

Northern Climate ExChange

Independent Information - Shared Understanding - Action on Climate Change

NCE Update March 24, 2010

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Announcements

1. WWF-Canada: Earth Hour - March 27 at 8:30 pm

"Political leaders have not yet negotiated a global deal on climate change. Demand action by joining the largest environmental movement in history.

On **March 27 at 8:30 pm**, hundreds of millions of people around the world will turn off their lights for an hour to **demand action on climate change**".

earthhourcanada.org

2. Climate Change Could be Affecting Human Health in Alaska - audio

Alaska Public Radio Network (APRN) - Wed, March 17, 2010

The story of climate change reshaping our natural environment is well known. But the warming planet has also had dramatic impacts on human health in Alaska and around the world. Health experts in the state addressed the topic at a forum Tuesday night in Anchorage sponsored by the National Wildlife Federation.

Annie Feidt, APRN - Anchorage and Kristin Spack, KSKA -



Anchorage

[Download Audio \(MP3\)](#)

aprn.org

3. Website: NOAA's Arctic Future Web site

"Melting sea ice may sound like a regional or local problem, but NOAA's new [Arctic Future Web site](#) shows that changes in the Arctic can also influence weather in the mid-latitudes, where a large part of the global human population lives.

These research efforts are part of the climate services that NOAA provides to businesses, communities and governments so they may make informed decisions to safeguard their social and economic well-being.

Aimed at everyone from students to researchers, the site brings together easy-to-understand cause-and-effect-graphics with links to the scientific literature that backs up the statements. It can be accessed at: <http://www.arctic.noaa.gov/future>".

www.noaanews.noaa.gov

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. Number of High Arctic animals declining

CBC News
March 18, 2010

Animals in the Arctic have increased in number over the last 40 years, but populations closest to the North Pole are shrinking, a new international study says.

The report, commissioned by the Circumpolar Biodiversity Monitoring Program (CBMP) and funded by the government of Canada, found that overall, the number of mammals, birds and fish in the Arctic has increased by 16 per cent since 1970.

The Arctic Species Trend Index, released Wednesday at a conference in Miami, credited hunting restrictions in place for decades with the animals' recovery. The number of geese, for example, has doubled, and certain species of whale are also recovering.

The biggest recovery was in the southernmost parts of the Arctic, where the number of animals was up 46 per cent from 1970 to 2004.

In sharp contrast, though, is the High Arctic, the area closest to the North Pole. The number of animals dropped by 25 per cent in the same time period, while the number of caribou was down by about one-third. "What we're seeing is that there's winners and losers with rapid changes in the Arctic," said Mike Gill, a Canadian government researcher and study co-author. Gill is also chair of the CBMP.

Louise McRad of the Zoological Society of London said the decrease near the North Pole is most worrisome because the effects of climate change are most dramatic in that area and are expected to worsen. The pressure brought by the loss of sea ice will only increase, she said.

Gill said there isn't enough evidence to blame climate change directly for the loss of animals, but it is "largely in line with what would be predicted with climate change."

The report found the areas associated with the biggest drop in the number of animals also saw a faster-than-expected loss of sea ice, and species such as polar bears and narwhals are dependent on sea ice to survive.

The study tracked 965 populations of 306 species, representing 35 per cent of all known vertebrate species found in the Arctic.

The animals with the biggest recovery include bowhead whales, white-tailed eagles and the Atlantic Puffin. The biggest drops were seen in Atlantic cod, lemmings and the brown bear.

Polar bears in the western Hudson Bay also experienced a large drop in numbers. The report said there wasn't sufficient data to make any conclusions on polar bear numbers elsewhere.

Download: [The Arctic Species Trend Index 2010: Tracking Trends in Arctic Wildlife](#) (2.4 MB)

www.cbc.ca

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2. Greenland Ice Sheet Losing Mass

RedOrbit
March 24, 2010

Ice loss from the Greenland ice sheet, which has been increasing during the past decade over its southern region, is now moving up its northwest coast, according to a new international study.

Led by the Denmark Technical Institute's National Space Institute in Copenhagen and involving the University of Colorado at Boulder, the study indicated the ice-loss acceleration began moving up the northwest coast of Greenland starting in late 2005. The team drew their conclusions by comparing data from NASA's Gravity and Recovery Climate Experiment satellite system, or GRACE, with continuous GPS measurements made from long-term sites on bedrock on the edges of the ice sheet.

The data from the GPS and GRACE provided the researchers with monthly averages of crustal uplift caused by ice-mass loss. The team combined the uplift measured by GRACE over United Kingdom-sized chunks of Greenland while the GPS receivers monitor crustal uplift on scales of just tens of miles. "Our results show that the ice loss, which has been well documented over southern portions of Greenland, is now spreading up along the northwest coast," said Shfaqat Abbas Khan, lead author on a paper that will appear in *Geophysical Research Letters*.

The team found that uplift rates near the Thule Air Base on Greenland's northwest coast rose by roughly 1.5 inches, or about 4 centimeters, from October 2005 to August 2009. Although the low resolution of GRACE -- a swath of about 155 miles, or 250 kilometers across -- is not precise enough to pinpoint the source of the ice loss, the fact that the ice sheet is losing mass nearer to the ice sheet margins suggests the flows of Greenland outlet glaciers there are increasing in velocity, said the study authors.

"When we look at the monthly values from GRACE, the ice mass loss has been very dramatic along the northwest coast of Greenland," said CU-Boulder physics Professor and study co-author John Wahr, also a fellow at CU-Boulder's Cooperative Institute for Research in Environmental Sciences.

"This is a phenomenon that was undocumented before this study," said Wahr. "Our speculation is that some of the big glaciers in this region are sliding downhill faster and dumping more ice in the ocean."

Other co-authors on the new GRL study included Michael Bevis and Eric Kendrick from Ohio State University and Isabella Velicogna of the University of California-Irvine, who also is a scientist at NASA's Jet Propulsion Laboratory. GRL is published by the American Geophysical Union.

A 2009 study published in GRL by Velicogna, who is a former CU-Boulder research scientist, showed that between April 2002 and February 2009, the Greenland ice sheet shed roughly 385 cubic miles of ice. The mass loss is equivalent to about 0.5 millimeters of global sea-level rise per year.

"These changes on the Greenland ice sheet are happening fast, and we are definitely losing more ice mass than we had anticipated," said Velicogna. "We also are seeing this ice mass loss trend in Antarctica, a sign that warming temperatures really are having an effect on ice in Earth's cold regions."

Researchers have been gathering data from GRACE since NASA launched the system in 2002. Two GRACE satellites whip around Earth 16 times a day separated by 137 miles and measure changes in Earth's gravity field caused by regional shifts in the planet's mass, including ice sheets, oceans and water stored in the soil and in underground aquifers.

"GRACE is unique in that it allows us to see changes in the ice mass in almost real time," said Velicogna. "Combining GRACE data with the separate signals from GPS stations gives us a very powerful tool that improves our resolution and allows us to better understand the changes that are occurring."

In addition to monitoring the Thule GPS receiver in northwest Greenland as part of the new GRL study, the team also is taking data from GPS receivers in southern Greenland near the towns of Kellyville and Kulusuk. An additional 51 permanent GPS stations recently set up around the edges of the Greenland ice sheet should be useful to measure future crustal uplift and corresponding ice loss, said Wahr.

"If this activity in northwest Greenland continues and really accelerates some of the major glaciers in the area -- like the Humboldt Glacier and the Peterman Glacier -- Greenland's total ice loss could easily be increased by an additional 50 to 100 cubic kilometers (12 to 24 cubic miles) within a few years," said Khan.

The study was funded by NASA and the National Science Foundation.

Greenland is about one-fourth the size of the United States and the massive ice sheet covers about 80 percent of its surface. It holds about 20 percent of the world's ice, the equivalent of about 21 feet of global sea rise. Air temperatures over the Greenland ice sheet have increased by about 4 degrees Fahrenheit since 1991, which most scientists attribute to a build-up of greenhouse gases in the atmosphere.

A 2006 study by Wahr and Velicogna using the GRACE satellite indicated that Greenland lost roughly 164 cubic miles of ice from April 2004 to April 2006 -- more than the volume of water in Lake Erie.

www.redorbit.com

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3. Wind contributing to Arctic sea ice loss, study finds

New research does not question climate change is also melting ice in the Arctic, but finds wind patterns

explain steep decline

David Adam
Guardian
March 22, 2010

Much of the record breaking loss of ice in the Arctic ocean in recent years is down to the region's swirling winds and is not a direct result of global warming, a new study reveals.

Ice blown out of the region by Arctic winds can explain around one-third of the steep downward trend in sea ice extent in the region since 1979, the scientists say.

The study does not question that global warming is also melting ice in the Arctic, but it could raise doubts about high-profile claims that the region has passed a climate "tipping point" that could see ice loss sharply accelerate in coming years.

The new findings also help to explain the massive loss of Arctic ice seen in the summers of 2007-08, which prompted suggestions that the summertime Arctic Ocean could be ice-free within a decade. About half of the variation in maximum ice loss each September is down to changes in wind patterns, the study says.

Masayo Ogi, a scientist with the Japan Agency for Marine-Earth Science and Technology in Yokohama, and her colleagues, looked at records of how winds have behaved across the Arctic since satellite measurements of ice extent there began in 1979.

They found that changes in wind patterns, such as summertime winds that blow clockwise around the Beaufort Sea, seemed to coincide with years where sea ice loss was highest.

Writing in a paper to be published in the journal *Geophysical Research Letters*, the scientists suggest these winds have blown large amounts of Arctic ice south through the Fram Strait, which passes between Greenland and the Norwegian islands of Svalbard, and leads to the warmer waters of the north Atlantic. These winds have increased recently, which could help explain the apparent acceleration in ice loss.

"Wind-induced, year-to-year differences in the rate of flow of ice toward and through Fram Strait play an important role in modulating September sea ice extent on a year-to-year basis," the scientists say. "A trend toward an increased wind-induced rate of flow has contributed to the decline in the areal coverage of Arctic summer sea ice."

Ogi said this was the first time the Arctic winds have been analysed in such a way.

"Both winter and summer winds could blow ice out of the Arctic [through] the Fram Strait during 1979-2009," she said.

A number of other factors were also responsible for ice loss, including warming of the air and ocean, she added.

According to the National Snow and Ice Data Centre in Colorado, Arctic sea ice "is in a state of ongoing decline". Since 1979, the ice has shrunk by about 10% a decade, or 28,000 square miles each year. The ice reaches its minimum extent each September, when it begins to reform as the freezing Arctic winter takes hold.

www.guardian.co.uk

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4. NASA IceBridge Mission Prepares for Study of Arctic Glaciers

NASA
March 18, 2010

NASA's Operation IceBridge mission, the largest airborne survey ever flown of Earth's polar ice, kicks off its second year of study when NASA aircraft arrive in Greenland March 22.

The IceBridge mission allows scientists to track changes in the extent and thickness of polar ice, which is important for understanding ice dynamics. IceBridge began in March 2009 as a means to fill the gap in polar observations between the loss of NASA's Ice, Cloud and land Elevation Satellite, or ICESat, and the launch of ICESat-2, planned for 2015. Annual missions fly over the Arctic in March and April and over Antarctica in October and November.

"NASA's IceBridge mission is characterizing the changes occurring in the world's polar ice sheets," said Tom Wagner, cryosphere program manager at NASA Headquarters in Washington. "The mission's goal is to collect the most important data for improving predictive models of sea level rise and global climate change."

Researchers plan to resurvey previous flight lines and former ground tracks of ICESat while adding new areas of interest. Scientists also will target some areas that have been undergoing mysterious changes. The major glaciers in southeast Greenland once thinned simultaneously, but some of those glaciers have been thinning at an accelerated rate -- as much as 40 feet per year -- while others have thickened. And glaciers in northwest Greenland, once a stable region, have mostly begun to thin.

In preparation for approximately 200 science flight hours during the spring 2010 campaign, engineers have been outfitting NASA's DC-8 aircraft with an array of science instruments. On March 21-22, the aircraft will travel to Thule, Greenland, where researchers and crew will spend about five weeks making 10 to 12 science flights. The first priority is to survey Arctic sea ice, which reaches its maximum extent each year in March or early April. High- and low-altitude flights also will survey Greenland's ice sheet and outlet glaciers.

In mid-April, the engineers will transfer the science instruments to the smaller, more maneuverable P-3B aircraft. The crew will spend May making another 10 to 12 science flights from Kangerlussuaq and Thule, Greenland.

Both aircraft will carry the Airborne Topographic Mapper, or ATM -- a laser altimeter similar to those on ICESat. ATM measures changes in the surface elevation of the ice by reflecting lasers from the ground back to the aircraft and converting the readings into elevation maps. Another laser altimeter, the Land, Vegetation, and Ice Sensor, operates at higher altitudes and can survey larger areas quickly.

The spring flights are led by project scientists Lora Koenig of NASA's Goddard Space Flight Center in Greenbelt, Md., and Michael Studinger of Goddard Earth Science and Technology Center at the University of Maryland. The mission also includes scientists, crew and technicians from Goddard, Wallops, NASA's Dryden Flight Research Center in Edwards, Calif., NASA's Ames Research Center in Moffett Field, Calif.; The Earth Institute at Columbia University in Palisades, N.Y.; the University of Kansas; and the University of Washington.

The versatility of the planes will allow some new observations not currently possible from satellites. Radar instruments from the University of Kansas and a gravimeter from Columbia University will allow scientists to "see" snow, ice, and bedrock characteristics at depths below the surface. Such information will enhance our understanding of glacier and ice sheet processes and will help scientists predict a glacier's future behavior.

"NASA has a unique capability to look at these things from a bird's-eye perspective, not only from space but also from multiple long-range, high performance aircraft," said John Sonntag, a senior scientist with URS Corporation in Wallops Island, Va., and member of the IceBridge management team. "If not for IceBridge, the global science community and the public would miss out on a great deal of knowledge about Greenland and Antarctica."

www.nasa.gov

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5. Iceberg art makes climate statement

'Sculptor draws attention to warming's impact on Inuits

Reuters
March 23, 2010

UUMMANAQ, Greenland - A Dutch artist has arranged two large sculptures on an iceberg in Greenland to raise awareness about climate change and is letting people watch online as the ice melts.

Ap Verheggen, a 45-year-old artist from The Hague, said he had built the swirling metal sculptures, which represent a dog sled, to highlight the impact of a warmer climate on the Inuit people, who struggle to move around on thinning ice.

"The sea doesn't freeze. People can't trust nature anymore," Verheggen said, before the 15-foot-tall sculptures were lifted by helicopter onto the iceberg last Friday.

"As an artist, I see it as a sort of mission to make people aware of what's happening over here."

In Uummannaq, an Inuit village of fishers and hunters on an island in northwest Greenland, the sea did not freeze enough this winter to form the thick ice needed for hunters to travel around the fjord on dog sleds.

Meanwhile, the thin ice that did form on the sea locked their boats in the harbor, further restricting their movements.

"We see the amount of sea ice is diminishing very fast," said Gert Polet from conservation group WWF, who helped fund the project. "A lot of ecosystems and a lot of animals depend on the sea ice for their survival, also people who live in the Arctic."

Verheggen said he had built two sculptures to reflect the Inuit tradition to always take a companion on journeys into the unknown.

"When Inuits travel to an unknown destination, they always go in twos," he said. "Where this iceberg is going to and when the trip ends - who knows, and therefore it's two."

People can monitor the iceberg as it melts and drifts through the Arctic via the project's Web site www.coolemotion.org.

www.reuters.com

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6. Canadian government 'hiding truth about climate change', report claims

By Stephen Leahy
Guardian
March 18, 2010

Canada's climate researchers are being muzzled, their funding slashed, research stations closed, findings ignored and advice on the critical issue of the century unsought by Prime Minister Stephen Harper's government, according to a 40-page report by a coalition of 60 non-governmental organisations.

"This government says they take climate change seriously but they do nothing and try to hide the truth about climate change," said Graham Saul, representing Climate Action Network Canada (CAN), which produced the report "[Troubling Evidence](#)".

"We want Canadians to understand what's going on with this government," Saul told IPS.

Climate change is not an abstract concept. It already results in the deaths of 300,000 people a year, virtually all in the world's poorest countries. Some 325 million people are being seriously affected, with

economic losses averaging 125 billion dollars a year, according to "The Anatomy of a Silent Crisis", the first detailed look at climate change and the human impacts.

Released last fall by the Geneva-based Global Humanitarian Forum, the report notes that these deaths and losses are not just from the rise in severe weather events but mainly from the gradual environmental degradation due to climate change.

"People everywhere deserve to have leaders who find the courage to achieve a solution to this crisis," writes Kofi Annan, former U.N. secretary-general and president of the Forum, in the report. Canadians are unlikely to know any of this.

"Media coverage of climate change science, our most high-profile issue, has been reduced by over 80 percent," says internal government documents obtained by Climate Action Network.

The dramatic decline results from a 2007 Harper government-imposed prohibition on government scientists speaking to reporters. Canadian scientists have told IPS they required permission from the prime minister's communications office to comment on their own studies made public in scientific journals and reports.

If permission is granted, it requires written questions submitted in advance and often replies by scientists have to go through a vetting process. Within six months, reporters stopped calling and media coverage declined, the leaked report noted.

While climate experts were being muzzled, known climate change deniers were put in key positions on scientific funding bodies says Saul. The report documents three appointments and their public statements that climate change is a myth or exaggerated.

"The climate-change issue is somewhat sensational and definitely exaggerated," said economist Mark Mullins, former executive director of a free-market think tank called the Fraser Institute in 2007, according to the report.

The Fraser Institute has often cast doubt on seriousness of climate change. In 2009, Mullins was appointed to the board of the major government funder the Natural Sciences and Engineering Research Council (NSERC).

Mullins is in good company. In late February, Maxime Bernier, a senior member of the Harper government and a former Foreign Affairs cabinet minister, published a letter in a major newspaper saying there was no scientific consensus on climate change and that the world's national academies of science were exaggerating.

"The alarmism that has often characterised this issue is no longer valid. Canada is right to be prudent," he wrote.

Bernier is considered a possible successor to Stephen Harper.

Last week, scientists who study climate change from a remote polar science research base on Ellesmere Island said they have run out of funding and will shut down this year.

Earlier this month, the new federal budget failed to provide any funding for Canada's main climate science initiative, the Canadian Foundation for Climate and Atmosphere Sciences. Funding everything from global climate models, to the melting of polar ice and frequency of Arctic storms, to droughts and water supply, the foundation will run out of cash early next year.

"Their (federal government) actions make it clear they don't care about climate change," said Andrew Weaver, a climate scientist at the University of Victoria.

"This administration is a very different form of government. It is top-down, and run by a small group who are anti-science," Weaver told IPS.

Previous governments have always consulted with scientists prior to funding and policy decisions related to science, but the current government does not even consult its own scientists, he said. "They are only

interested in issues on their agenda: oil and related industries," he said.

Last October, Prime Minister Harper announced a 1.6-billion-dollar, multi-year partnership with the oil industry to reduce emissions from Canada's tar sands oil projects, saying: "We are taking real action at home and on the world stage to produce real, tangible reductions in greenhouse gas emissions."

The tar sands, located mainly in the province of Alberta, produce 1.3 million barrels of oil a day, almost all for the U.S. market. The massive project is the single biggest source of greenhouse gases in Canada, has the biggest toxic tailing ponds covering 50 square kilometres, and a much longer list of staggering environmental impacts.

This "real action" promised by Harper is to invest in an unproven, risky and expensive long shot called "carbon capture and sequestration" that is at least a decade away. Even if this new technology can be developed and works as planned, Canada's carbon emissions would be reduced far faster, easier and more reliably by improving energy efficiency, experts say.

Spending 1.6 billion dollars to replace old refrigerators with high-efficiency ones in the average Canadian home brings higher emissions reductions than carbon capture and sequestration in the tar sands ever will, according to information provided by the Pembina Institute, an Alberta NGO.

"Almost all of the money this government claims is climate change work is about getting more oil out of the ground," said John Bennett, executive director of the Sierra Club Canada.

"Canadian climate science is falling behind and the world is not getting information about what is happening in the Canadian Arctic," Bennett said in an interview.

The Harper government sees climate change as a communications problem and is eliminating government-funded climate research so there won't be any "bad news" about what is happening, he said. "This government is doing nothing on climate but they always make sure to sound like they're doing something to fool Canadians," Bennett said.

Report: [Troubling Evidence: The Harper Government's Approach to Climate Science Research in Canada](#)

www.guardian.co.uk

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7. DOE, USDA, and NSF Launch Joint Climate Change Prediction Research Program

New inter-agency program to generate high-resolution tools to address climate change

U.S. Department of Energy
March 22, 2010

Washington, DC - The U.S. Departments of Energy and Agriculture and the National Science Foundation (NSF) announced the launch of a joint research program to produce high-resolution models for predicting climate change and its resulting impacts. Called Decadal and Regional Climate Prediction Using Earth System Models (EaSM), the program is designed to generate models that -- significantly more powerful than existing models -- can help decision-makers develop adaptation strategies addressing climate change. These models will be developed through a joint, interagency solicitation for proposals.

The promise of an historic program

EaSM is distinguished by its promise for generating: 1) predictions of climate change and associated impacts at more localized scales and over shorter time periods than previously possible; and 2) innovative interdisciplinary approaches to address the interdisciplinary sources and impacts of climate change. These interdisciplinary approaches will draw on biologists, chemists, computer scientists, geoscientists, materials scientists, mathematicians, physicists, computer specialists, and social scientists.

"The impacts of energy production and use on climate and the impacts of a changing climate on our future energy infrastructure are among the most critical challenges facing the Department of Energy," said Dr. William F. Brinkman, Director of DOE's Office of Science. "This research will help us better understand how much our climate is changing and what that will mean at both a global and regional level over the next few decades."

By producing reliable, accurate information about climate change and resulting impacts at improved geographic and temporal resolutions, models developed under the EaSM solicitation will provide decision-makers with sound scientific bases for developing adaptation and management responses to climate change at regional levels.

The need for improved climate change models

The development of high-resolution, interdisciplinary predictive models through EaSM is important because the consequences of climate change are becoming more immediate and profound than anticipated. These consequences include prolonged droughts, increased ecosystem stress, reduced agriculture and forest productivity, altered biological feedbacks, degraded ocean and permafrost habitats and the rapid retreat of glaciers and sea ice -- all of which are expected to have major impacts on ecological, economic and social systems as well as on human health.

To mitigate these consequences, EaSM models will be designed to support planning for the management of food and water supplies, infrastructure construction, ecosystem maintenance, and other pressing societal issues at more localized levels and more immediate time periods than can existing models.

Program funding

The joint solicitation for EaSM proposals enables the three partner agencies to combine resources and fund the highest-impact projects without duplicating efforts. The FY 2010 EaSM solicitation will be supported by the following funding levels: 1) about \$30 million from NSF; 2) about \$10 million from DOE; and 3) about \$9 million from USDA. This project represents an historic augmentation of support for interdisciplinary climate change research by NSF and its partner agencies.

This solicitation is the first solicitation for the five-year EaSM program, which will run from FY 2010 to FY 2014. Submitted proposals will be reviewed through NSF's peer review process, and awards will be funded by all three partner agencies. About 20 NSF grants under EaSM are expected to be awarded.

Research goals for EaSM

DOE is particularly interested in developing models that better define interactions between climate change and decadal modes of natural climate variability, simulate climate extremes under a changing climate, and help resolve the uncertainties of the indirect effects of aerosols on climate.

NSF is particularly interested in developing models that will produce reliable predictions of 1) climate change at regional and decadal scales; 2) resulting impacts; and 3) potential adaptations of living systems to these impacts. Related research may, for example, include studies of natural decadal climate change, regional aspects of water and nutrient cycling, and methods to test predictions of climate change.

The USDA is particularly interested in developing climate models that can be linked to crop, forestry and livestock models. Such models will be used to help assess possible risk management strategies and projections of yields at various spatial and temporal scales.

Types of proposals

Two types of interdisciplinary proposals will be considered for EaSM funding: Type 1 proposals should be capacity/community building activities, address one or more goals, and last up to three years; these proposals may receive up to \$300,000 in annual funding. Type 2 proposals should describe large, ambitious, collaborative, interdisciplinary efforts that advance Earth system modeling on regional and decadal scales, and last three to five years; these proposals may receive \$300,000 to \$1 million in annual funding.

www.energy.gov

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8. How Will Climate Change Affect Arctic Migrations?

With climate change transforming the Arctic, biologists are scrambling to understand the impact on gray whales and other creatures living in the region

By Jane Kay and The Daily Climate

Scientific American

March 10, 2010

LAGO DE SAN IGNACIO, Baja California - The season of migration has come again to the warm blue waters off the coast of Mexico. Mother gray whales are nursing their newborn calves, plumping them up for the 6,000-mile trip next month to summer feeding grounds in the Arctic. This migration, one of the longest of any of the world's wild mammals, has gone on for thousands of years. Increasingly, the watery voyage raises questions about how the changing climate is affecting species that live in the Arctic, the part of the world transforming most dramatically from humanity's greenhouse gas emissions.

As ocean and atmospheric temperatures rise, the gray whales - and other Arctic dwellers like the walrus, polar bear, ice seal and Arctic fox -- are making their way in an unknown warming world. Their habitat and food supply are shifting as a result of warmer waters and shrinking sea ice.

But little is known of that food chain. Even less is known of how it will shift as the climate changes. And that represents a worrisome gap in basic science, say scientists meeting at a State of the Arctic conference in Miami last week.

The teeming waters are among the richest in the world yet the least studied because of difficulties overcoming months of dark days and impassable frozen seas. Arctic scientists say they've just begun to document the polar cap's biological diversity. They don't know how the animals are responding to global warming, where they're feeding, how their icy habitat has been affected or how the ecosystem's food web has changed.

The researchers want to fill crucial data gaps so that they can advise how best to safeguard the wild Arctic. Protection is crucial, they say, as the Northwest Passage begins to open year round and increasing access offers new chances for development. Nations, including the United States, are clamoring to exploit oil and gas resources, rich fish supplies and tourist and commercial vessel trade.

The pack ice is melting earlier and forming later. In the last three years, the sea ice's extent - the ocean area in which a defined minimum of sea ice can be found -- was at its lowest in the 30-year satellite record.

Plankton, crustaceans and fish, all food for wildlife, reproduce at the dynamic edge of the sea ice, where it floats over shallow near-shore waters. When that edge moves off the continental shelf into deep open ocean waters, the productivity drops off and the marine organisms that feed larger wildlife are out of reach, scientists say.

And that's a problem for the gray whales swimming today in the haven of Baja's waters.

The whale's favorite fatty marine crustacean, the amphipod, has declined in the Bering Sea feeding grounds over the last 30 years as currents in the North Pacific Ocean warmed and sea ice gradually melted and thinned. Whales with their babies are forced to swim through the Bering Strait and fan out in the Arctic Ocean searching for a substitute food supply. They're heading in greater numbers to the Chukchi and Beaufort seas in the Arctic Ocean and even congregating off Barrow, scientists say.

In recent years, say scientists at the National Oceanic and Atmospheric Administration, these baleen whales that typically sift out little crustaceans from the bottom are now eating mysid shrimp and even krill in ocean waters. They have to eat tons more of them to make up the lost mass of fatty amphipods. "It's like

replacing steak with vegetables," said one researcher.

Whale experts are hopeful. The grays are opportunistic feeders, they say, which makes them better candidates to adapt to the changing climate. Their ancestors date back more than one million years and have already survived extreme geologic changes.

But adaptation takes time, and the whale's population has already dipped from roughly 26,000 to 17,000. Scientists link the swift transformation of the Bering Sea ecosystem to the decline, and don't know yet if eating a wider diet is enough to stabilize the population.

Putting around San Ignacio Lagoon in a seven-person skiff, biologist Steven L. Swartz greeted passing whales with "Hola, ballena." Swartz co-directs the Ecosystem Science Program at the lagoon with Jorge Urban Ramirez, a professor at the Universidad Autonoma de Baja California Sur.

Researchers census the lagoon's whales from February to April, building a photographic identification record. The lagoon is one of three Baja stopping places for the population. Others are Scammon's Lagoon and Magdalena Bay. On any given day, about 250 gray whales swam in the lagoon, "spy hopping" in the air to look at the small boats before approaching alongside or beneath. The daily count includes 20 pairs of mothers and nursing newborns only weeks old, which are the last to leave for the north in April.

"It's very important to see what's happening up there in the Arctic," said Swartz. "The gray whale's old prey fields are gone. I want to know where they can find food."

If they can't find enough food, they can't make the arduous journey south to Baja California, Swartz said. "They get skinny and die."

It's happened before. In El Nino year of 1997, scientists recorded the warmest water temperatures ever in the eastern Bering Sea. A small phytoplankton replaced the normal summer phytoplankton, profoundly affecting the rest of the food chain, according to NOAA scientists. Zooplankton couldn't eat the smaller phytoplankton, and their numbers declined. As a result, seabirds starved and salmon runs declined.

Hundreds of gray whales stranded dead along beaches from Mexico to Alaska on the northern migration in 1999 and 2000. Whale scientists counted 200 dead in Mexico and observed that one in 10 looked emaciated. One theory is that the whales were in poor condition from the poor food supply when they came down to Baja to mate and give birth. Then, they just couldn't make the trip back to the Arctic food supply.

Other aspects of the Arctic - sea-ice extent, temperature fluxes - are well studied. Now several leading Arctic institutes, including the University of Alaska at Fairbanks, Woods Hole Oceanographic Institution, University of Maryland and other academies in the eight Arctic nations, have been asking that biological research be added to the long-conducted physical research.

One suggestion is the creation of a collaborative network, called the Distributed Biological Observatory. Research groups from the eight nations in the Arctic Council would set up environmental sampling stations throughout the Arctic and sub-Arctic. Whenever a research vessel was near a station, it would stop and gather biological information. That way, the gaps in seasonal information could be filled. Passing vessels could record such characteristics as abundance and distribution of phytoplankton all the way up to fish, marine mammals and seabirds.

"That would give us a time-series and would allow us to better interpret what's changing and how fast it's changing," said Doug DeMaster, research science director for NOAA Fisheries in Juneau. "This is a fragile ecosystem that needs to be protected but is also going to be used."

Environmental groups and scientists have been pressing for more research before industrial development forges ahead. "The trouble is we don't yet know how to develop in ways that are very, very safe," said Melanie Smith, a biologist with the National Audubon Society in Anchorage. Her group, along with Oceana, has released this week an Arctic atlas of the Chukchi and Beaufort seas.

"I do know that the Exxon Valdez spill was very difficult to clean up in an area that was ice free. We don't yet know how to clean up oil spills in broken pack ice," said Smith.

"We need to understand where the key habitats are located, the places that are essential to ecosystems. If they were severely impacted, there would be a ripple effect," she said.

The U.S. Interior Department has sold leases for offshore oil and gas development in the Arctic Ocean throughout the Bush administration. Some of the leases are under court challenge, and Interior is expected to make an announcement on their fate this month. However, exploration could begin this summer in both the Chukchi and Beaufort seas.

Last year 400 scientists sent a letter to President Barack Obama asking for more study before industrial activity goes ahead, noting that the "Arctic Ocean is one of the least-understood regions on Earth."

In October, Congress approved a conference report attached to the U.S. Department of Interior's appropriations bill that cited expanded leasing in the Arctic Ocean, including seismic testing and exploratory drilling, and called for independent scientific analysis before the agency proceeds. Congress noted that Arctic waters host "a rich diversity of wildlife and fish resources and are critical to the survival of the subsistence culture of the Inupiat people of Arctic Alaska." The independent analysis, it said, should assess the health, biodiversity and functioning of Arctic ecosystems, including the impacts of industrial activities and of climate change.

In response, the U.S. Geological Survey began a study on changing Arctic ecosystems to better understand the consequences of lost permafrost and sea ice habitats, and the Interior Department established a Climate Science Center at the University of Alaska to specifically address Arctic issues.

Back in San Ignacio Lagoon, most of the single females and males have left by now for the long journey north. The mothers and babies remain, packing pounds on the young, preparing for the uncertainty that lies ahead.

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