IPY/NSTA Web Seminar:
The Role of Polar Regions in Earth’s Changing Climate System

Tuesday, November 27, 2007
6:30 p.m. - 8:00 p.m. Eastern time
Agenda:

1. Introductions
2. Tech-help info
3. Web Seminar tools
4. Presentation
5. Evaluation
6. Chat with the presenter
Supporting the Presenting Team are…

For additional Tech-help call:
Elluminate Support,
1-866-388-8674 (Option 2)
We would like to know more about you…
How many web seminars have you attended?

A. 1-3
B. 4-5
C. More than 5
D. More than 10
E. This is my first web seminar

Use the letters A-E located at the top left of your actual screen to answer the poll.
Where are you now?

Note:
Alaska & Hawaii
Not to scale
www.50states.com
What grade level do you teach?

A. Elementary School, K-5.
B. Middle School, 6-8.
C. High School, 9-12.
D. I teach undergrad and/or grad students.
E. I am an Informal Educator.
IPY/NSTA Web Seminar:
The Role of Polar Regions in Earth’s Changing Climate System

Tuesday, November 27, 2007
NSTA Web Seminar (Nov. 27, 2007): Polar Climates, How are they Changing?

Douglas “Dr. Doug” Williams in the Russian Arctic
Do any of you include the “poles” in your curriculum?

A. In the past
B. Currently
C. Plan to in the future
How the Climate System is changing

How the Arctic is responding

How the Antarctic is responding

Teaching Opportunities
Why Focus on the Polar Regions?

- Critical linkages to the Earth’s Climate System
- Relevance to Society
- Interdisciplinary content spans broad spectrum of the geosciences
- Opportunities for authentic inquiry-based learning
- Opportunities to engage students in research-driven learning in an interdisciplinary context

Polar bears on melting ice berg in Beaufort Sea, 2004
Courtesy Environment Canada

Modified from Dr. Roberta Johnson, UCAR Windows to the Universe
In a warming world, spatial differences are evident

Mean Surface Temperature Anomalies (°C) 2001-2005

Base Period=1951-1980   Global Mean=0.53°C

Modified from Dr. Roberta Johnson, UCAR Windows to the Universe

NASA
Arctic air temperatures have been increasing.
Associated with warm temperatures after 1950, reduced tree growth was most common in the warmer and drier sites of Alaska, perhaps due to drought-stress accompanying increased warming in the boreal forest.
Given your knowledge of the seasonal differences between the No. and So. Hemispheres, place a stamp on the sea ice conditions when winter is occurring in both hemispheres.
Given your knowledge of the seasonal differences between the No. and So. Hemispheres, place a stamp on the sea ice conditions when winter is occurring in both hemispheres.
Minimum Arctic Sea Ice

Use your (red) drawing tool to outline the area of sea ice missing in 2007 as compared to 1979.

NASA Goddard Space Flight Center
Winter Growth Season: Arctic Sea Ice Extent

(Area of ocean with at least 15% sea ice)

From NSIDC.org
Sea Ice Decline Intensifies: September (minimum) trend, 1978-2007

Why is this important? Are you familiar with the term *albedo*?
In your own words, define the term *albedo*.

<p>| | |</p>
<table>
<thead>
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<td>3</td>
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What IF… The Arctic were Ice-free?

Surface without snow or ice absorbs more heat

Surface with snow and ice reflects more heat
What computer models indicate...

What do you think will be some of the consequences of this scenario?
The seasonal melting of the Greenland Ice Sheet has increased on average by 16% from 1979 to 2002.
The seasonal melting of the Greenland Ice Sheet has increased on average by 16% from 1979 to 2002.

The September trend for sea ice from 1979 to 2005 is now showing a decline of more than 8 percent per decade.

In what way do the effects of disappearing sea ice and melting Greenland ice differ?

| Greenland melting raises global sea level | Sea ice disappearing raises global sea level | Greenland melting cools global air temps. | Sea ice disappearing cools global air temps. |
Glaciers **worldwide** have been shrinking
Faraway Consequences: Increased coastal erosion
Permafrost in the Arctic is melting, leading to infrastructure damage and economic costs as well as disrupting subsistence lifestyles.

Source: Romanovsky, in Impacts of global climate change in the Arctic regions, IASC, Tromsø, April 1999.

Courtesy of Dr. Roberta Johnson, UCAR Windows to the Universe
Overall trends

Glacier-front trends on the Antarctic Peninsula over the last 50 years

Alison Cook, British Antarctic Survey
Winter sea ice around Antarctica hits record high in Sept. 2007, compared to average Sept. maximum

(from National Snow and Ice Data Center (NSIDC))
- Air temperatures are increasing
- Snow cover is declining
- Sea ice is decreasing, thinning
- Soil temperatures increasing
- Permafrost melting
- Glaciers receding
- Coastal erosion increasing
- Freshwater input increasing
- Temperate species are invading
### Teaching Opportunities & IPY

#### Place a stamp where you see potential

<table>
<thead>
<tr>
<th>Unifying Concepts and Processes</th>
<th>Science as Inquiry</th>
<th>Physical Science</th>
<th>Life Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Systems, order, and organization</td>
<td>• Abilities necessary to do scientific inquiry</td>
<td>• Properties and changes of properties in matter</td>
<td>• Populations and ecosystems</td>
</tr>
<tr>
<td>• Evidence, models, and explanation</td>
<td>• Understandings about scientific inquiry</td>
<td>• Motions and forces</td>
<td>• Diversity and adaptations of organisms</td>
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<tr>
<td>• Change, constancy, and measurement</td>
<td>• Evolution and equilibrium</td>
<td>• Transfer of energy</td>
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<tr>
<th>Earth and Space Science</th>
<th>Science and Technology</th>
<th>Science in Personal and Social Perspectives</th>
<th>History and Nature of Science</th>
</tr>
</thead>
<tbody>
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<td>• Structure of the Earth system</td>
<td>• Understandings about science and technology</td>
<td>• Populations, resources, and environments</td>
<td>• Science as a human endeavor</td>
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<tr>
<td>• Earth’s history</td>
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<td>• Natural hazards</td>
<td>• Nature of science</td>
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<tr>
<td>• Earth in the solar system</td>
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<td>• Risks and benefits</td>
<td>• History of science</td>
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<tr>
<td></td>
<td></td>
<td>• Science and technology in society</td>
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</tr>
</tbody>
</table>

### NSES Content Standards Grades 5-8

Courtesy of Dr. Roberta Johnson, UCAR Windows to the Universe
Some Great Websites on Climate

- Intergovernmental Panel on Climate Change (IPCC) - http://www.ipcc.ch/index.html
- US Global Change Research Program (lots of good stuff) - http://www.usgcrp.gov/usgcrp/default.htm
- World Health Organization (WHO) - http://www.who.int/peh/climate/climate_and_health.htm
- US Environmental Protection Agency (EPA) – http://yosemite.epa.gov/oar/globalwarming.nsf/content/Climate.html
- National Snow and Ice Data Center (great cryosphere data) - http://nsidc.org/noaa/
- National Center for Atmospheric Research Climate and Global Dynamics - http://www.cgd.ucar.edu/
- Climate HotSpots Map (AMAZING!) - http://www.climatehotmap.org/index.html
- World View of Global Warming (photos) - http://www.worldviewofglobalwarming.org/
- Global Environmental Change and Our Health - http://www.pbs.org/journeytoplanetearth/johnshopkins/index.htm
- NCAR Education and Outreach Website – www.ncar.ucar.edu/eo

Courtesy of Dr. Roberta Johnson, UCAR Windows to the Universe
Thank You

NSF, NOAA, and NASA

http://www.ipy.org
http://www.elluminate.com
Welcome to The NSTA Learning Center

Get the Help, When You Need It

NSTA developed the Learning Center as a professional development website to help address your classroom needs and busy schedule. Using this site, you can gain access to more than 1,200 different resources and opportunities, such as:

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- FREE weekly live Web Seminars where you can interact with experts from NASA, NOAA, FDA, NSF, and the NSDL Community.
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Gerry Wheeler, Executive Director
Frank Owens, Associate Executive Director
Conferences and Programs
Al Byers, Assistant Executive Director e-Learning

NSTA Web Seminars
Flavio Mendez, Director
Jeff Layman, Technical Coordinator
• **NASA JPL: Robotics Engineering: Big Toys, Big Fun**

   November 29, 2007

• **FDA: Outbreak Investigations**

   December 4, 2007

http://learningcenter.nsta.org
Web Seminar Evaluation:

Click on the URL located on the Direct Messaging Window