



Climate Education Update

News from the ARM Program for students and teachers about climate change studies

SUMMER 2002

ARM Climate Change Workshops in the Pacific

Dr. Laura K. Marsh, ARM Science Programs Specialist

"I come from the coldest part of [Papua New Guinea] in Western Highlands Province. In the past, we did not have bananas, peanuts or corn growing. However, during the past 15 years, I've noticed these food crops...were growing. This indicates that the Earth's temperature is rising. Also some of our animals...used to stay in my village. Now, you'll hardly see any. They are leaving the area for colder places."

-Lawrence Mai, Miokep Village, Western Highlands Province, PNG

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Warmer or colder, wetter or drier, we all see differences in the daily weather, and, over time, we see the patterns emerge as climate. These topics were well discussed recently in a workshop series conducted in Port Moresby and Manus Island, Papua New Guinea (PNG), and the Republic of Nauru. I was accompanied by Dr. Than Aung and Dr. Chalapan Kaluwin in PNG and was briefly joined in Nauru by Dr. Aung. We covered many exciting topics and the teachers practiced activities that illustrate concepts in climate change, such as El Niño, clouds, solar radiation, ozone hole, sea level rise, greenhouse effect, microclimates, coral reefs, tsunamis, and human involvement.

Each workshop lasted from 3.5 to 5 days and had 38 to 41 teachers attend from the surrounding areas. On the last day of each workshop, the teachers were taken on a field trip. Teachers in Manus and Nauru were given tours of the ARM site, and teachers in Port Moresby were taken on a tour of the PNG National Weather Service (NWS) facility.

In Port Moresby, Wildlife Conservation Society (WCS) staff were invited as part of a newly forming collaboration with ARM Education. WCS has permanent staff in the region and they are interested in gaining expertise in climate change so that they can help promote ARM. A lesson on tree kangaroos was taught at the Port Moresby and Manus workshops in support of research conducted by both WCS and Dr. Dabek of the Roger Williams Park Zoo (RWPZ).



Manus teachers demonstrating the activity on evaporation.



Port Moresby teachers filling out workshop evaluations.

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The ARM Climate Change Kiosk – Community Meetings in Barrow, AK

Marja Springer, ARM Kiosk Development

Marja Springer, ARM Education Project, and Jeff Berger, Yaza Design, traveled to Barrow, Alaska in April 2002 to present the first design application for the Atmospheric Radiation Measurement (ARM) educational kiosk to the Barrow community. The kiosk, when completed, will be located at the Inupiat Heritage Center (IHC) in Barrow. ARM Education is working closely with the Director of the IHC, Ron Brower, as well as scientists from ARM, NOAA, NWS, teachers and students, and elders on the design of the kiosk material. The purpose of this trip was to gather information from the community on the first design application of the kiosk program.



Elders Molly and Noah Itta at the Elder Workshop.

A highlight of the trip to Barrow was meeting with Barrow elders Martha Aiken, Noah and Molly Itta, Jane Brower, Mary Lou Leavitt, and Julia Segevan. These elders had serious concerns about climate change affecting their environment and their native way of life. They worry about the impact climate change might have on their native food sources. Subsistence hunting has been affected by warmer weather. The bowhead whales, one of their major food sources, have been showing up in April, earlier than usual. They expressed particular concern about fossil fuel sources from other sources and areas impacting the Arctic.

ARM also met with several representatives of the North Slope Borough School District. They were impressed

with the kiosk and suggested we use video clips from all North Slope villages. It is important to use local community members in the video clips because people enjoy seeing familiar faces. They especially liked the content on erosion since it is a serious issue for villages on the North Slope, and they suggested we develop student learning packages that give content knowledge to link to skill building.

The kiosk application was shared with high school teachers Tim Buckley's and Leslie Boen's General Science classes at Barrow High School. Students were shown the kiosk application, and they were asked to fill out questionnaires and give suggestions at the end of the class time. The students were intrigued by the thunderstorms, and were impressed that the application would support both English and Inupiaq languages. The students also responded well to the graphics. They suggested longer video clips and more North Slope-related subjects as part of the application.



Barrow High School - Tim Buckley's General Science class evaluates kiosk application.

ARM Education also met with local scientists with the National Weather Service, NOAA, and the Barrow Arctic Science Consortium to get their input. All of these meetings provided valuable information on how the community views the progress of this kiosk and what direction ARM needs to take when finishing it.

Student Opportunities

A Student's Experience Working for the ARM Program

Shelby Winiacki

In the summer of 1999, I joined the Tropical Western Pacific (TWP) team at Los Alamos National Laboratory (LANL) as part of the Department of Energy's (DOE) Global Change Education Program (GCEP). I worked with Bill Porch, an Atmospheric Radiation Measurement (ARM) scientist. Working with Bill and other members of the TWP group opened my eyes to many intriguing aspects of atmospheric science.



Shelby Winiacki

I concentrated on the instrumentation that measures the amount of sunlight getting to the ground, specifically the Multi-Filter Rotating Shadowband Radiometer (MFRSR). I found that there are times when the tropical climate takes a toll on the equipment, causing it to shut down briefly which creates gaps in the data. My summer project was to determine the causes of these gaps by using a computer code that looked at gap lengths and times. Short gaps in the data may be due to a bird resting on the equipment. A longer gap may be an overnight storm that cut power to the MFRSR. This information helped us evaluate how to improve the monitoring of the instruments.

I worked a second summer for the ARM Program where I studied the Nauru Island cloud plumes. Winds



Nauru cloud plumes.

carry the air over the ocean waters and this air hits the area above the island. Something happens in the atmosphere which creates clouds that appear like a tail off the coast of the island. We looked to the datasets and tried to explain what is happening in the atmosphere to cause these cloud plumes. I checked wind speeds to see if these plumes occur on clear or cloudy days, and also looked at how much sunlight the instruments were recording. Days with high wind speeds and lots of sun were most likely to produce these cloud plumes, but not all the time. Further research is needed to explain this finding.

In August, the ARM Program sent me to Hawaii to meet with scientists from the U.S. and Japan. I presented what I discovered about the Nauru cloud plumes. This meeting was a great opportunity to share what I had learned and to consult with experienced scientists about the cause of these clouds. My summer experience was over before I knew it, but I hope to return to TWP soon to resume this study.



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An important part of the workshops was the valuable information we gained from our participants. We had the opportunity to discuss their knowledge of climate change impacts from their own experiences and from passed down stories. One of the goals of ARM Education is to incorporate local expertise into our

educational materials, so that traditional knowledge as well as current science is represented for students.

We can't thank everyone enough for all of the work and effort that went into these very successful workshops!



Activity ~ Making Clouds

A cloud is a collection of tiny water droplets or ice crystals that float in the air. Clouds are formed from water that has evaporated from oceans, lakes, rivers, or moist soil and plants. Clouds are an important part of earth's weather. They carry water that falls to the earth's surface as rain and snow. Moisture from clouds supports all forms of life. However, clouds can sometimes bring destruction in the form of hail or tornadoes.



Important Points to Understand

- Three things are necessary for cloud formation: cooling of air, water vapor and condensation nuclei.
- Water vapor must condense on something in order to form the droplets that compose clouds.
- Many things can serve as condensation nuclei. Some of the most common include dust, pollen, salt from ocean spray, and smoke.

Objective:

The objective of this activity is to investigate the conditions that must be present for clouds to form.

Materials:

1 liter (or larger) clear glass jar with lid. Large mouthed jars work best.
Ice cubes or crushed ice
Hot water (Be careful not to burn yourself.)
Matches
Can of aerosol spray (Air freshener is suggested)
Black construction paper
Safety goggles



Note: The teacher should perform these experiments as a demonstration in front of the class. Do not have students handle the matches and aerosol cans. Be very careful: Flames and aerosol cans are an explosive combination.

Procedure

1. Fill the jar with hot water.
2. Pour out most of the hot water, leaving about 2 cm of water in the bottom of the jar.
3. Hold the black paper upright or prop it up against some books behind the jar
4. Turn the lid of the jar upside down and fill it with ice. Now place the upside down lid on the jar.
5. Put on your safety goggles, strike a match, and drop the burning match into the jar. Cover the mouth of the jar immediately (with the ice-filled lid). Record your observations.
6. Pour out the water in the jar and repeat steps (1) and (2).
7. Spray a very small amount of the aerosol in the jar and immediately cover the mouth of the jar with the ice-filled lid.
8. Observe what happens in the jar for three minutes and record your observations.

Manus teacher demonstrating the "Making Clouds" activity.



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Questions

1. In these experiments, did a cloud form when you put the lid over the mouth of the jar?
2. Look up the word 'aerosol' in a dictionary and write the definition.
3. Based on the definition given in your answer to Question (2), would you classify smoke as an aerosol?
4. Based on your observations and your answers, what is the other condition besides moisture and cool air necessary for cloud formation?

For other classroom activities, check out the ARM webpage at
<http://www.arm.gov/docs/education/tlessons.html>



Critical Thinking Question

Why does it get cold when you climb to the top of a mountain or fly in an airplane?

Water vapor is more concentrated in air near the ground, and water vapor acts like a blanket that holds in heat from the earth. High in the atmosphere (above about 1 km), the water vapor decreases and the air gets cold. CO₂ acts like water vapor (H₂O) in warming the air, but the concentration of CO₂ is much lower than water vapor. Computer models that predict temperature increases of several degrees (due to activities by humans) include only a small warming directly from CO₂ (a few tenths of a degree). This small warming allows more water vapor to remain in the air, and the water vapor absorption causes most of the predicted warming.

(This Critical Thinking Question was contributed by Dr. Bill Porch)



We want to hear from you!

Please send us any comments or let us know how we can serve you and your school by either sending us an email or writing a letter. If you live in Manus or Nauru, you can also bring your comments to our observers at the ARCS research site. We are happy to hear from you anytime!

**ARM Education Program
Los Alamos National Laboratory
PO Box 1663, MS J495
Los Alamos, NM 87545 U.S.A.**

Fairley Barnes, Program Director: fbarnes@lanl.gov
Carrie Talus, Newsletter Editor: talus@lanl.gov

ARM Education News Briefs

Quotes from teachers who attended ARM Teacher Workshops

Manus teacher, Grades 2 and 4:

“Since I’m not too sure about doing some experiments of the lessons taught, I have gain more experience on some experiments done. With all these I would carry out experiments in my own school with my own students to give them more ideas and enhance their learning and understanding...”



Teacher, Mary Taniyaola, asking a question at the Manus workshop.



Nicholas Duburiya giving Nauru teachers a tour of the ARM site.

Nauru teacher, Grades 8, 9 and 10:

“It was worth attending the workshop to receive first hand updated information, to refresh the mind, to meet and share ideas with teacher colleagues, good break from the classroom, very inspirational.”

Port Moresby teacher, Evendahana Primary School:

“When I present the knowledge I have gained to my students and colleagues I know they will all appreciate the effort put into this workshop...From the bottom of my heart I want to say thank you...”



Teacher measuring temperatures for the “Microclimate Activity” at the Port Moresby workshop.

ARM Education Program
Mail Stop J495
Los Alamos National Laboratory
Los Alamos, New Mexico 87545
505/667-6782 Fax 505/665-3866

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