



NOAA/NSTA Symposium: The Ocean's Role in Weather and Climate Thursday, November 2, 2006

8:00 AM – 8:25 AM

Welcome, Introductions, Goals for the Symposium

Al Byers, Assistant Executive Director of Government Partnerships and e-Learning, NSTA

Flavio Mendez, Symposia and Web Seminars Program Manager, NSTA

- About NSTA Symposia
- Agenda/Goals
- Forms/Logistics/Introductions

Dr. Mike J. McPhaden, Tropical Atmosphere Ocean Array Project Office Director, National Oceanic and Atmospheric Administration

Scott Kiser, Tropical Cyclone Program Manager, National Weather Service, National Oceanic and Atmospheric Administration

Sarah Schoedinger, Program Officer, NOAA Office of Education, National Oceanic and Atmospheric Administration

Frank Niepold, Climate Education Fellow, NOAA Climate Program Office, National Oceanic and Atmospheric Administration

Judy Reeves, Einstein Fellow, National Oceanic and Atmospheric Administration

Joseph Shewmaker, Einstein Fellow, National Oceanic and Atmospheric Administration

8:25 AM – 8:45 AM

Overview of the Symposium

Sarah Schoedinger, NOAA

Learning Outcome:

After participating in the presentation,

- Participants will identify ways that NOAA pursues its mission.

8:45 AM – 9:20 AM

The Ocean's Role in Weather and Climate: Hurricane Formation, Prediction and Impacts

Scott Kiser, National Weather Service

Learning Outcomes:

After participating in the presentation,

- Participants will list the significant historical advances in hurricane forecasting and monitoring.
- Participants will state the atmospheric conditions which affect the movement of hurricanes.
- Participants will list atmospheric and oceanic conditions which cause hurricanes to strengthen or decay.
- Participants will list hurricane threats.
- Participants will name the primary factors which climatologists use to predict seasonal hurricane activity.



9:20 AM – 10:20 AM

Activity 1: Storm Surge

Judy Reeves, Joseph Shewmaker, NOAA, and Scott Kiser, National Weather Service

Learning Outcomes:

After participating in the activity,

- Participants will define storm surge.
- Participants will predict the effects of hurricane storm surge on coastal areas.
- Participants will determine the distance inland that the storm surge will reach.
- Participants will list the various factors which determine storm surge.

10:20 AM – 10:35 AM

Break

10:35 AM – 11:10 AM

El Niño and La Niña: Causes and Global Consequences

Dr. Mike McPhaden, NOAA

Learning Outcomes:

After participating in the presentation,

- Participants will identify the impacts of El Niño on human health, ecosystems, and socio-economic conditions.
- Participants will identify methods used to monitor and predict El Niño.
- Participants will analyze different sources of evidence regarding the possible link between global warming and El Niño.

11:10 AM – 12:10 AM

Activity 2: El Niño! La Niña!

Frank Niepold and Dr. Mike McPhaden, NOAA

Learning Outcomes:

After participating in the activity,

- Participants will compare and contrast normal conditions with conditions found during El Niño years and La Niña Years.
- Participants will list ways in which El Niño and La Niña impact weather patterns both globally and on a local scale.

12:10 PM – 12:30 PM

Final Words

- Post-assessment form
- Evaluation form/Survey/Credit info
- NSTA Web Seminars
- Raffle 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 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.

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

- 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.

Content Standards, 9-12

**Content Standard A:
As a result of activities in grades 9-12, all students should develop
Understanding about Scientific Inquiry**

- Scientists usually inquire about how physical, living, or designed systems function. Conceptual principles and knowledge guide scientific inquiries. Historical and current scientific knowledge influence the design and interpretation of investigations and the evaluation of proposed explanations made by other scientists.

- Scientists rely on technology to enhance the gathering and manipulation of data. New techniques and tools provide new evidence to guide inquiry and new methods to gather data, thereby contributing to the advance of science. The accuracy and precision of the data, and therefore the quality of the exploration, depends on the technology used.

**Content Standard D:
 Earth and Space Science**

As a result of their activities in grades 9-12, all students should develop understanding of

- Energy in the Earth System
 - Heating of the earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents.
 - Global climate is determined by energy transfer from the sun at and near the earth's surface. This energy transfer is influenced by dynamic processes such as cloud cover and the earth's rotation, and static conditions such as the position of mountain ranges and oceans.

**Content Standard E:
 Science and Technology**

As a result of activities in grades 9-12, all students should develop

- Understandings about science and technology
 - Scientists in different disciplines ask different questions, use different methods of investigation, and accept different types of evidence to support their explanations. Many scientific investigations require the contributions of individuals from different disciplines, including engineering. New disciplines of science, such as geophysics and biochemistry often emerge at the interface of two older disciplines.
 - Science often advances with the introduction of new technologies. Solving technological problems often results in new scientific knowledge. New technologies often extend the current levels of scientific understanding and introduce new areas of research.

**Content Standard F:
 Science in Personal and Social Perspectives**

As a result of their activities in grades 9-12, all students should develop understanding of

- Natural and human-induced hazards
 - Human activities can enhance potential for hazards. Acquisition of resources, urban growth, and waste disposal can accelerate rates of natural change.
 - Some hazards, such as earthquakes, volcanic eruptions, and severe weather, are rapid and spectacular. But there are slow and progressive changes that also result in problems for individuals and societies. For example, change in stream channel position, erosion of bridge foundations, sedimentation in lakes and harbors, coastal erosions, and continuing erosion and wasting of soil and landscapes can all negatively affect society.

Ocean Literacy Standards:

3. The ocean is a major influence on weather and climate.

- a. The ocean controls weather and climate by dominating the Earth's energy, water and carbon systems.

- c. The El Niño Southern Oscillation causes important changes in global weather patterns because it changes the way heat is released to the atmosphere in the Pacific.

- f. The ocean has had, and will continue to have, a significant influence on climate change by absorbing, storing, and moving heat, carbon and water.

7. The ocean is largely unexplored.

- d. New technologies, sensors and tools are expanding our ability to explore the ocean. Ocean scientists are relying more and more on satellites, drifters, buoys, subsea observatories and unmanned submersibles.