Mistakes in the IPCC reports, found in recent months, don't undercut the broad consensus on global warming, but they have shaken the credibility of climate scientists and given skeptics ammunition.

Dijkgraaf said the review is "a forward-looking report" but will also examine the errors already found as "case studies."

Vow of 'truly independent'

The review will involve a mix of outside experts and climate scientists who have worked with the IPCC before but are "far enough removed to be truly independent," Dijkgraaf said. The idea is to have expertise and insight into how the IPCC works without including current leaders, he said.

"The full panel needs gravitas and I think scientific stature," Dijkgraaf said. The members of the panel haven't been chosen, but it will likely be 10 scientists.

The evaluation group will be chosen when the InterAcademy's board meets on March 22, Dijkgraaf said. The InterAcademy has done science reviews before for the United Nations.

"The (review) panel will have great liberty to function and work and write a report with an open mind," Dijkgraaf said. And the conclusions of the panel itself will be peer-reviewed by outside scientists.

The IPCC was formed in 1989 by the United Nations and the World Meteorological Organization to study global warming and its causes and effects. It shared the Nobel Peace Prize in 2007 with former Vice President Al Gore. The IPCC, which is mostly a collection of scientists volunteering their work, produced reports that had several errors, among them: mistaking how much of the Netherlands is below sea level and botching how fast glaciers in the Himalayans are expected to melt.

The errors cropped up in a report of more than 3,000 pages that cited more than 10,000 scientific papers. The next IPCC update on climate change will be published in 2013.

Its 2007 report wrongly said Himalayan glaciers could vanish by 2035, a prediction derived from articles that hadn't been reviewed by scientists before publication. An original source had spoken of the world's glaciers melting by 2350.

"In drafting the paragraph in question, the clear and well-established standards of evidence, required by the IPCC procedures, were not applied properly," the IPCC said in a statement earlier this year.

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*The next Update from the Northern Climate ExChange will be sent out **Wednesday, March 24, 2010***