

Science Teachers Take Part in NOAA-led International Field Study

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It might not be obvious from the average science textbook, but not all of the big questions have been answered yet. Before students can become future scientists, this point has to be brought home to them – accompanied by their own realization that the people now searching for the answers are in many ways just like them.

By sending science teachers into the field to observe and take part in NOAA research expeditions, the [Teacher at Sea program](#) is taking on the challenge of proving to students that great science still remains to be done, and that they can choose themselves to do it.

NEAQS-ITCT 2004 Teachers in the Field

This month, over 100 scientists from five countries are wrapping up a four-month field campaign for what may be the largest and

most complex air quality-climate study in history. [ICARTT](#) (the International Consortium for Atmospheric Research on Transport and Transformation) researchers have been collecting samples and measurements over an [area](#) that extends from the middle of North America across the Atlantic Ocean and into Western Europe.

Within this huge study region, [NOAA](#) led its own massive coordinated field mission: [NEAQS-ITCT 2004](#): The New England Air Quality Study – International Transport and Chemical Transformation, 2004. (See Inset: *The Science of NEAQS-ITCT 2004*.) The NOAA-led mission included [ground-based sites](#), operational forecast support headquartered at [Pease International](#)

The Science of NEAQS-ITCT 2004

“The New England Air Quality Study – International Transport and Chemical Transformation, 2004.” This long, complicated name reflects how the NOAA-led campaign joins together two long-term efforts within the atmospheric research community.

The NEAQS component builds on NOAA-led research into regional air quality issues central to New England (which is sometimes called ‘the tailpipe of North America’). This effort is based at the University of New Hampshire under the name [AIRMAP](#), and has included the [NEAQS 2002](#) field study.

The ITCT component of NOAA’s 2004 campaign continues [internationally advocated](#) research into the impact of large-scale transport of pollutants through the atmosphere. In the spring of 2002, an international field effort called [ITCT 2002](#) investigated pollutant gases and particles flowing from Asia across the Pacific Ocean and arriving at the west coast of North America. ITCT 2002 was supported by NOAA’s [Office of Global Programs \(OGP\)](#). [The mission of ITCT 2004](#) is to learn how gases and particles flowing out of North America move across the Atlantic Ocean into Europe, and what effects this has on air quality and climate.

This year, in addition to contributing to support Kirk, Kevin, and Eric in the field, OGP contributed \$4.6 million to research in NEAQS-ITCT 2004.

Video links



VADM Lautenbacher announces 2004 NEAQS launch. Video courtesy of University of New Hampshire.

http://www.ogp.noaa.gov/streams/tas/neaqs_04/vadm.ram



NOAA scientist Eric Williams talks about the components of the ICARTT campaign.

http://www.ogp.noaa.gov/streams/tas/neaqs_04/williams.ram



Scientist Claire Reeves (U.K.) discusses ICARTT and the goals for ITCT – 2004.

http://www.ogp.noaa.gov/streams/tas/neaqs_04/reeves.ram



NOAA scientist Tim Bates discusses the goals for NEAQS-ITCT 2004.

http://www.ogp.noaa.gov/streams/tas/neaqs_04/bates.ram

Click on a picture or link to watch the video.

Tradeport, airborne measurements from NOAA's [Lockheed WP-3D Orion](#) and [ETL remote sensing DC-3](#), and four weeks of intense data collection aboard the NOAA Research Vessel [Ronald H. Brown](#).

Observing, reporting, and taking part in the science of NEAQS-ITCT 2004 were three American [teachers](#): [Kirk Beckendorf](#), from [Obsidian Middle School](#) in Redmond, Oregon; Kevin McMahon, from William E. Grady High School in Brooklyn, New York; and Brian Emond, from the [University of Massachusetts, Amherst](#). All three participated as part of NOAA's Teacher at Sea program, and were supported by the [Office of Global Programs](#) (OGP), the NOAA Marine and Aviation Operations (NMAO) [Teacher at Sea](#) office, and the University of Iowa's Center for Global and Regional Environmental Research ([CGRER](#)).

Kirk and Kevin spent time aboard the *Brown*, on the ground, and aloft. Kirk joined the *Brown* in Portsmouth for the first leg of her two-part cruise (July 4 – 23), and

NEAQS-ITCT 2004 Teachers in the Field



Kirk Beckendorf, from Obsidian Middle School in Redmond, Oregon (click http://www.ogp.noaa.gov/stre/ams/tas/neaqs_04/beckendorf_1.ram to meet Kirk and the Obsidian MS principal, Janelle Beers).



Kevin McMahon, from William E. Grady High School in Brooklyn, New York.



Brian Emond, from the University of Massachusetts, Amherst.

NOAA Platforms in NEAQS-ITCT 2004



The NOAA Lockheed WP-3D Orion



The ETL remote sensing DC-3



The Research Vessel *Ronald H. Brown*

then disembarked to investigate the operations center at Pease and ground-based research at Mount Washington, and spent time with one of the forecasters in Plymouth, NH. (See Kirk's [daily logs and photos](#).)

Kevin worked at Pease for several days, including flights on the NOAA [DC-3](#) and NASA [DC-8](#), before embarking for the second leg of the *Brown's* cruise (July 26 – August 12). He left the ship on August 9 and finished up with a second stint at Pease. (See Kevin's [daily logs and photos](#).)

The third NEAQS-ITCT 2004 teacher, Brian, was also a Teacher at Sea in 1999. He returned to the field for this campaign as a TAS alumnus, videographer, and science education teacher. Brian's objective was to capture both the NOAA-led mission and Kirk and Kevin's experiences on film. He was at Portsmouth from July 22 – August 1, conducting interviews and filming activities and science meetings.

Brian will be producing a video for presentation at educational conferences, such as national and regional meetings of the National Council of Teachers of Mathematics and other science education conferences. He will also create a curriculum unit with exercises for elementary through high school use.

Early Reports

The NOAA Teachers at Sea are taking part in field science; and in the field, surprises are nearly always a part of the experience. Sometimes there are so many unforeseen events that the mission becomes something completely different from what anyone expected. Several of the surprises Kirk and Kevin met with can be read about in their [logs](#) – equipment breaking, uncooperative weather, and sudden encounters with high-ozone plumes, to name a few. Fortunately, the NEAQS-ITCT 2004 teachers seem to have rolled with the unpredictabilities they faced. I asked Kirk and Kevin for a few reflections on his time in the field. Kirk wrote back, “The experience was incredible.”

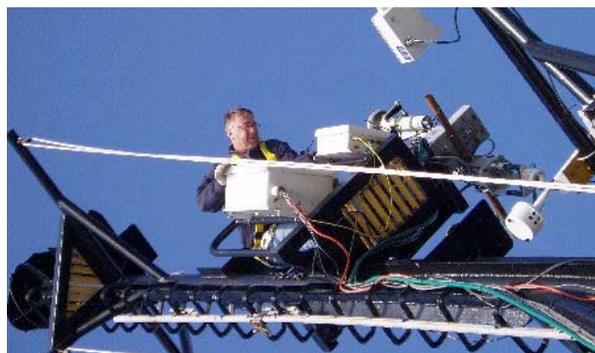
“I have to admit,” he added, “that when I left Central Oregon (where we have high air quality) to go to New England I really did not think there would be much relevance to our area. During my time on the Brown and at Pease, I came to understand how much air quality is really not just a local issue but rather a global issue.”

A Few Highlights from Kirk and Kevin



July 7 (Kirk's log) – The ozonesonde was released at 10:05 AM ET...In real time we watched as the ozone levels were instantly graphed by the computer as the balloon ascended... Once the instruments reached about 17 km, the graph showed a major increase in the amount of ozone... About 2.5 hours after launch when it was 38.6 kms (about 23 miles) high, the balloon popped and everything fell back to Earth still collecting data.

July 11 (Kirk's log) – While soaking up the sun and enjoying the view of the harbor I helped Drew Hamilton, from NOAA's Pacific Marine Environmental Lab in Seattle, Washington take some measurements with an instrument called a sunphotometer...



August 7 (from Kevin's log) – My morning was spent helping Dan Wolfe, one of the NOAA meteorologists repair...the sensors that relay air temperature and relative humidity to computers aboard ship...



During the time we were engaged with the repair we started to notice a small school of dolphins moving closer to the ship...As we were stationary in the water, a flock of shearwaters could be seen loitering off our stern and starboard side... The dolphins would at times glide under the floating shearwaters and make them alight from the water...

Kirk plans to make one of the central themes of his new science unit ‘To what extent can we have a local environment?’ As he wrote from the *Brown* on July 22, “Air pollution is a global problem not a local problem. Even people in areas, like Redmond, OR, with little pollution should be concerned. Air pollution doesn’t stay where it is made. North America gets pollution from Asia, Europe gets pollution from N. America, Asia gets pollution from Europe.

“Each one of us needs to realize that we are part of the problem.”

For his part, Kevin called it “the most wonderful experience I’ve ever had.” He

talked about his amazement at the highly advanced capabilities of the instruments, the huge quantities of data being collected, the incredible range of samples being collected, and the complex logistics at every level of operations, even down to feeding the scientists and crew aboard the *Brown*.

Kevin also commented on how the mission brought home to him, too, the fact that air pollution is a global issue. We can’t get away from it, he said, even in a fjord in Maine; even if we have enough money to live in a place like Bar Harbor.

“We all produce it, and we all receive it.”

The Future for NOAA Teachers in the Field

Traditionally the Teachers at Sea program placed participants on NOAA vessels. As the program has evolved, teachers have been able to experience more facets of the research. This summer, OGP and TAS sent five teachers into the field: two with the North American Monsoon Experiment (NAME), and three with NEAQS-ITCT 2004. The NAME teachers went aloft on research flights and visited the NAME operations and forecast centers; NEAQS-ITCT 2004 teachers were aboard ship and at the operations forecast center, as well as visiting ground sites and accompanying research flights.

With the support of TAS director Jennifer Hammond and OGP education and outreach director John Kermont, teachers have begun to make use of the capabilities of the Internet, giving their students real-time insights into the daily life of a field scientist through daily logs and photos, on-line interviews with scientists and crew, question-and-answer sessions by e-mail, and even live webcasts to the classroom.

The future also holds more involvement with the science itself. For the past few field campaigns, OGP-sponsored teachers have been sent to science planning meetings before the campaign, to meet the scientists and become oriented to the mission. Teachers have increasingly assisted with field measurements, such as releasing ozonesondes. In future teachers may be sent to post-mission data workshops as well.

Finally, OGP and TAS are working to make the most of the experience after the mission itself is over. The NAME and NEAQS-ITCT 2004 missions will both yield educational materials for use in elementary through high school classrooms, and also for presentation at science education conferences nationwide, to show how any science teacher can use the materials and on-line resources to inform and inspire their own students. Mission scientists may also visit the teachers’ classes – yet another way to forge connections between students and ‘real-world’ science.