IPY/NSTA Symposium: The Role of Polar Regions in Earth's Changing Climate System
Friday, November 9, 2007

1:30 PM – 1:55 PM
Welcome, Introductions, Goals for the Symposium

Al Byers, Assistant Executive Director of Government Partnerships and e-Learning, NSTA
Flavio Mendez, Symposia and Web Seminars Director, NSTA
- About NSTA Symposia
- Agenda/Goals/Forms/Logistics/Introductions

Dr. Taneil Uttal, Scientist, Earth Sciences Research Laboratory, NOAA
Dr. Todd Hinkley, Laboratory Manager, National Ice Core Laboratory
Jane Beitler, Science Communications Manager, National Snow and Ice Data Center
Dr. Doug Williams, Carolina Trustee Professor of Marine and Geological Sciences, USC-Columbia
Frank Niepold, Climate Education Coordinator, NOAA Climate Program Office

1:55 PM – 2:10 PM
Not as Cool as They Used to Be: Where are the Poles, What is Happening There, Why Do We Care?

Jane Beitler

Learning Outcomes:

After participating in the presentation,
- Participants will list three differences between Antarctica and the Arctic.
- Participants will list some of the extreme changes being observed at the poles.
- Participants will describe one example of how polar climate might affect the climate where they live.

2:10 PM – 2:45 PM
Ice Cores: Our Guide to Earth's Climate History Over the Past Million Years

Dr. Todd Hinkley

Learning Outcomes:

After participating in the presentation,
- Participants will list several kinds of evidence that ice cores give about the Earth's climate over the past million years.
- Participants will explain why ice cores are one of the best tools available to study the climate.

2:45 PM – 3:40 PM
Activity 1: The Dynamics of Climate from Ice Core Records

Dr. Doug Williams and Dr. Todd Hinkley

Learning Outcomes:

After participating in the activity,
- Participants will describe the physical structures in short segments of ice cores.
- Participants will graphically display data derived from ice cores (i.e., temperature, concentration of CO2 and methane (CH4), and dust (calcium).
- Participants will construct (describe) a realistic interpretation of data derived from ice cores using their short ice core segments as a model.

3:40 PM – 3:55 PM
Break

3:55 PM – 4:30 PM
Arctic Clouds: A Missing Puzzle Piece

Dr. Taneil Uttal

Learning Outcomes:

After participating in the presentation,

- Participants will describe the different effects that clouds, aerosols and gases have on climate change.
- Participants will state the ways that in the Arctic, these effects might be different, even opposite to the way they work in the rest on the rest of the planet.
- Participants will list several effects that the Arctic atmosphere has on the Earth, as seen in the changes we observe.

4:30 PM – 5:25 PM
Activity 2: Arctic Cloud Activity

Jane Beitler and Dr. Taneil Uttal

Learning Outcomes:

After participating in the activity,

- Participants will do a physical demonstration of how a cloud can warm OR cool the Earth.
- Participants will explain how clouds in Polar Regions affect the Earth differently than clouds on the rest of the planet.
- Participants will describe if the "Arctic Cloud Effect" is likely to become stronger or weaker in a warming climate scenario.

5:25 PM – 5:40 PM
Reflections and the International Polar Year

Frank Niepold

Learning Outcome:

After participating in the presentation,

- Participants will explain the links the Arctic and Antarctic regions have with the rest of the globe.
- Participants will describe how IPY 2007–2008 also aims to educate and involve the public, and to help train the next generation of engineers, scientists and leaders.
- Participants will summarize the 125-year history of internationally coordinated study of Polar Regions starting with the first IPY back in 1882–1883.

5:40 PM – 6:00 PM
Final Words

- Post-assessment form
- Evaluation form/Survey/Credit info/Online Follow-up
- Drawing of door prizes

National Science Education Standards Addressed:
Content Standards, 5-8

Content Standard A:
Abilities Necessary to do Scientific Inquiry

- Develop descriptions, explanations, predictions and models using evidence.
- Think critically and logically to make the relationships between evidence and explanations.
- Recognize and analyze alternative explanations and predictions.

Understanding about Scientific Inquiry

- Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve seeking more information; some involve discovery of new objects and phenomena; and some involve making models.
- Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.
- Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. The scientific community accepts and uses such explanations until displaced by better scientific ones. When such displacement occurs, science advances.
- Science advances through legitimate skepticism. Asking questions and querying other scientists' explanations is part of scientific inquiry. Scientists evaluate the explanations proposed by other scientists by examining evidence, comparing evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations.

Content Standard B:
Physical Science
As a result of their activities in grades 5-8, all students should develop an understanding of

- Transfer of Energy
  - The Sun is a major source of energy for changes on the Earth's surface. The Sun loses energy by emitting light. A tiny fraction of that light reaches the Earth, transferring energy from the Sun to the Earth. The Sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation.

Content Standard D:
Earth and Space Science
As a result of their activities in grades 5-8, all students should develop understanding of

- Structure of the Earth System
  - Clouds, formed by the condensation of water vapor, affect weather and climate.
  - Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.
  - Living organisms have played many roles in the earth system, including affecting the composition of the atmosphere, producing some types of rocks, and contributing to the weathering of rocks.

Content Standard E:
Science and Technology
As a result of activities in grades 5-8, all students should develop

- Understandings about science and technology
  - Science and technology are reciprocal. Science helps drive technology, as it addresses questions that demand more sophisticated instruments and provides principles for better instrumentation and technique. Technology is essential to science, because it provides instruments and techniques that enable observations of objects and phenomena that are otherwise unobservable due to factors such as quantity, distance, location, size, and speed. Technology also provides tools for investigations, inquiry, and analysis.

Content Standard F:
Science in Personal and Social Perspectives
As a result of their activities in grades 5-8, all students should develop understanding of

- Populations, Resources, and Environments
  - Causes of environmental degradation and resource depletion vary from region to region and from country to country.
- Natural Hazards
  - Internal and external processes of the earth system cause natural hazards, events that change or destroy human and wildlife habitats, damage property, and harm or kill humans. Natural hazards include earthquakes, landslides, wildfires, volcanic eruptions, floods, storms, and even possible impacts of asteroids.
  - Human activities also can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal. Such activities can accelerate many natural changes.
- Risks and Benefits
  - Students should understand the risks associated with natural hazards (fires, floods, tornadoes, hurricanes, earthquakes, and volcanic eruptions), with chemical hazards (pollutants in air, water, soil, and food), with biological hazards (pollen, viruses, bacterial, and parasites), social hazards (occupational safety and transportation), and with personal hazards (smoking, dieting, and drinking).
  - Important personal and social decisions are made based on perceptions of benefits and risks.

Content Standard G:
History and Nature of Science
As a result of their activities in grades 5-8, all students should develop understanding of

- Science as a human endeavor
  - Women and men of various social and ethnic backgrounds--and with diverse interests, talents, qualities, and motivations--engage in the activities of science, engineering, and related fields such as the health professions. Some scientists work in teams, and some work alone, but all communicate extensively with others.
- Nature of science
  - In areas where active research is being pursued and in which there is not a great deal of experimental or observational evidence and understanding, it is normal for scientists to differ with one another about the interpretation of the evidence or theory being considered. Different scientists might publish conflicting experimental results or might draw different

conclusions from the same data. Ideally, scientists acknowledge such conflict and work towards finding evidence that will resolve their disagreement.

National Science Education Standards Addressed:
Professional Development Standards

Professional Development Standard B:
Professional development for teachers of science requires integrating knowledge of science, learning, pedagogy, and students; it also requires applying that knowledge to science teaching. Learning experiences for teachers of science must:

- Connect and integrate all pertinent aspects of science and science education.
- Address teachers' needs as learners and build on their current knowledge of science content, teaching, and learning.
- Use inquiry, reflection, interpretation of research, modeling and guided practice to build understanding and skill in science teaching.

Professional Development Standard D:
Professional development programs for teachers of science must be coherent and integrated. Quality pre-service and in-service programs are characterized by:

- Clear, shared goals based on a vision of science learning, teaching, and teacher development congruent with the NSES.
- Collaboration among the people involved in programs, including teachers, teacher educators, teacher unions, scientists, administrators, policy makers, member of professional and scientific organizations, parents, and business people, with clear respect for the perspectives and expertise of each.
- Recognition of the history, culture, and organization of the school environment.