IPY/NSTA Web Seminar:

Polar Science, Global Discoveries: IPY Research Update for Teachers

Dr. Mary Albert

Thursday, May 22, 2008
Overview

- Is polar science relevant to world peace?
- How is the atmosphere involved in current climate change?
- How do we know about ancient atmospheres?
- What are some discoveries from the International Polar Year so far?
- How can teachers become involved in IPY?
Climate science and the 2007 Nobel Peace prize

The Intergovernmental Panel on Climate Change (IPCC) and Albert Arnold (Al) Gore Jr. were awarded the Nobel Peace Prize "for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change".
Climate science and the Nobel Peace Prize 2007

The Nobel Peace Prize has been given for advocacy of human rights, mediation of international conflicts, and arms control, -- and now climate science!

What does climate have to do with world peace?
What does climate have to do with world peace?

<table>
<thead>
<tr>
<th>Climate affects agriculture</th>
<th>Climate affects fisheries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate affects access to natural resources</td>
<td>Climate affects transportation</td>
</tr>
<tr>
<td>Climate affects the economy</td>
<td>World peace depends on stability, and changes in climate may create conflict in some areas</td>
</tr>
</tbody>
</table>
“The IPCC was established to provide …

...an objective source of information ...

... Its role is to assess on a comprehensive, objective, open and transparent basis the latest scientific, technical and socio-economic literature...

...IPCC reports should be neutral with respect to policy,...

...high scientific and technical standards, and aim to reflect a range of views, expertise and wide geographical coverage.”
The best summary about current climate change

www.ipcc.ch
Global warming is definitely occurring, and humans are likely to be contributors.

September 1980

September 2007

Read more - IPCC Working Group I Report “The Physical Science Basis”

www.ipcc.ch
The impacts of climate change will affect you, either directly or indirectly.

Read more about it - in the IPCC Working Group II Report "Impacts, Adaptation, and Vulnerability"

www.ipcc.ch
You can help mitigate climate change

- Energy
- Transportation
- Buildings
- Waste management
- Sustainability

Read about these and more - in the IPCC Working Group III Report “Mitigation of Climate Change”

www.ipcc.ch
Let’s Pause for Two Questions from the Audience
How is the atmosphere involved in current climate change?
The addition of greenhouse gases like CO$_2$ and CH$_4$ to the atmosphere increases the greenhouse effect, warming the earth more and more. This is changing our climate now.
Measurements of atmospheric CO$_2$ in Hawaii and elsewhere show currently increasing trends in atmospheric CO$_2$. 
For many hundreds of thousands of years, temperature and greenhouse gases have been closely linked. Long-term evidence of CO$_2$ and methane from ice cores are much lower than the present.
Where can we find ancient air?

Measurements…

<table>
<thead>
<tr>
<th>…in deep valleys</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>…in the upper atmosphere</td>
<td></td>
</tr>
<tr>
<td>…of tree rings</td>
<td></td>
</tr>
<tr>
<td>…in ocean sediments</td>
<td></td>
</tr>
<tr>
<td>…in ice cores</td>
<td></td>
</tr>
</tbody>
</table>
Precipitation

Surface snow (top ~ 0-1 m)

Firn

Ice with bubbles (~80-120 m & deeper)

Bedrock (~3000+ m)

Albert for NSTA 2008
Old air exists in the pore space of polar ice:

Air in the pore space in firn, and in bubbles in the ice, hold gases. We can measure the composition to find evidence about past atmospheric composition, for example greenhouse gases like carbon dioxide and methane.
Evidence from the polar ice cores allow us to think about current climate in the context of the past.
IPY: the atmosphere


An international effort to investigate atmospheric pollution and climate in the Arctic. The Arctic is a natural laboratory for investigating atmospheric processes.

www.polarcat.no
Let’s Pause for Two Questions from the Audience
What are some discoveries from IPY so far?
The largest extent of melt recorded in the 28 years of satellite measurements of Greenland occurred in 2007, due to global warming.

Steffen, 2007
Polar bear is listed as threatened species

By Kenneth R. Weiss, Los Angeles Times Staff Writer
May 15, 2008
The Interior Department on Wednesday designated the polar bear as threatened with extinction because of shrinking sea ice, making it the first creature added to the endangered species list primarily because of global warming.

The designation under the Endangered Species Act requires the agency to identify critical habitat to be protected and to form a strategy to assist the bear population's recovery.

But the department also issued special rules designed to exempt from the law offshore oil and gas drilling in prime polar bear habitat off Alaska's north coast.
Lakes of melt water can crack Greenland’s ice and contribute to faster ice sheet flow.

www.whoi.edu
Human impact: Industrial pollution from burning coal caused a seven-fold increase in black carbon (soot) in Arctic snow between 1850 & 1910. Soot reduces reflectivity (albedo), allowing snow to absorb more energy from the sun.

But human actions can also improve the environment.

Ice cores from Greenland contain evidence that the clean air act helped to reduce human-caused atmospheric lead pollution.

McConnell et al., 2002.
Let’s Pause for Two Questions from the Audience
Some sites that include teacher involvement in the IPY
How is East Antarctica, the sleeping giant of ice sheets, reacting to global change?

http://traverse.npolar.no

Albert for NSTA
Join in!
Activities for teachers and learners will be on the website:
http://traverse.npolar.no
The return traverse is Nov 2008 thru Feb 2009.
Let us know how YOU want to be involved!

Landsat Image Mosaic of Antarctica (LIMA) – a tool for studying Antarctica. True-color high-resolution satellite view of the continent enabling everyone to view Antarctica as it appears in real life.

NASA LIMA website: http://lima.nasa.gov/

Access LIMA at: http://lima.usgs.gov/
IPY: new infrastructure
Center for Remote Sensing of Ice Sheets

To Understand and Predict the Role of Polar Ice Sheets in Sea Level Change

https://www.cresis.ku.edu/education/
IPY: sites for teachers

- www.ipy.gov – the site for US involvement in IPY, includes lists of explore & learn sites
- www.ipy.org – the international IPY site, includes page for educators
- www.polartrec.org – U.S. teachers go to the field for IPY science
- http://passporttoknowledge.com/polar-palooza/ - podcasts, tours, educator’s corner, ..
- NOAA: www.climate.noaa.gov/education
Teachers, what are your ideas for becoming involved in the IPY?

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Thank you

Thank you to the National Science Foundation for inviting me to speak.

Thank YOU, teachers, for using evidence-based science for teaching the scientists and engineers of tomorrow!
Thanks to our presenter, Dr. Mary Albert and to the NSF, NOAA, and NASA for sponsoring this program
Welcome to Your Professional Development

The Learning Center is NSTA’s e-professional development portal to help you address your classroom needs and busy schedule. You can gain access to more than 2,600 different resources that cater to your preference for learning. Over 700 hundred resources, such as journal articles, science objects and web seminars are available for free. A suite of practical tools such as My Library, My Transcript, and My Professional Development Plan and Portfolio tool help you organize, personalize, and document your growth over time.

http://learningcenter.nsta.org
National Science Teachers Association
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

LIVE INTERACTIVE LEARNING @ YOUR DESKTOP