

# Atmospheric Sciences

## Section of AGU Newsletter

Volume 1, Issue 4

September 7, 2007

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## Searching for Future Scientists: Climate Workshop Engages the Next Generation

*Michel dos Santos Mesquita*

The search for the future generation of scientists is essential. Various institutions are doing their part to promote science among high school students. One such activity was a workshop designed by Dr. Elena Sparrow and Martha Kopplin (both with the Outreach Education Department at the International Arctic Research Center (IARC)) called "Climate Change Workshop for Alaska Youth." These students are from a program called Upward Bound, which, according to Sparrow, is a summer program that prepares students for entry into college life. Most of them are from under-served populations, low-income families and ethnic minorities. It was a good

opportunity for these students to understand global climate change.

Leading scientists made presentations about their own research:

- Dr. Igor Polyakov (Research professor, IARC – topic: Climate)
- Dr. F. Stuart (Terry) Chapin (Research professor, Institute of Arctic Biology, IAB, and Principal Investigator of the Bonanza Creek Long Term Ecological Project, LTER – topic: Forest Ecology)
- Dr. Harper Simmons (Research associate professor, IARC, topic: Oceans)
- Dr. Sarah Trainor (Research associate, Institute of Northern Engineering – topic: Human/Social).

Graduate students also made a contribution. Matthew Druckenmiller, a PhD student in geophysics at the Geophysical Institute spoke about coastal regions, and I led an interactive talk called Beyond Climate Change. There was also a video podcast from Scott Wales, who has an MBA and is currently taking Climate Policy courses in Palo Alto, Calif. The podcast showed aspects of the IPCC report and discussed examples of climate policy from California. The students also had the opportunity to do some field work around Fairbanks, Alaska, with graduate student, Kimberley Maher, a forestry PhD student in the School of Natural Resources and Agricultural Sciences, and Tim Cater, a botanist with ABR, Inc.



**Students working on an activity during the Beyond Climate Change talk at the Climate Change Workshop for Alaska's Youth.**



**Teachers act out the transfer of solar energy from the tropics to the extratropics at CSU's Teaching Weather and Climate course, see Page 2 for story.**

### HIGHLIGHTS

**AGU Fall Meeting** Dec. 10-14 in San Francisco, Calif.

**2007 Fall AS Section Banquet** is planned for Tuesday, December 11, at the Empress of China.

**More education-themed articles** in the following pages.

**AS Newsletter**

Dear Reader,

*Most of you probably already understand the importance of ensuring that the next generation of scientists is at least as talented and enthusiastic as this one. You probably know that it would be worthwhile for you to spend an afternoon with students talking about climate, air pollution or another related topic. I'm willing to bet the main thing keeping you from doing this is TIME, or lack of it.*

*Articles in this Issue describe three effective ways of reaching out to the next generation - by hosting a workshop on climate change, working with teachers or doing a few hands-on experiments. The examples in this issue definitely took a lot of time and effort to put together. Hopefully, you can take ideas from each article and find a way to engage and educate students that fits your schedule.*

*We hope this issue sparks some communication and action. Following issues can have space devoted to feedback on these articles. If you are already involved in education programs and have ideas to share, or if something you read here sparked you to action, I'd like to hear about it ([abharper@atmos.colostate.edu](mailto:abharper@atmos.colostate.edu)).*

*Also in this Issue, we introduce our fourth reporter, Juan A. Anel. Juan has recently completed his PhD at the University of Vigo, and wanted to wait for it to be official before publishing his biography (Page 3). Join us in congratulating him on this great accomplishment!*

*Thanks for reading.*

*Anna Harper, Editor  
Colorado State University*

**Newsletter Reporters:**

*Will Anderson - Johns Hopkins University  
Juan A. Anel - University of Vigo, Spain  
Michel dos Santos Mesquita - Univ. of Alaska, Fairbanks*

## Equipping Teachers to Teach Weather and Climate

Anna Harper

It is not easy to spark a passion for the earth sciences in young students. Communicating directly with these students is one way to positively influence them, but we as scientists and professionals usually do not have the opportunity to meet with students every day. However, we can educate and inspire the teachers who do. For this reason, a course for teachers was taught at Colorado State University this July through the Center for Multiscale Modeling of Atmospheric Processes (CMMAP). CMMAP is a National Science Foundation Science and Technology Center, and has committed a large portion of its funding and resources to education and diversity programs. The course was led by Scott Denning and Brian Jones. Denning is a professor in Colorado State University's Atmospheric Science department and is CMMAP's Associate Director for Education, Outreach, and Diversity, and Jones is the director of the Little Shop of Physics (see next story for more information on the Little Shop of Physics).

The week-long course equipped 29 junior high and middle school teachers with the tools to engage and educate their students. The teachers-turned-students learned an entire semester's worth of upper level undergraduate weather and climate in five days. The topics included radiation, thermodynamics, general circulation, atmospheric chemistry, mesoscale weather, paleoclimate, climate change and modeling. The course was arranged into eight 3.5-hour units structured around an instructional model called the "Five E's" – Engage, Explore, Explain, Extend, and Evaluate. Many of the teachers were already familiar with the Five E's, and structuring the class in this way provided them with an outline for teaching the material in their own classrooms. The teachers participated in and learned fun, hands-on experiments from the Little Shop of Physics, ranging from making clouds in a bottle to gazing upon the world with infrared goggles. They also went home with \$250 worth of equipment for conducting these experiments in their own classrooms. On the last day, the group went to Boulder to visit the National Center for Atmospheric Research. There they learned about computer models and tried out some more hands-on experiments from the University Corporation for Atmospheric Research (available online at <http://www.windows.ucar.edu>). Overall, the course gave the teachers a more in-depth knowledge of our field, and provided them

with the tools to transfer that knowledge to their students in an effective, engaging manner.

CMMAP plans to conduct a similar course each summer. Other CMMAP programs that reach students include a Colorado Global Climate Conference held in April for Colorado high school students, a Little Shop of Physics tour focusing on weather, climate and clouds, and summer internships. For more information, visit:

<http://kiwi.atmos.colostate.edu/cmmmap/contact-eod.html>, or e-mail Christine Aguilar, CMMAP's Science Education Manager, at [christine@atmos.colostate.edu](mailto:christine@atmos.colostate.edu).

## The Little Shop of Physics: Bringing Exciting Science to Schools

Anna Harper



Brian Jones remembers his first experience of teaching physics to young students. At the time, he was a faculty member of Colorado State University's Physics Department, and had been invited to give a talk at a local middle school.

"I basically taught a college class to middle schoolers. They were bored and passing notes to each other, it was quite unpleasant," he said.

Afterward, he let the students play with some of the experiments he had brought, and the kids had a blast. Jones, a natural tinkerer since childhood, realized that kids need to get their hands on things to figure them out for themselves. The next year, he came back with lots of hands-on experiments, and the students had a much more meaningful experience.

In 1991, Jones created the Little Shop of Physics (LSOP), a collection of hands-on science experiments for students ranging from kindergartners to high school seniors. Since then, he and his tie-dye-clad volunteers have reached more than 250,000 students.

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According to the LSOP website: “We don’t show students science. We help them do science, to observe, experiment, and question – and discover how rewarding this can be.”

Although directing the LSOP is a full-time job for Jones, sharing science with students is something any scientist can do. He has three tips for engaging and educating the students, without having the unpleasant experience he had during his first school visit.

**Hands-on is key!** “It is important that the students are actively engaged and doing something hands-on. This is absolutely crucial,” said Jones. This also helps the students realize that science is something that they are capable of doing.

**Utilize undergrads.** Undergraduates can provide guidance as the students work with the experiments. The undergrads can also connect with the students and serve as role models. The students will realize that scientists are people not too unlike themselves. This also benefits the undergrads because it provides them with an opportunity to be involved in their field, and they learn more through the teaching experience.

**Connect with a research mission.** The LSOP has recently connected with the Center for Multiscale Modeling of Atmospheric Processes (see article on Page 2), a partnership that Jones said revitalized the Little Shop. Connecting with your institution’s research mission is a good way to share its research and to strengthen its outreach. Also, you will have a broader set of resources to tap into.

If you are interested in doing something similar (but perhaps on a smaller scale), visit the LSOP website at:

<http://littleshop.physics.colostate.edu/>, or e-mail Brian Jones at: [bjones@lamar.colostate.edu](mailto:bjones@lamar.colostate.edu).



**Both students and teachers enjoy learning about the color spectrum with 3-D glasses.** Above: Junior high and middle school teachers at Colorado State University’s Teaching Weather and Climate course. Right: Elementary school students participating in a Little Shop of Physics Workshop.

## Meet the Press, Part 2

**Juan Antonio Añel Cabanelas**

(<http://ft2dc.uvigo.es/juan/juan.html>)

**Hometown:** Ourense, Spain

**Background:** PhD. in Atmospheric Physics, Universidade de Vigo. MSc in Physics, Universidade de Vigo. B.S. in Physics, Facultad de Ciencias de Ourense, Universidade de Vigo, Spain. I have worked as a research assistant in the Universidad Complutense de Madrid (Spain), as an invited researcher in the Universidade de Aveiro (Portugal) and as an assistant professor in the Universidad de Vigo.

**Currently Studying:** I have recently obtained my PhD. in Atmospheric Physics from the Universidade de Vigo in Ourense. The title of my PhD. Thesis has been “Análisis climático de la tropopausa mediante datos de radiosondeo” (Climatic analysis of the tropopause from radiosonde data). I continue working for this university as a research assistant and am staying in the Universidade de Aveiro as an invited researcher. Moreover, I am looking for possibilities for postdoctoral stays in other research centers. Nowadays, my main research subject is the study of the tropopause and multiple tropopause phenomena. I am interested in the study of the atmosphere using radiosondes and other observational data. I also like other, more theoretical subjects in the study of the atmosphere, such as data homogenization.

**Interests:** Physics and computer sciences, books, free software, bonsais, chocolate, spending time with my friends.

**What I like about science and doing research:** I love to think and to try to solve problems. Moreover, doing research and teaching physics is pleasing (when the bureaucracy lets you). The possibility of having certain freedoms in your daily work schedule

because of doing research is a plus. Also, the research on atmospheric sciences combines several pleasant fields for me: physics, computer sciences, the study of the climate, and the opportunity to perform a work which I really feel is useful and contributes to a better world for everybody.

## Surviving the Extremes: Measuring winds on Mt. McKinley

*Michel dos Santos Mesquita*

As described in our [last issue](#), the Japan Alpine Club (JAC) team found the Mt. McKinley weather station blown down during their annual climb in 2007. The station was situated at 5710 m, made from titanium rods bolted into rock, and was established by the JAC in 1991. It would have taken a powerful wind to destroy the station – in January of 2003 the station survived a very powerful wind of 84 m/s that destroyed the station anemometer. The same kind of wind could be responsible for the mysterious deaths of Japanese adventurers and explorers in 1984 and 1989. Measuring high speed winds is not simple, and in a remote environment where the wind is frequently coming from above or below and carrying rocks or pieces of ice, the challenge is even greater. Most wind instruments available today are not suitable for work on top of McKinley due to a combination of size, power requirements, moving parts, susceptibility to icing and frail mechanical/electrical components.

These problems, coupled with a desire to capture a full three-dimensional representation of the wind at the summit, were some of the requirements and problems that led Dr. David E. Atkinson at the International Arctic Research Center to develop an innovative instrument to measure high winds. This instrument consists of an aluminum sphere approximately the size of a cantaloupe that is attached to a pole. The sphere rests on a three-dimensional array of pressure sensors that measures the force generated on the sphere by the wind, from which 3-D wind speed and direction can be extracted.

Atkinson established the following criteria for a McKinley anemometer: no moving parts, no on-board digital electronics, not susceptible to icing, small and light enough to be carried by a climber, capable of measuring winds in three axes up to 112 m/s,

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**Atkinson with his newly developed "Three-Axis Thrust Anemometer". He is accepting suggestions for a more "lively" name.**

robust enough to survive impacts with flying rocks and ice and very low power consumption.

After drawing up preliminary technical drawings, Atkinson approached Sensing Systems Corporation of Worcester, Massachusetts, to have the sensor (the "Three-Axis Thrust Anemometer") built in 2006. Wind-tunnel testing and simulations using the computational fluid dynamics software package "Fluent" at the Arctic Region Supercomputing Center are now underway to determine the full range of instrument dynamical responses and to arrive at calibration parameters. Funded by the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) and costing approximately \$15,000 to develop and build, the unit currently represents a prototype that is not yet commercially available. It is possible that commercialization could reduce the cost in the future. Atkinson's current objective is to get the instrument ready for deployment to the McKinley weather station during the 2008 climbing season. If the unit proves successful, more will be deployed to provide wind data from some of Alaska's more challenging field sites.

Questions or comments, including suggestions for a more "lively" name for the instrument, can be directed to:  
[datkinson@iarc.uaf.edu](mailto:datkinson@iarc.uaf.edu).

**ACKNOWLEDGMENTS** – I would like to thank Dr. Atkinson for the interview and comments on the text.

## Workshop Spotlight: Climate Dynamics, Climate Change and Regional Climate Prediction

Juan A. Añel

The first Iberoamerican Workshop on Climate Dynamics, Climate Change and Regional Climate Prediction was held in São Paulo, Brazil, from Aug. 20 to 23. The workshop aimed to bring together scientists from different Iberoamerican countries and discuss state-of-the-art studies of climate dynamics, climate change and regional climate prediction in this community, with a special focus in research on South America. The conveners were Dr. Tércio Ambrizzi and Dr. Rosmeri Rocha from the Instituto de Astronomia, Geofísica e Ciências Atmosféricas in the Universidade de São Paulo.

Participant talks covered several topics. Some of the most relevant were methods for climate dynamics analysis, precipitation in South America, the impact of climate change on Amazonia and South America in general, and comparisons between different regional climate models, with special emphasis on the RegCM3 (the ICTP Regional Climate Model: <http://www.ictp.trieste.it/~pubregcm/RegCM3/>). Moreover the workshop included a laboratory about regional climate modeling.

The main conclusions of the discussion panels were:

**Climate dynamics:** It is necessary to develop a better understanding of the low-frequency modes affecting South America and their impacts on the climate of the region. Moreover, it is very important to build a more profound knowledge of boundary conditions to be used in the models, such as evapotran-

spiration and vegetation cover, which would require a better observational system. The need of a regional reanalysis for South America was also discussed.

**Climate change:** This panel discussed the confidence in the data, models and predicted temperature changes due to climate change. It was pointed out that the results of the models represent considerable uncertainties. Another conclusion was that large-scale aspects close to South America have been simulated, but indices and regional features still need to be analyzed. Finally, the discussion focused on how climate change will affect the precipitation in South America and its impact on fishing, agriculture and hydroelectric power.

**Regional climate prediction:** It was concluded that there should be no competition between models, since a regional climate model with very good results in one region could have very poor results in another region. Rather, it is necessary to validate models to different regions. Moreover the differences between the use of a global climate model and a regional climate model were discussed. The need for a regional analysis for South America to run regional climate models was pointed out.

## Opportunities

*Compiled by Anna Harper*

**Note: You may be asked for your AGU member # to open the following links.**

**AGU job postings can be found at:**

[http://www.agu.org/cgi-bin/membership\\_services/joblistings.cgi](http://www.agu.org/cgi-bin/membership_services/joblistings.cgi)

**Below is a list of the postings in Atmospheric Sciences:**

- Assistant Professor, Climate Science, Dept. of Geography, Univ. of California - Santa Barbara. Deadline Oct. 15
- Research Scientist, Jet Propulsion Laboratory, Pasadena, Calif.: earth cryospheric modeling and remote sensing.
- Post-doctoral Researcher, Atmospheric Sciences Dept., University of Arizona: apply



**Participants in the First Iberoamerican Workshop on Climate Dynamics, Climate Change and Regional Climate Prediction was held in São Paulo, Brazil.**



GPS occultation data to study ENSO - reviews began Aug. 27

- 2008 UCAR Visiting Scientist Program, Geophysical Fluid Dynamics Laboratory, Princeton, N.J., Climate Change Research Initiative - deadline Oct. 1
- Post-doctoral Research Associate (2 positions), University of Washington: Atmospheric Chemistry, measure and interpret data from ground and airborne measurements of mercury, nitrogen oxides, ozone, and/or aerosols - accepting applications until position filled
- Research Associate, Cooperative Institute for Research in Environmental Sciences / NOAA Earth System Research Laboratory: work with the Hurricane-Weather Research and Forecasting model, Boulder, Colo.
- Post-doctoral Research Position, University of Texas - Arlington: Climate Modeling (interactions between climate and marine carbon cycle in earth's history). Position opens on Oct. 1, 2007.
- Post-doctoral Position, Georgia Institute of Technology: Atmospheric Chemistry Modeling and Analysis, analyzing measurements using 3-D global/regional chemical transport models. Position starts in Sept. 2007.
- Post-doctoral Research, Dept. of Marine, Earth and Atmospheric Sciences at North Carolina State Univ.: application and evaluation of advanced 3-D atmospheric chemistry-aerosol-climate models.
- Research positions, Atmospheric and Space Technology Research Associates: modeling of upper atmospheres of Earth and Mars; ionosphere-thermosphere-magnetosphere research; data assimilation; instrument development - reviews begin immediately
- Research Associate Positions, Cooperative Institute for Research in Environmental Sciences, NOAA Space Environment Center in the areas of solar UV imaging, solar x-ray and EUV irradiance, and the impacts of solar irradiance on the terrestrial atmosphere - reviews begin Sept. 4
- Postdoctoral scientist, Center for Ocean-Land-Atmosphere Studies, Institute of Global Environment and Society, Maryland: regional climate modeling - deadline Sept. 15
- Postdoctoral Fellowship, Jet Propulsion Laboratory / Caltech - deadlines July 1 and Nov. 1, 2007

## Biogeosciences

- Faculty Positions, Dept. of Marine, Earth, and Atmospheric Sciences at North Carolina State University: Global Climate Dynamics; Geoscience Education - review begins Sept. 15.

- Postdoctoral (or more experienced) researcher positions, Princeton University: Southern Ocean processes; carbon sources and sinks; applications of satellite observations; the response of ocean biology to global warming; and more - reviews begin immediately

## Ocean Sciences

- Tropical Ocean Modeler, Australian Bureau of Meteorology Research, Melbourne: evaluate and improve tropical variability in AusCOM ocean model, with focus on climate variability issues. Deadline Sept. 20
- UCAR Visiting Scientist, NESDIS, Office of Research and Applications, Camp Springs, Maryland: operational impact of satellite surface vector wind on numerical weather prediction. Reviews begin Oct. 15
- Assistant Professor, Ocean Sciences Dept., Univ. of Calif. - Santa Cruz: focus on the role of the oceans on climate and/or climate change. Deadline Oct. 15
- Numerical Modeling/Programmer, Makai Ocean Engineering Inc.'s submarine cable group, Makapuu Point, Oahu, Hawaii
- Oceanographic Research and Software Engineering, Princeton Univ. and GFDL/NOAA: ocean general circulation and ocean bio-geochemical modeling, particularly development of community software for use in climate earth system models - deadline Oct. 1
- Post-doctoral Research Position, Univ. of Miami's Rosenstiel School of Marine and Atmospheric Science: study seasonal and interannual variability of currents and transports within the Intra-Americas Sea - position available from Oct. 1
- Physical Oceanographer, The National Oceanography Centre, Univ. of Southampton: research aimed at understanding the control exerted by the Arctic Ocean on global climate - deadline Sept. 30
- Researcher, NOAA's Geophysical Fluid Dynamics Laboratory and Princeton University: ice sheets, sea level, and climate change - deadline Oct. 15
- Physical Oceanographer, U.S. Department of Commerce/ NOAA's Atlantic Oceanographic and Meteorological Laboratory, Miami, Fla.: physical oceanography and the ocean's role in climate variations

graphic and Meteorological Laboratory, Miami, Fla.: physical oceanography and the ocean's role in climate variations

## Interdisciplinary/Other

- Fellowship Program for Distinguished Faculty, Senior Scholars, and Practitioners, The Program in Science Technology and Environmental Policy at Princeton Univ. (2008-2009)
- Post-doctoral Position, Dept. of Earth and Planetary Sciences, Harvard Univ.: Climate Dynamics
- Cryosphere Modeling, Dept. of Earth System Science, Univ. of California - Irvine: Projects will examine aerosol interactions with polar climate - deadline Oct. 1
- Fellowship Opportunities for AGU/EOS members: AIP/APS Congressional Fellowships - deadline Jan. 15
- Assistant Professor in Human-Environment Interaction, Dept. of Geography, Indiana Univ. - Bloomington - early deadline Oct. 15
- Global Change Informatics Scientist - College of Agriculture and Environmental Sciences, Univ. of Calif. - Davis - deadline Oct. 8
- Post-doctoral Position, Dept. of Earth and Atmospheric Sciences / Purdue Climate Change Research Center: greenhouse gas emissions modeling - position opened Aug. 20
- Associate Director, Center for Remote Sensing of Ice Sheets, University of Kansas
- Assistant Professor (tenure-track), environmental history, Department of History and the Program of Environmental Studies at Yale University - deadline Oct. 15.
- Project Earth Scientist/Technical Coordinator, Earth Knowledge, Inc., Tucson, Arizona
- Senior Program officer, World Wildlife Fund, Climate Change Global Program Unit
- Climate Scientist / Professor, Environmental Studies Dept., Macalester College, St. Paul, Minn. - early deadline is Oct. 15

## Student Opportunities

- PhD Scholarships in hydrology, climatology, and paleoclimatology, Centre for Climate Impact Management, Univ. of New-

castle, Australia - deadline Sept. 30 for non-Australian students, Oct. 31 for Australian students

## Conferences

- AGU Fall Meeting (Dec. 10-14) - San Francisco, Calif.  
<http://www.agu.org/meetings/fm07/>

- The American Chemical Society Physical Chemistry Division is pleased to announce a symposium, "Physical Chemistry of Atmospheric Processes," which will be held in New Orleans, Louisiana from April 6-10, 2008. Information about the program, logistics, registration, and submission of abstracts can be found at:  
<http://www.chemistry.org/portal/a/c/s/1/acsdisplay.html?DOC=meetings%5cneworleans2008%5chome.html>

This symposium will be dedicated to an examination of the use of physical chemistry concepts and methods in the study of various atmospheric processes. From a topical point of view, issues related to climate change and air quality will be discussed through the investigation of the fundamental physical chemistry of the relevant atmospheric gas phase, particle-phase, and heterogeneous interaction phenomena. From a methods point of view, field observations, laboratory experiments, and theoretical and computational results will be represented.

The specific session topics are:

- 1) Photochemical Pathways
- 2) Sources and Transformations of Aerosol Organics
- 3) Aerosol Formation, Hygroscopicity, Phase Transitions, and Cloud Nucleation
- 4) Heterogeneous and Multiphase Chemistry
- 5) Atmosphere-Biosphere-Cryosphere Interactions
- 6) Insights from Isotopes
- 7) Emerging Areas

The deadline for submission of abstracts is October 28, 2007:

<http://oasys.acs.org/acs/235nm/phys/papers/index.cgi>

For further information contact:

Matt Elrod: [matthew.elrod@oberlin.edu](mailto:matthew.elrod@oberlin.edu)

Joel Thornton:

[thornton@atmos.washington.edu](mailto:thornton@atmos.washington.edu)