

Please note that this presentation
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for more information please visit
<http://www.cop15.state.gov/> .



Understanding Arctic Change



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Office of Polar Programs

U.S. National Science Foundation



NSF's Arctic Programs

Basic research on the Arctic Environment

- Contemporary change
- Past change
- Polar processes ocean, biosphere, atmosphere, cryosphere

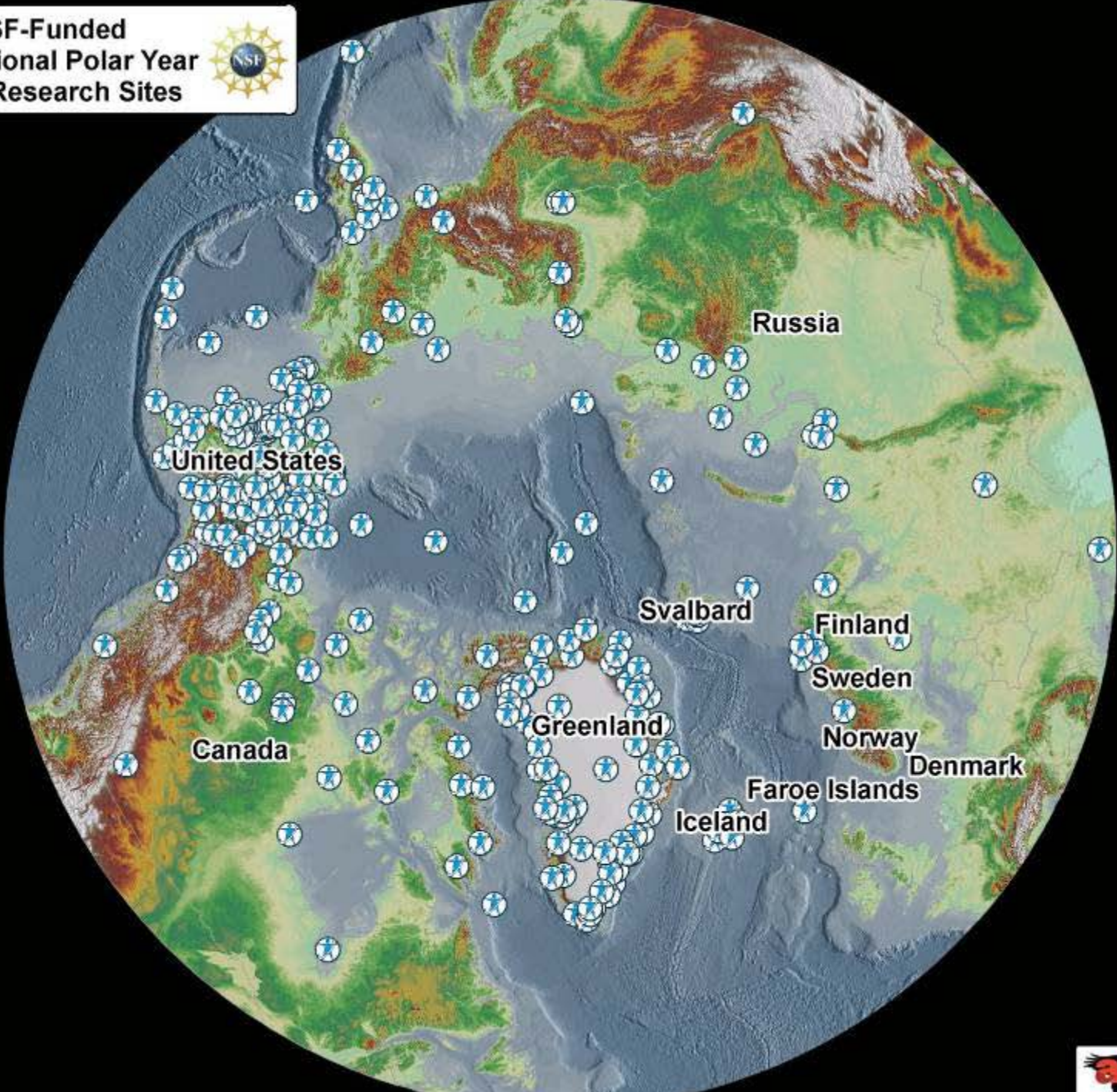
Social sciences research - past and present

Research at all scales

Integration to answer larger questions

International collaboration

Science education and outreach



Polar Bear Response to Ice Loss



Photo by John Whiteman

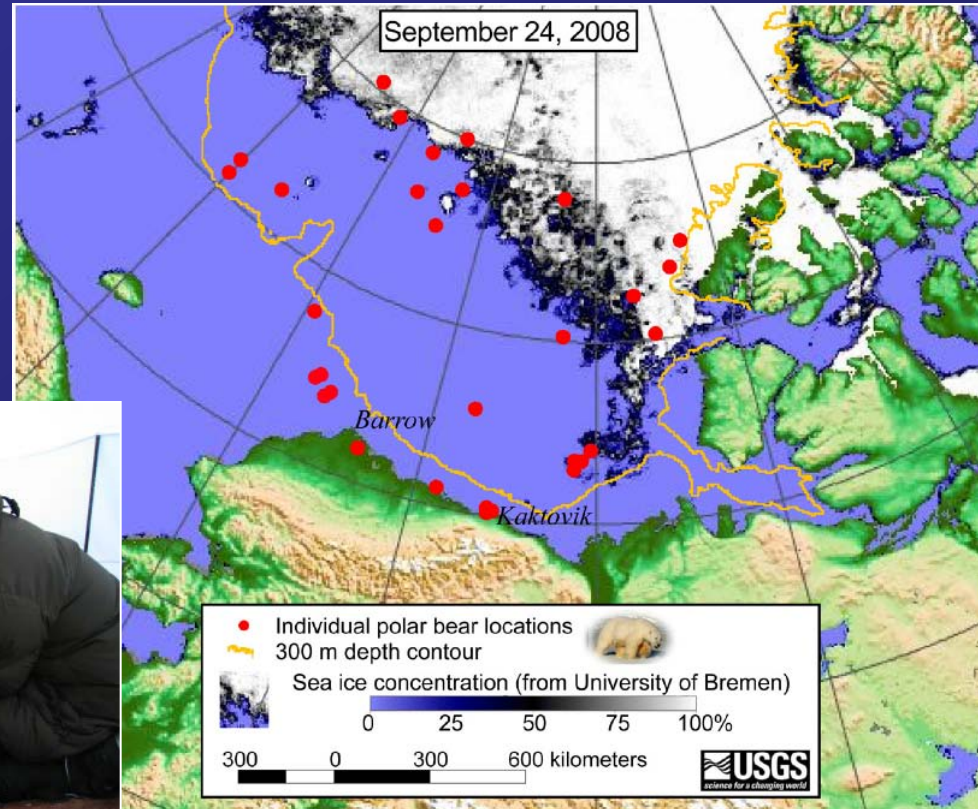


Photo by Cristine Galvan - polartrec.com

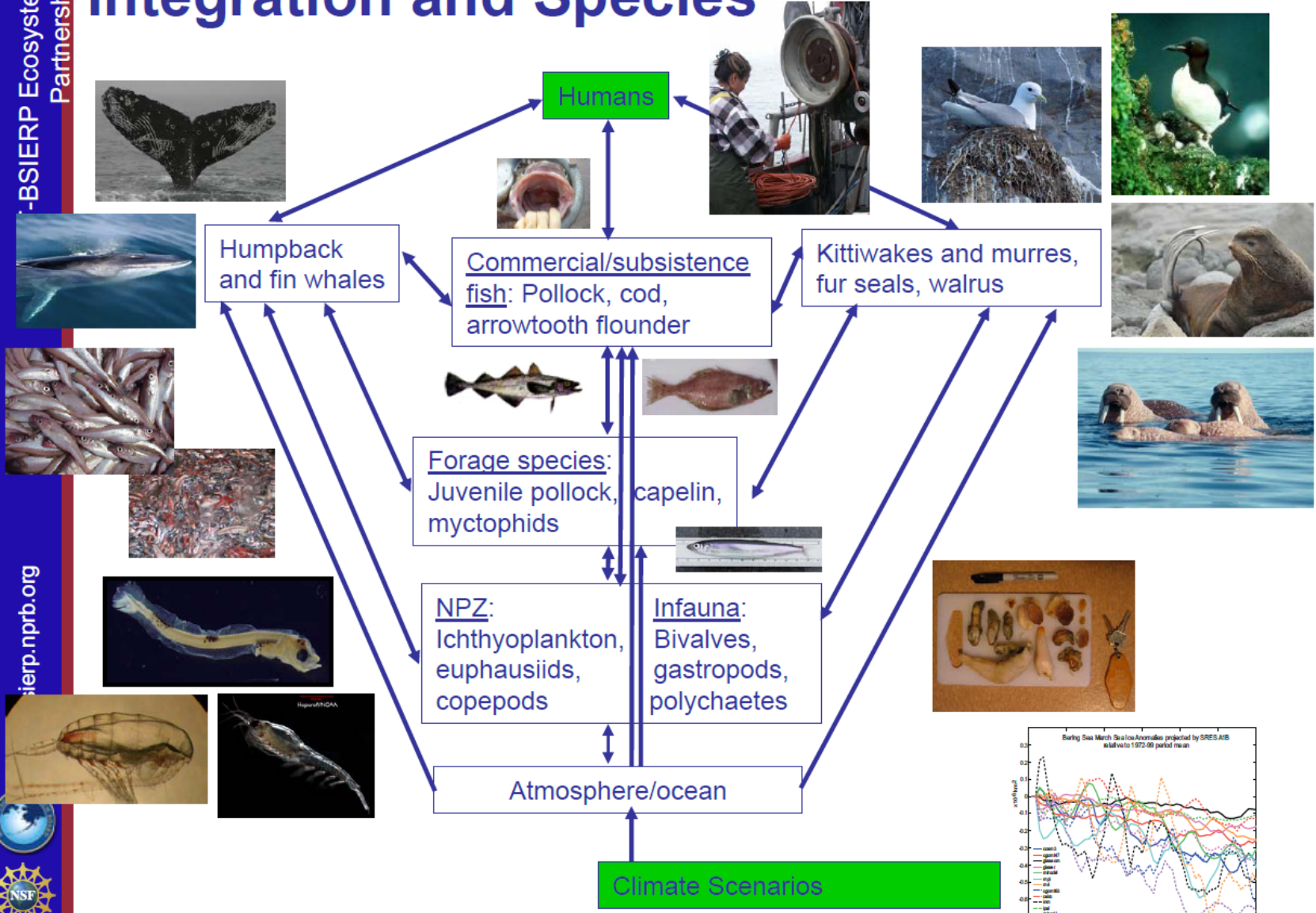
Bears on sea ice eat seals and stay active

Bears on land may fast and enter 'walking hibernation'

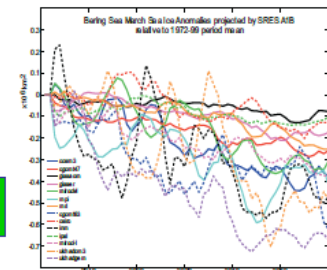
Bering Ecosystem Study ~ BEST

BSIERP Ecosystem Partnership

Integration and Species



bsierp.nprb.org





North Slope of Alaska

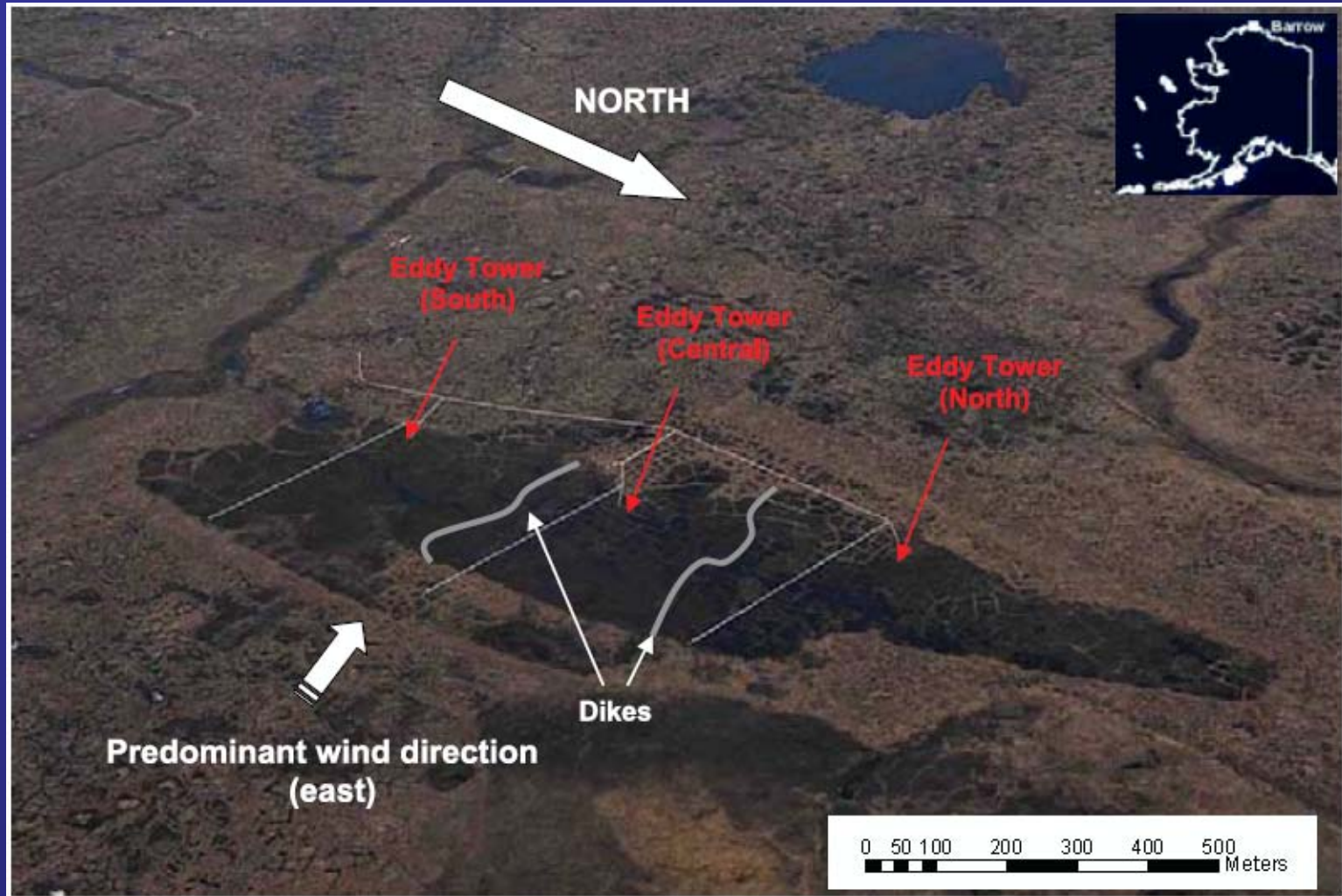
Shrubby vegetation is
increasing

1957 photo by
George Kunkel



2007 photo by
Ken Tape

Greenhouse Gases and Tundra



Methane and CO₂ release from tundra varies with water table and permafrost depth

Seasonality/Phenology

Caribou still
calve at the
same time



2001



But the plant
season has
changed

2009



May

June

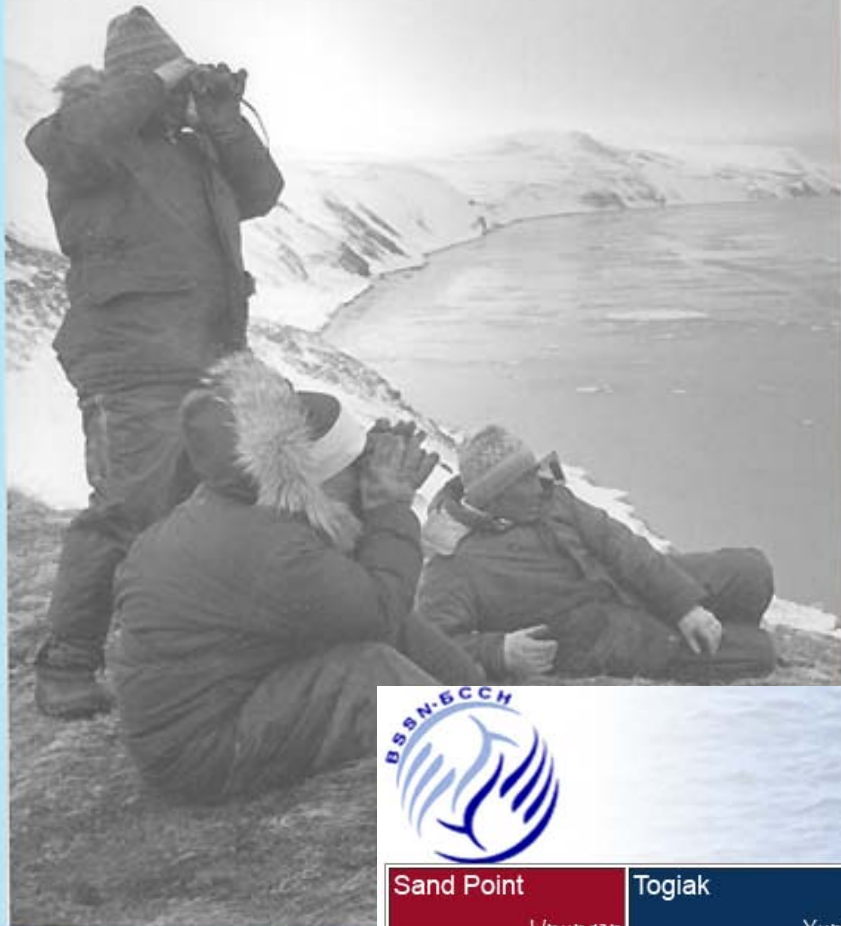
July

August

September

The Earth is Faster Now:

Indigenous Observations of Arctic Environmental Change



Northern communities observe their environment is less predictable than in the past

The Arctic Observing Network includes a community based observing network in the Bering Sea



BERING SEA SUB NETWORK

Sharing knowledge - improving understanding

Coastal communities of the Bering Sea observing their environment

| | | | | | |
|-----------------------|-----------------|------------------|----------------------|---------------------------|-----------------------|
| Sand Point Unungan | Togiak Yupik | Tymlat Koryak | Kanchalan Chukchi | Gambell Siberian Yupik | Nikolskoye Unungas |
|-----------------------|-----------------|------------------|----------------------|---------------------------|-----------------------|

Lake El'gygytyn, Russia



3.6 M year climate record
~400m of sediment core
recovered in 2009



Russia, Germany and the U.S.



Processes Affecting the Greenland Ice Sheet

Home » Live from the Poles » Expedition 4 » Greenland in Depth » Greenland meltwater animation

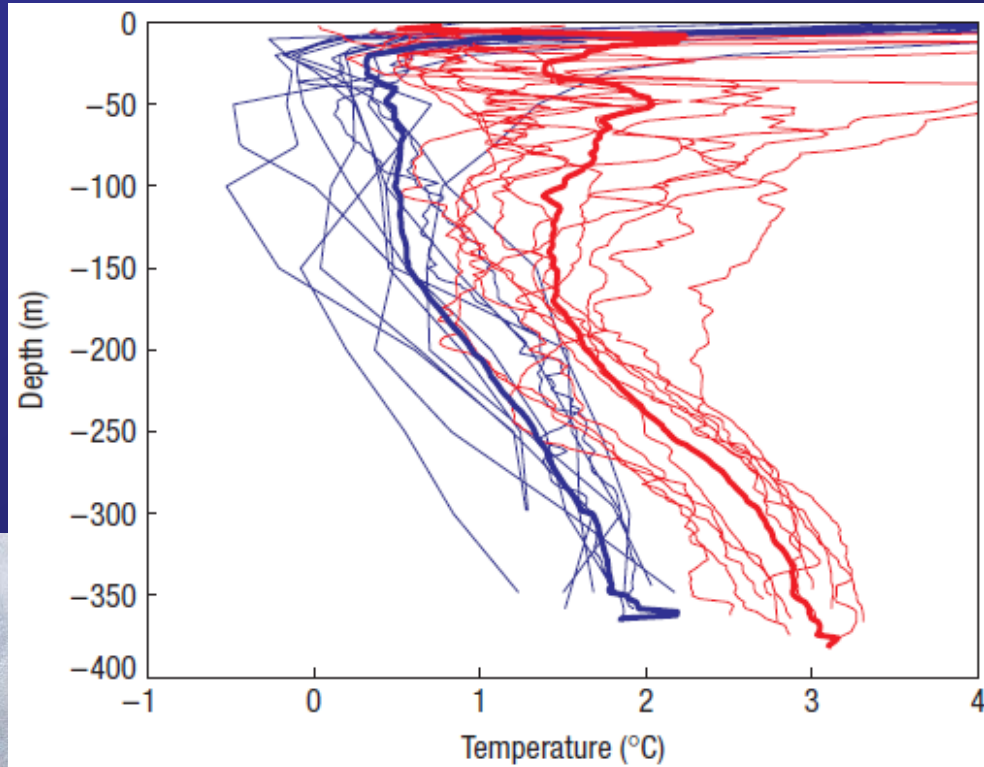
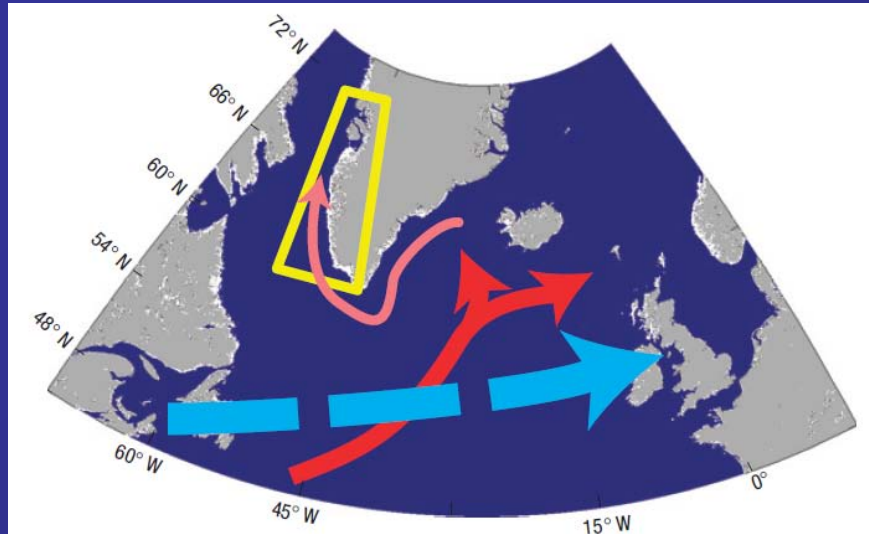
Beneath Greenland's glaciers, a huge, flowing plumbing system



Meltwater lakes pool on Greenland's ice sheet each spring and summer, then flow through cracks to bedrock, and out to the ocean. A look under the ice shows how this meltwater forms and flows, and may possibly raise global sea levels.

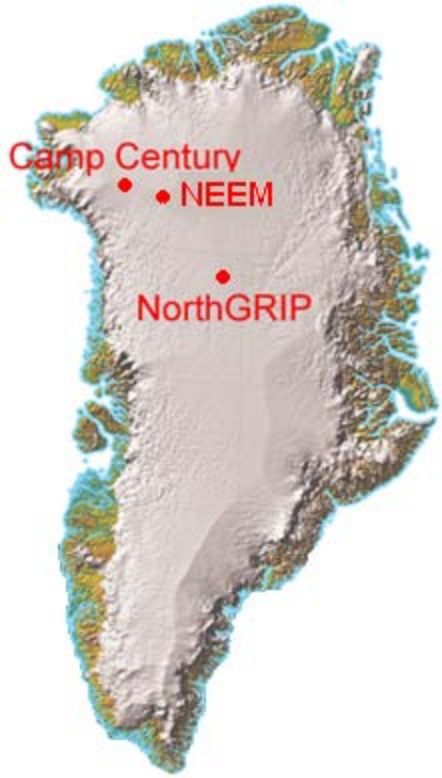
Polar Discovery, Chris Linder, Woods Hole Oceanographic Institute

Jakobshavn Glacier



Blue: 1957, 1980-1990
Red: 1997-2007 missing 2006

NEEM Ice Core, Greenland



Sampling from a warm period 130,000-115,000 years ago



Partners



Science Education and Outreach



Science In Education Week, Greenland

Students, educators, and representatives from Greenland, Denmark and the U.S. travel to research sites in Greenland for hands-on experience and to share cultures



Engaging students and the public in science is a high priority for U.S. agencies.



Research Initiatives and Synthesis

International Polar Year 2007-2009

IPY and Related Conferences

State of the Arctic, 16-19 March 2010 - Miami, Florida

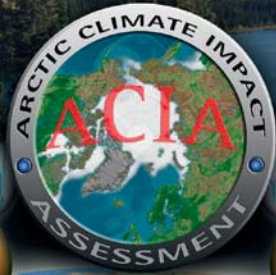
Polar Science Conference, 8-12 June 2010 - Oslo, Norway

Scientific Committee on Antarctic Research,
3-6 August 2010 – Buenos Aires, Argentina

IPY Conference, 2012 – Canada



ARCTIC CLIMATE IMPACT ASSESSMENT



Data are synthesized in reports prepared by bodies of scientists, policy makers, government and non-governmental organizations

 National Science Foundation
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Climate Change

Our planet's climate affects—and is affected by—the sky, land, ice, sea, life, and people found on it. To understand the entire story of climate change—what we know, what we still have to learn, and what humankind can do to prepare for the future—we must study all of the natural and human systems that contribute to and interact with Earth's climate system.

“Climate change is the most important puzzle humankind has attempted to solve”

[Climate Change Report PDF](#)

INTRO SKY SEA ICE LAND LIFE PEOPLE

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CLIMATE CHANGE 2007

THE PHYSICAL SCIENCE BASIS

Working Group I Contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change

Climate Change and the Arctic Cryosphere:

Snow
Water
Ice and
Permafrost in the Arctic

SWIPA: An Arctic Council Project coordinated by AMAP • IASC • WCRP/CIC • IPY • IASSA

Intersection of Science and Policy

Basing Actions on Sound Science

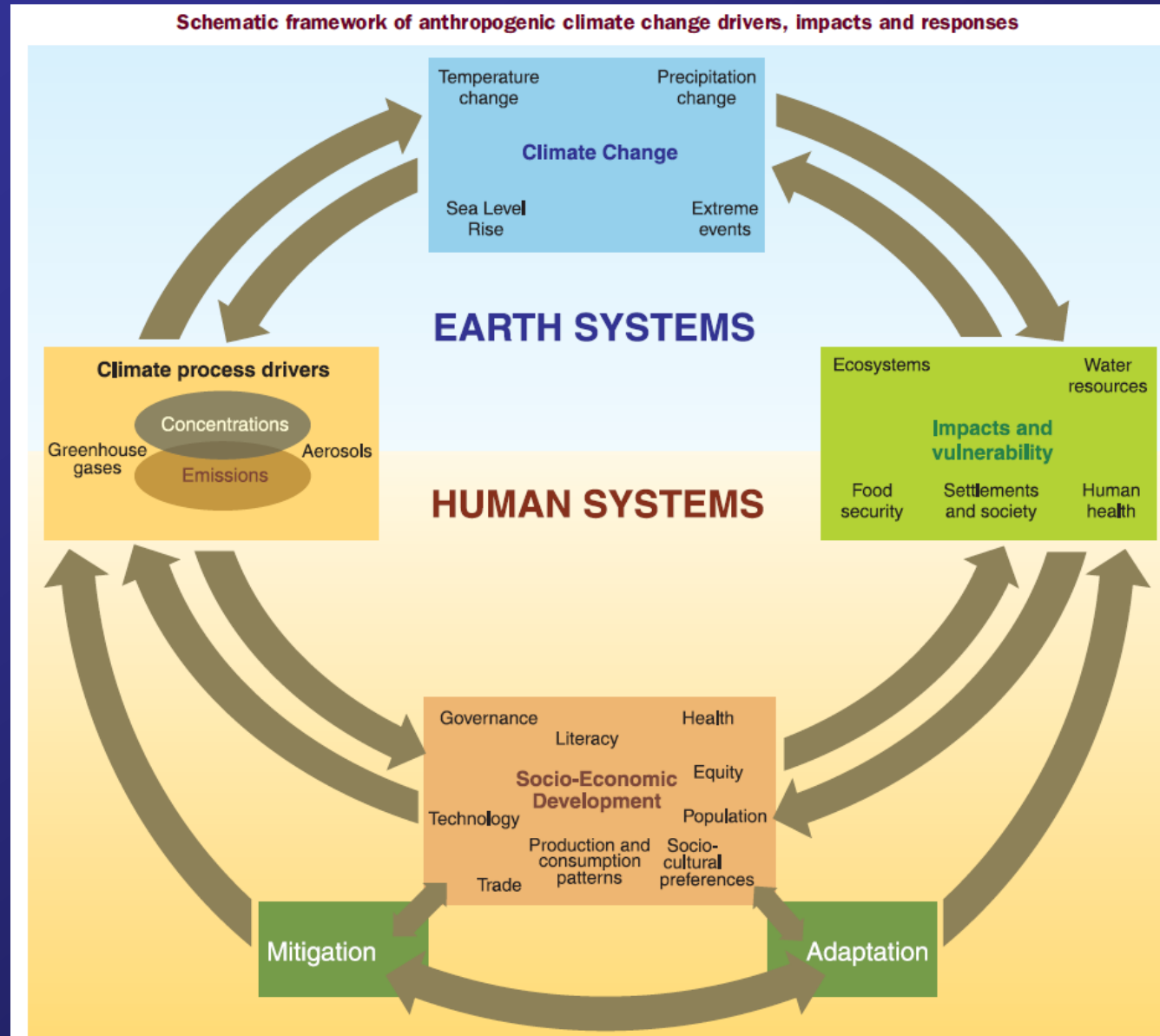


Figure I.1. Schematic framework representing anthropogenic drivers, impacts of and responses to climate change, and their linkages.

Additional Resources

Arctic Climate Impact Assessment

<http://www.acia.uaf.edu/>

Arctic Observing Network

<http://www.arcus.org/search/aon.html>

Bering Sea Sub-Network

<http://www.bssn.net>

International Polar Year

<http://ipy.gov>

International Study of Arctic Change

<http://www.arcticchange.org/>

Polar Bears

<http://www.uwyo.edu/polarbear/>

PoleNet

<http://www.polenet.org/>

State of the Arctic

<http://soa.arcus.org/>

Study of Environmental Arctic Change

<http://www.arcus.org/search>

Education and Outreach

ANDRILL

<http://www.andrill.org/>

Arctic Observing Network

<http://www.arcus.org/search/aon.html>

Barrenlands Traverse

<http://www.barrenlands.org/MainPage.html>

Bering Ecosystem Study (BEST)

<http://bsierp.nprb.org/>

Beneath Arctic Seas

<http://www.norbertwu.com/index.html>

Beyond Penguins and Polar Bears

<http://beyondpenguins.nsd.org/>

Encounters: Raven Radio

<http://www.ravenradio.org/>

Ice Planet Earth

<http://iceplanetearth.org/about.shtml>

Ice Stories

<http://www.exploratorium.edu/poles/>

Jakobsavn Glacier studies by David Holland

<http://efdl.cims.nyu.edu/>

Journalist Fellowships for Hands-on Science

<http://www.mbl.edu/sjp/index.html>

Penguin Science

<http://www.penguinscience.com/>

Polar Connections

<http://k12s.phast.umass.edu/stem/>

Polar Discovery

<http://polardiscovery.whoi.edu/live.html>

Polar TREC

www.polartrec.com

Polaris Project

<http://www.thepolarisproject.org/>

PolarPalooza

<http://passporttoknowledge.com/polar-palooza/>

Pole to Pole: Soundprint

<http://soundprint.org/>

Research Opportunities in Antarctica for Minorities (ROAM)

<http://sel.utep.edu/IPY-ROAM/index.html>

Student Polar Research and Teacher Training

<http://www.us-satellite.net/>

Teacher's Domain

www.teachersdomain.org

What is Climate Change to You?

<http://www.polarhusky.com/>

Zero Emissions Snowmobile Competition

<http://www.mtukrc.org/snowmobile.htm>