

# Northern Climate ExChange

*Independent Information - Shared Understanding - Action on Climate Change*

NCE Update April 14, 2010

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## Announcements

### 1. Yukon Environment Fair celebrates biodiversity - April 17

The Yukon government is hosting an Environment Fair in April to help connect the public with the people and organizations that help protect Yukon's ecosystems.

When: Saturday, April 17 10 am - 3 pm  
Where: Canada Games Centre, ATCO ice area  
Cost: Free admission

A full list of displays and presentations is available on the department's website at [www.environmentyukon.gov.yk.ca](http://www.environmentyukon.gov.yk.ca). Environment Yukon is organizing the forum with financial assistance from Environment Canada and the participation of environment-related non-government organizations and government programs.

[www.gov.yk.ca](http://www.gov.yk.ca)

### 2. Northern Bioenergy Conference in Whitehorse, Yukon

**The Northern Bioenergy Conference will take place in Whitehorse, Yukon on May 26 & 27, 2010.**

"This is the first bioenergy conference with a focus on Northern opportunities and potentials. The purpose of this two day



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conference is to provide Northern residents with relevant information on bioenergy, and to look at what territorial governments are doing to support a bioeconomy.

The basics of an emerging northern bioeconomy will be covered in the first part of the workshop followed by a more detailed examination of bioenergy opportunities and potential solutions for the North, as well as review government's strategy and policy.

This conference will benefit First Nations, industry, government, and communities looking for alternative energy sources.

[www.northernbioenergyconference.ca](http://www.northernbioenergyconference.ca)

### **3. Pacific Climate Seminar Series: An Outside-the-Box Approach to Climate Change Negotiations**

**What:** Pacific Climate Seminar Series: An Outside-the-Box Approach to Climate Change Negotiations

**When:** Wednesday, April 28 - 3.30 to 4.30 p.m.

**Where:** Social Sciences and Mathematics Bldg. Room A120

**Presented by:** Barry Carin, Associate Director, Centre for Global Studies, University of Victoria and Senior Fellow, Centre for International Governance Innovation.

Seminar will be available via live webcast at:

<http://www.pics.uvic.ca/broadcast.php>. The presenter's slides will be available online just before the seminar. [More information](#).

[www.pics.uvic.ca](http://www.pics.uvic.ca)

### **4. Northern Energy Solutions Conference - presentations on-line**

The **Energy Solutions Centre** in Whitehorse, hosted the **Northern Energy Solutions Conference** on February 15 - 19, 2010. The conference focused on practical and current Energy Solutions for commercial and institutional structures and touched on residential housing and other energy issues.

To view conference presentations on-line click [here](#).

[yukonenergyconference.ca](http://yukonenergyconference.ca)

### **5. Whitehorse Earth Day Challenge - April 22, 2010**

The **Yukon Environmental Network (YTEN)** invites you to join in celebrating the 40th Anniversary of Earth Day, April 22, 2010 by participating in a friendly **Earth Day Challenge**.

**Businesses:** Yukon businesses and organizations are challenged to commit to selling "green" products and services, and/or to actively "green" your workplaces, or to otherwise give back to the earth in some way, in celebration

of Earth Day, 2010. Become a Corporate Challenger! Download registration form [here](#) and send to: [earthdayt@gmail.com](mailto:earthdayt@gmail.com).

**Youth:** Participate in our **Earth Day School Challenge**. If you have a great "green" project or message to share with the world - we challenge you to share it with us! If you don't have a "green" activity in mind, we've got one for you. We challenge all classrooms and students to participate in the [Schools for Change Challenge 2010](#). To register go to the [Climate Change North Website](#) or contact the [Northern Climate ExChange](#) at 668-8862.

For more information on the YTEN Earth Day Challenge call 668-5678.

[www.yten.ca](http://www.yten.ca)

## **6. Studies of Climate Change in the Yukon River Basin: Connecting Community and Science Through a Unique Partnership**

"An exciting new partnership between the **U.S. Geological Survey** (USGS) and the **Yukon River Inter-Tribal Watershed Council** (YRITWC) is yielding critical data for the assessment of climate change effects in the Yukon River Basin. The foundation of this partnership is a shared interest in the current and future water quality of the Yukon River and its relation to climate.

The USGS began a landmark study of the Yukon River and its major tributaries in 2000. A key objective of this study is to establish a baseline dataset of water quality, which will serve as an important frame of reference to assess future changes in the basin that may result from a warmer climate".

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[www.pubs.usgs.gov](http://www.pubs.usgs.gov)

## **Articles**

### **1. 2 more glaciers disappear from Glacier National Park**

By Matthew Brown  
*The Associated Press*  
Daily News-Miner  
April 8, 2010

BILLINGS, Mont. - Glacier National Park has lost two more of its namesake moving icefields to climate change, which is shrinking the rivers of ice until they grind to a halt, the U.S. Geological Survey said Wednesday.

Warmer temperatures have reduced the number of named glaciers in the northwestern Montana park to 25, said Dan Fagre, an ecologist with the agency.

He warned the rest of the glaciers may be gone by the end of the decade.

"When we're measuring glacier margins, by the time we go home the glacier is already smaller than what we've measured," Fagre said.

The latest two to fall below the 25 acre threshold were Miche Wabun and Shepard. Each had shrunk by roughly 55 percent since the mid-1960s. The largest remaining glacier in the park is Harrison Glacier, at about 465 acres.

On a local scale, fewer glaciers means less water in streams for fish and a higher risk for forest fires. More

broadly, Fagre said the fate of the glaciers offers a climate barometer, indicating dramatic changes to some ecosystems already under way.

While the melt-off shows the climate is changing, it does not show exactly what is causing temperatures to rise.

In alpine regions around the world, glacier melting has accelerated in recent decades as temperatures increased. Most scientists tie that warming directly to higher atmospheric concentrations of greenhouse gases such as carbon dioxide.

Some glaciers, such as in the Himalayas, could hold out for centuries in a warmer world. But more than 90 percent of glaciers worldwide are in retreat, with major losses already seen across much of Alaska, the Alps, the Andes and numerous other ranges, according to researchers in the United States and Europe.

In some areas of the Alps, ski resorts set atop glaciers have taken drastic measures to stave off the decline, such as draping glaciers in plastic sheeting to keep them cooler.

It could prove a losing battle: Scientists working for the United Nations say the last period of widespread glacial growth was more than three decades ago, lasting only for a few years.

Since about 1850, when the Little Ice Age ended, the trend has been steadily downward.

The area of the Rocky Mountains now within Glacier National Park once boasted about 150 glaciers, of which 37 were eventually named.

Fagre said a handful of the park's largest glaciers could survive past 2020 or even 2030, but by that point the ecosystem would already be irreversibly altered.

Fagre said geological evidence points to the continual presence of glaciers in the area since at least 5000 B.C.

"They've been on this landscape continually for 7,000 years, and we're looking at them disappear in a couple of decades," he said.

A glacier needs to be 25 acres to qualify for the title. If it shrinks more, it does not always stop moving right away. A smaller mass of ice on a steep slope would continue to grind its way through the mountains, but eventually could disappear completely.

Smaller glaciers and warmer temperatures could lower stream flows, which in turn prompt fishing restrictions and hobble whitewater rafting businesses, said Denny Gignoux, who runs an outfitting business in West Glacier. Tourism is a \$1 billion-a-year industry in the area.

"What happens when all these threats increase?" Gignoux asked. "We're losing a draw to Glacier."

A report released Wednesday by two environmental groups highlighted the threat to tourism of fewer glaciers. The study by the Rocky Mountain Climate Organization and Natural Resources Defense Council included an analysis of weather records that showed Glacier was 2 degrees hotter on average from 2000 to 2009, compared with 1950 to 1979.

Download full report: [\(large file - 23 MB\)](#)

[newsminer.com](http://newsminer.com)

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## **2. Massive Arctic Ice Cap Is Shrinking, Study Shows; Rate Accelerating Since 1985**

Close to 50 years of data show the Devon Island ice cap, one of the largest ice masses in the Canadian High Arctic, is thinning and shrinking.

A paper published in the March edition of *Arctic*, the journal of the University of Calgary's Arctic Institute of North America, reports that between 1961 and 1985, the ice cap grew in some years and shrank in others, resulting in an overall loss of mass. But that changed 1985 when scientists began to see a steady decline in ice volume and area each year.

"We've been seeing more mass loss since 1985," says Sarah Boon, lead author on the paper and a Geography Professor at the University of Lethbridge. The reason for the change? Warmer summers.

The High Arctic is essentially a desert with low rates of annual precipitation. There is little accumulation of snow in the winter and cool summers, with temperatures at or below freezing, serve to maintain levels. Any increase of snow and ice takes years.

This delicate equilibrium is easily upset. One warm summer can wipe out five years of growth. And though the accelerated melting trend began in 1985, the last decade has seen four years with unusually warm summers -- 2001, 2005, 2007 and 2008.

"What we see during these warm summers is the extent of the melt is greater," says Boon about the results of a five-year remote sensing study that ran between 2000 and 2004.

The white surfaces of snow and ice reflect heat -- a process known as the albedo effect. Retreating ice exposes dark soil and gravel, which absorb heat and increase the melt rate of ice along the periphery of the cap. But it's not only the edges of the cap that are losing ice. At lower altitudes the ice is thinning as well.

Changes to the Devon ice cap, which covers approximately 14,400 sq. km, could have multiple impacts on everything from ship traffic to sea level.

There has already been an increase in the number of icebergs calving off from outlet glaciers that flow into the ocean. Boon explains that melt water runs between the bottom of the glacier and the ground, creating a slippery cushion that allows the glacier to slide forward more rapidly than it would in colder conditions.

"There are a lot of things we need to consider. One is the iceberg calving and its implications for shipping. These things don't just go away, they float out into the ocean," says Boon. A second area of concern is the contribution of increased glacier melt to rising sea level.

The work of Boon and her colleagues demonstrates the importance of long-term research. Work on Devon Island began in 1961 with researchers from the Arctic Institute of North America, including long-time Arctic scientist Roy 'Fritz' Koerner, who was part of the current study until his death in 2008. This ongoing research, which is continuing thanks to federal International Polar year funding, has created a comprehensive dataset that contributes to the understanding of the complex play between the ice cap, the atmosphere and the ocean.

"We all know long-term studies are important but they are really hard to pay for."

[www.sciencedaily.com](http://www.sciencedaily.com)

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### **3. Esa's Cryosat mission switches on radar instrument**

By Jonathan Amos  
BBC News  
April 12, 2010

The radar instrument on Europe's Cryosat-2 spacecraft has been switched on and is reported to be working well.

The satellite, which was launched last Thursday from Kazakhstan, will use the equipment to map the thickness and shape of the Earth's polar ice cover.

Controllers must now check all of Cryosat's systems while a calibration team fine-tunes the radar.

The science phase of the mission is expected to start in a few months' time and continue through to at least 2013.

Cryosat is the latest Earth observation venture to be flown by the European Space Agency (Esa).

A command was sent from its operation's centre in Darmstadt, Germany, on Sunday to activate the satellite's SAR/Interferometric Radar Altimeter (Siral).

The instrument then acquired sample data over the Antarctic and Arctic for relay back to Earth.

"We've tried the instrument out in all its modes," said Esa project manager Dr Richard Francis.

"The very first time we switched it on, it worked brilliantly," he told BBC News.

Siral advances the technology flown on previous European radar missions, such as ERS and Envisat.

It has an along-track (straight ahead) resolution of about 250m, which will allow it to see the gaps of open water between the protruding sea-ice floes of the Arctic.

With centimetre-scale accuracy, the altimeter will measure the difference in height between the two surfaces so scientists can work out the overall volume of the marine cover.

A second antenna on Siral offset from the first by about a metre will enable the instrument to sense the shape of the ice below, returning more reliable information on slopes and ridges.

This interferometric observing mode will be used to assess the edges of Greenland and Antarctica where some rapid thinning has been detected in recent years.

Cryosat's Dnepr rocket gave the mission a perfect start by injecting the spacecraft about 100m above the requested 720km-high mean orbit.

Controllers will now modify this orbit slightly to enable the radar instrument to perform at its best.

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#### **4. Tipping Point Not Likely for Arctic Sea Ice**

By Brandon Keim  
Wired Science  
April 9, 2010

A late-winter expansion of Arctic sea ice is a good example of ice-forming dynamics that could keep the Arctic from hitting a "tipping point" in the near future.

Some scientists have predicted that rising temperatures could create a runaway feedback loop in the Arctic. Sunlight-reflecting ice sheets would give way to sunlight-absorbing water, driving up temperatures and melting even more ice. The Arctic climate would change so dramatically that winter ice couldn't form again, producing planet-wide ripples in weather patterns.

But some research suggests that other, previously underappreciated forces may stabilize the melt before it's complete. The Arctic will soon be ice-free in summer, and winter ice will decline, but it won't suddenly become permanently ice-free.

"Everyone thought there would be a tipping point," said Dirk Notz, a Max Planck Institute climate scientist. "But that's too simple."

The most recent Arctic sea-ice spurt was caused by a cold snap over the Bering and Barents Seas that allowed ice to form until later than usual in March, nudging total ice cover towards averages seen between 1979 and 2000. But, Notz emphasized, this was just a single data point. Since 1979, the Arctic's maximum winter sea-ice cover, measured before the summer melt, has dropped by about 6 percent.

The spurt does, however, demonstrate the ability of thin ice, such as that at the edge of Arctic ice sheets, to grow very rapidly. That's a big reason why Arctic ice sheets should be able to re-form in winter. Indeed, as Notz described in a review of polar-sea-ice research in December in *Proceedings of the National Academy of Sciences*, there's no evidence of the Arctic hitting a tipping point in the last several million years, even though temperatures and sea-ice levels have fluctuated widely.

Over the last few years, Arctic sea-ice cover has reached modern historical lows, stoking the tipping-point fears. Though a tipping point isn't out of the question, it would likely happen at greenhouse gas levels beyond what's expected, said Notz.

The same can't be said for ice sheets in western Antarctica and possibly Greenland. The dynamics of that ice, much of which rests atop solid land rather than floating on water, are different. Melting ice could slide off continental shelves and into the ocean faster than it's replaced by fresh snowfall. This may have been what fueled two sudden, massive sea-level rises at the end of the last Ice Age.

Tipping-point evidence is stronger for western Antarctica than Greenland, said Notz. But even the absence of a tipping point wouldn't necessarily be reassuring. "It doesn't mean Greenland won't melt away," he said. "It just means it will happen gradually."

[www.wired.com](http://www.wired.com)

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## **5. Melting Arctic poses security risk: U.S. Congress report**

By Randy Boswell  
*Canwest News Service*  
Montreal Gazette  
April 7, 2010

A new report prepared for the U.S. Congress on the growing importance of the Arctic in global affairs has highlighted the "potential emerging security issue" created by diminished ice, increased ship traffic and looming resource competition on the Northern Hemisphere's polar frontier.

The study, submitted last week to U.S. lawmakers by the Congressional Research Office, also underscores the "major jurisdictional question" over the status of the Northwest Passage, the disputed sea route through Canada's Arctic islands that's viewed as an "international strait" by the U.S. but as "internal waters" by the Canadian government.

And while the 65-page document notes several areas of co-operation among Arctic nations - showcased last week at a foreign ministers' Arctic Summit hosted by Canada - the report also quotes the U.S. navy's top oceanographer warning that American navigation through several "strategic choke points" in Arctic waters, including the "narrow passage" south of Canada's Queen Elizabeth Islands, is "vulnerable to control or blockade by adversaries."

The report was prepared by naval affairs specialist Ronald O'Rourke, a researcher with congress's public policy analysis unit.

"Although the establishment of sovereignty through the demarcation of boundaries in the region is being conducted peacefully under the auspices of the UN Convention on the Law of the Sea, the Arctic is also increasingly being viewed by some as a potential emerging security issue," the report states. "In varying degrees, the Arctic coastal states have indicated a willingness to establish and maintain a military presence in the high north.

"The Russian government has stated that, although it deplores the notion of an arms race in the region and does not foresee a conflict there, it intends to protect its Arctic interests."

Russia remains the wild card player in the future Arctic - a fact highlighted last week in Ottawa by Norwegian Foreign Minister Jonas Gahr Store, who described his country's eastern neighbour as "not yet a stable, reliable, predictable state."

The Canadian government, too, has exchanged frosty words occasionally with Moscow since 2007, when a team of Russian scientists carried out a controversial flag-planting on the North Pole seabed using a mini-submarine.

Earlier this week, during a sovereignty tour of the Canadian North, Foreign Affairs Minister Lawrence Cannon expressed annoyance over another planned Arctic "stunt" by the Russian military, which plans to conduct a parachute exercise at the North Pole to commemorate a Cold War-era expedition by Soviet paratroopers.

University of British Columbia polar specialist Michael Byers - author of the recently published book *Who Owns the Arctic?* - said the U.S. report appears to be "seeking to cover every conceivable angle" in listing potential security challenges for the U.S., and that "the possibility of a U.S. naval or coast guard challenge to Canada's claim is actually decreasing as the sea-ice melts."

But Byers did raise concerns about the report's "mistaken" contention that the European Union backs the U.S. position in its dispute with Canada over the Northwest Passage.

"To the contrary, the EU has always maintained a studied ambiguity on this issue," Byers says. The U.S. report notes that "preserving freedom of navigation" in Arctic waters is "an important tenet of U.S. policy."

And quoting a study prepared last year by the U.S. navy's oceanography chief David Grove, the congressional report states: "Aside from access and right of passage, the Navy and Coast Guard, in particular, must also be concerned with strategic choke points such as the Bering Strait, Canada's Queen Elizabeth Islands in the Northwest Passage, and Russia's Severnaya Zemlya and New Siberian Islands in the Northern Sea Route."

Those narrows "offer some protection from persistent ice blockage, but they are also vulnerable to control or blockade by adversaries that would significantly disrupt potential commercial shipping and oil transport."

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## **6. Ice plumbing is protecting Greenland from warm summers**

By Anil Ananthaswamy  
New Scientist  
April 1, 2010

If some of the spectacular calving of ice shelves in Antarctica is down to global warming, then why did we not see break-ups on the same scale in Greenland, which is much warmer? It turns out that, counter-intuitively, it's because Greenland is warmer.

When the ice sheets that blanket Antarctica and Greenland eventually meet the sea, they don't immediately calve off and create icebergs. Instead, they extend out to sea as floating ice shelves while remaining joined to the ice sheets on land.

In 2002, a gigantic section of the Larsen B ice shelf in the Antarctic Peninsula suddenly broke off. It had been an unusually warm summer, with temperatures rising to a balmy 4 °C. As the ice melted, huge pools of meltwater formed on the surface of the ice, and as this water poured down crevasses it forced apart sections of the shelf. "It fell apart in a whole lot of little slivers," says Richard Alley, a glaciologist at Pennsylvania State University in University Park.

In contrast, while Greenland has experienced summer temperatures of up to 11 °C over the past half century, many of the ice shelves had held firm, despite some surface melting. "Greenland ice shelves are surviving," says Alley.

Now Alley, along with Byron Parizek, also of Penn State, and colleagues have worked out how the warmer temperatures themselves could explain why. Mathematical models suggest the higher temperatures in Greenland cause lakes of meltwater to form on the ice sheet, rather than on the ice shelf as happens in Antarctica. This meltwater then pours down the glacier's "plumbing" - its crevasses and moulins - to the ice sheet's base, where it flows out to sea. Had the meltwater pooled on an ice shelf, the water flowing into the cracks would have split the floating ice.

The models suggest that something similar could happen in Antarctica as it warms. Over time, as "plumbed" ice forms on land and flows down to the sea, the ice shelf could regrow. The plumbing would channel the water to the sea without forcing apart cracks in the ice.

However, Alley cautions that the regrowth would be temporary, as witnessed in Greenland, where the ice shelf in front of the Jakobshavn glacier finally fell apart in the mid-1990s, as seawater eroded it from underneath (Journal of Geophysical Research, [DOI: 10.1029/2009jf001325](https://doi.org/10.1029/2009jf001325)).

The idea could be put to the test by studying the glaciers behind the now-disintegrated Larsen A and B ice shelves. If these ice sheets develop plumbing and push this ice towards the sea, then we may see the ice shelves regrow. "Whether the regrowth could slow down the ice loss, that's a question we have to go after next," says Alley.

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## 7. River reveals chilling tracks of ancient flood

*Water from melting ice sheet took unexpected route to the ocean.*

By Quirin Schiermeier\*  
Nature News  
March 31, 2010

A thousand years after the last ice age ended, the Northern Hemisphere was plunged back into glacial conditions. For 20 years, scientists have blamed a vast flood of meltwater for causing this 'Younger Dryas' cooling, 13,000 years ago. Picking through evidence from Canada's Mackenzie River, geologists now believe they have found traces of this flood, revealing that cold water from North America's dwindling ice sheet poured into the Arctic Ocean, from where it ultimately disrupted climate-warming currents in the Atlantic.

The researchers scoured tumbled boulders and gravel terraces along the Mackenzie River for signs of the meltwater's passage. The flood "would solve a big problem if it actually happened", says oceanographer Wally Broecker of Columbia University's Lamont-Doherty Earth Observatory in Palisades, New York, who was not part of the team.

On [page 740](#), the geologists present evidence confirming that the flood occurred ([J. B. Murton et al. Nature 464, 740-743; 2010](#)). But their findings raise questions about exactly how the flood chilled the planet. Many researchers thought the water would have poured down what is now the St Lawrence River into the North Atlantic Ocean, where the currents form a sensitive climate trigger. Instead, the Mackenzie River route would have funnelled the flood into the Arctic Ocean (see [map](#)).

The Younger Dryas was named after the Arctic wild flower *Dryas octopetala* that spread across Scandinavia as the big chill set in. At its onset, temperatures in northern Europe suddenly dropped 10 °C or more in decades, and tundra replaced the forest that had been regaining its hold on the land. Broecker suggested in 1989 that the rapid climate shift was caused by a slowdown of surface currents in the Atlantic Ocean, which carry warm water north from the Equator to high latitudes (W. S. Broecker et al. *Nature* 341, 318-321; 1989). The currents are part of the 'thermohaline' ocean circulation, which is driven as the cold and salty - hence dense - waters of the far North Atlantic sink, drawing warmer surface waters north.

Broecker proposed that the circulation was disrupted by a surge of fresh water that overflowed from Lake Agassiz, a vast meltwater reservoir that had accumulated behind the retreating Laurentide Ice Sheet in the area of today's Great Lakes. The fresh water would have reduced the salinity of the surface waters, stopping them from sinking.

The theory is widely accepted. However, scientists never found geological evidence of the assumed flood pathway down the St Lawrence River into the North Atlantic; or along a possible alternative route southwards through the Mississippi basin. Now it is clear why: the flood did occur; it just took a different route.

The team, led by Julian Murton of the University of Sussex in Brighton, UK, dated sand, gravel and boulders from eroded surfaces in the Athabasca Valley and the Mackenzie River delta in northwestern Canada. The shapes of the geological features there suggest that the region had two major glacial outburst floods, the first of which coincides with the onset of the Younger Dryas. If the western margins of the Laurentide Ice Sheet lay just slightly east of their assumed location, several thousand cubic kilometres of water would have been able to flood into the Arctic Ocean.

"Geomorphic observations and chronology clearly indicate a northwestern flood route down the Mackenzie valley," says James Teller, a geologist at the University of Manitoba in Winnipeg, Canada, who took part in the study. But he thinks that the route raises questions about the climatic effects of the Lake Agassiz spill. "We're pretty sure that the water, had it flooded the northern Atlantic, would have been capable of slowing the thermohaline ocean circulation and produce the Younger Dryas cooling," he says. "The question is whether it could have done the same in the Arctic Ocean."

Broecker, however, says that the Arctic flood is just what his theory needed. He says that flood waters heading down the St Lawrence River might not have affected the thermohaline circulation anyway, because the sinking takes place far to the north, near Greenland. A pulse of fresh water into the Arctic, however, would ultimately have flowed into the North Atlantic and pulled the climate trigger there. "There's no way for that water to go out of the Arctic without going into the Atlantic," he says.

*\* additional reporting by Richard Monastersky*

[www.nature.com](http://www.nature.com)

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## **8. Climategate scientists chastised over statistics**

By Catherine Brahic

New Scientist  
April 14, 2010

If the beleaguered climate scientists of the University of East Anglia have a weakness, it is in their statistics - yet their conclusions that the planet is warming stands on solid ground.

That's the conclusion of the third independent inquiry into "climategate" - the fallout from last November's release of hundreds of emails from the Climatic Research Unit (CRU) at the university, which is located in Norwich, UK.

Crucially for the scientists who work at the CRU, the inquiry - led by Ron Oxburgh, a former chair of the UK House of Lords science and technology select committee - cleared them of any professional misconduct. "We found absolutely no evidence of any impropriety whatsoever," said Oxburgh at a press briefing in London today.

"We are absolutely satisfied that these people were doing their job fairly. I don't think they even minded what the outcome [of their research] was, as long as it was as close to truth as possible," he continued.

### **Career decision**

That will have been a comfort for the CRU team. As Oxburgh put it, they were "unlikely to have worked as scientists again" had the inquiry panel found them guilty of professional misconduct.

The panel found that the statistical tools that CRU scientists employed were not always the most cutting-edge, or most appropriate. "We cannot help remarking that it is very surprising that research in an area that depends so heavily on statistical methods has not been carried out in close collaboration with professional statisticians," reads the inquiry's conclusions.

However, "it is not clear that better methods would have produced significantly different results," the panel adds.

### **Messy data**

Oxburgh was commissioned by the university to review the professional conduct of the CRU scientists. The UK Royal Society recommended his appointment and that of the panel of scientists which assisted him.

David Hand, president of the UK Royal Statistical Society and a member of Oxburgh's panel, said the work of climate scientists is a "particularly challenging statistics exercise because the data are incredibly messy".

Climate scientists must gather temperature data from disparate sources. Over the course of decades, temperature probes may have to be moved - because of the growth of cities, for example - and temperatures are not always measured in the same way at different stations around the globe.

### **Hockey stick**

He said the strongest example he had found of imperfect statistics in the work of the CRU and collaborators elsewhere was the iconic "hockey stick" graph, produced by Michael Mann of Pennsylvania State University in University Park.

The graph shows how temperatures have changed over the past 1000 years (see graphic, right). Hand pointed out that the statistical tool Mann used to integrate temperature data from a number of difference sources - including tree-ring data and actual thermometer readings - produced an "exaggerated" rise in temperatures over the 20th century, relative to pre-industrial temperatures.

That point was initially made by climate sceptic and independent mathematician Stephen McIntyre. The upwards incline on later versions of the graph has been corrected to be shorter and less exaggerated (for the full story of the hockey stick controversy, see *Climate: The great hockey stick debate, and Climate myths: The 'hockey stick' graph has been proven wrong*).

Hand said he was "impressed" by McIntyre's statistical work. But whereas McIntyre claims that Mann's

methods have "created" the hockey stick from data that does not contain it, Hand agrees with Mann: he too says that the hockey stick - showing an above-average rise in temperatures during the 20th century - is there. The upward incline is just shorter than Mann's original graphic suggests. "More like a field-hockey stick than an ice-hockey stick," he told New Scientist.

Two other inquiries, by British members of parliament and Pennsylvania State University, have also cleared the scientists of misconduct. Two further inquiries, one led by former British civil servant Muir Russell and the other conducted by British police, are still under way.

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Northern Climate ExChange

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*NOTE: The NCE Update will be published bi-weekly beginning this week and will resume weekly publication in September. The next Update from the Northern Climate ExChange will be sent out **Wednesday, April 28, 2010***