A G U A T M O S P H E R I C S C I E N C E S

Atmospheric Sciences Section of AGU Newsletter

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Preparing Undergraduates for Careers in Our Field

Undergraduate Research Experience at Storm Peak Laboratory

Morgan Brown

The National Science Foundation's Opportunity for Enhancing Diversity in the Geosciences Program has recently extended its bounds to include the Geoscience Research at Storm Peak Program (GRASP), which is designed to give underrepresented undergraduates experience doing field work research. Participants are involved in a year-long program, beginning with an intensive, week-long research project at the Storm Peak Laboratory (SPL) in Steamboat Springs, Colo. Participants have the opportunity to collect data for their research using instruments available at SPL, and then continue the research throughout the year after the short course is over. This year's final products will be presented at Howard University in Washington, D.C. this winter as a requirement to complete the program.

GRASP participants kick-off the program with a short course at the Storm Peak Laboratory. Pictured are Asia Dowtin, Wanda Vargas, program coordinator Gannet Hallar, Shorma Bianca Bailey, Christina Hopewell, Ian McCubbin, and Brittan Hallar.

For its first year, GRASP has had an astounding start. Four participants took part in the program this year from four different universities across the U.S. Christina Hopewell, a Biology Pre-Medicine major from Colorado State University-Pueblo, said the GRASP program helped her build on skills she had acquired from coursework, as well as apply them to solve a problem in an entirely different area from what she was exposed to in school. She said, "We were able to gather data from a variety of instruments and then interpret that data to solve a problem that we did not have the answers to. That was both interesting and exciting, because we did not know where our data would lead us."

Professor Gannet Hallar, instructor and coordinator of the GRASP program, said the goal is to provide as much one-on-one interaction between the students and the instructors as possible. Research done by the participants occurs with the help of recruited instructors, as well as nearby experts. Hallar said the group got the chance to visit the National Center for Atmospheric Research (NCAR), where they learned about modeling, computing, and visualization. The GRASP participants also had the opportunity to meet the participants of the Significant Opportunities in Atmospheric Research and Science (SOARS) program. This unique

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HIGHLIGHTS

Special section on undergraduate and graduate-level programs, **Pages 4 & 5**.

Before leaving for San Francisco, look for the next issue of the Newsletter, which will be focused on the AGU Fall Meeting!

2008 Fall Meeting early registration and housing deadline is **Nov. 14**. Remember to register for the **AS Section Banquet,** which is Tuesday, Dec. 16.

Nominate someone you know for the Yoram J. Kaufman Unselfish Cooperation in Research Award by **Dec. 1.**

AS Newsletter

Hello Readers,

As you will read in the Section News, I've decided to hand over the reigns of the Newsletter at the end of this year. Serving as Editor-in-Chief for the Newsletter has been a great experience for me. I've been able to learn about cutting-edge research and technology (like Will Anderson's articles on the Earth Simulator in Volume 1, Issues 2 and 3), exciting educational programs (like the ones we highlight in this issue), international climate change mitigation strategies (see Volume 1, Issue 2) and some unexpected ways to share our research with others (for example, Michel Mesquita's article on artist Charlie Hooker in Volume 1, Issue 5). (You can download any of these Issues from http://www.agu.org/sections/atmos and click on the Newsletter tab on the left.)

However, the most meaningful part of my role as Editor-in-Chief has been the connections I have made. It has been exciting to work with a range of people (from accomplished researchers, to other young scientists and students) who share my enthusiasm for communicating our science to others. I am optimistic about the future of the Newsletter and I look forward to continued involvement with it. Thank you for reading and contributing, I encourage you to continue to make this Newsletter relevant and valuable to the members of the Atmospheric Sciences Section.

Happy Reading,
Anna Harper, Editor-in-Chief
abharper@atmos.colostate.edu
Colorado State Univ.

AS Horizons

SPARC DynVar & UTLS Initiative

Juan A. Añel

In the past few years it has become obvious that the stratosphere has a more important role in the climatic system than was previously supposed. Stratospheric research clearly has advanced and as Dr. Susan Solomon said in the last SPARC Assembly, "There has never been a better time to invest yourself in stratospheric processes and their role in climate."

SPARC (Stratospheric Processes and their Role in Climate) works through different themes and activities. In this issue I will highlight two of them in AS Horizons: DynVar and the UTLS Initiative. Both of them were also presented in Issue 29 of the SPARC Newsletter (July 2007). DynVar (SPARC Dynamical Variability Activity) is coordinated by Drs. Paul Kushner, Marco Giorgetta, Elisa Manzini, Judith Perlwitz, Lorenzo Polvani and Fabrizio Sassi. UTLS is coordinated by Drs. Peter Haynes, Andrew Gettelman and Marvin Geller. Both the DynVar project and the Tropopause Initiative support collaborative work in the frontiers of atmospheric sciences. The first deals with hard topics on the validation of climatic models and the representativeness of the modeled climate. The second one tries to produce a better understanding in a field with a clear lack of knowledge. The tropopause represents a real challenge, particularly as far as determining its location and its role in issues such as the troposphere-stratosphere interaction.

SPARC DynVar

The DynVar main goal is to understand the two-way coupling between the stratospheric and tropospheric circulation, using comprehensive AGCM's as the principal tools of investigation. Through the comparison of AGCM's with a well-resolved stratosphere ("high-top" models) to standard climate models ("low-top" models), it is expected to gain a better understanding of the degree to which the stratosphere can influence the troposphere's mean climate, variability, and response to climate change.

DynVar has currently involved 57 researchers and four main analysis areas: Top, Intraseasonal, Climate Change and Ideal. "Top" accounts for the study of the stratospheric impact on tropospheric circulation, ocean circulation and on the cryosphere. "Intraseasonal" studies the stratospheric influence on tropospheric intraseasonal variability. "Climate Change" is about the role of the stratosphere in trends and projections of climate change. "Ideal" analyzes the stratosphere-troposphere interactions using simplified models and dynamical theory.

Dr. Paul Kushner, the SPARC DynVar coordinator, says that an important issue that has emerged from the first DynVar steps is how best to separate the effects of stratospheric vertical representation (e.g., vertical resolution and lid height) in a GCM from the effects of subgrid-scale parameterization of gravity wave drag. Both could affect the strength of tropospheric responses to climate change. Several papers have now pointed out the importance of gravity wave drag in the climate response of stratospheric transport (through the Brewer Dobson Circulation) and of tropospheric circulation.

A first planning workshop was held in Toronto in March 2008, during which a series of coordinated GCM runs that would test for the effects of stratospheric representation were planned. Three different simulations have been established, which will all attempt to simulate the climate of the 20th century. The first has prescribed SST's and will elucidate the effects of representing the stratosphere in a GCM in the absence of coupling to the ocean. This experiment is linked to the CLIVAR C20C Project (http://www.iges.org/c20c/). The second has a mixed-layer ocean and the third has a full dynamical ocean. These will show effects of stratospheric representation in the presence of thermal coupling to the ocean and in the presence of full dynamical coupling to the ocean circulation, respectively.

The SPARC Tropopause Initiative

The number of papers published, and therefore the level of research activity, on the tropopause has experienced spectacular growth in the last few years, after a decade of lack of interest in the end of the past century. For example, a good summary of the research on the tropical tropopause can be found in a paper to appear in *Review of Geophysics* by Dr. Stephan Fluegistaler et al. The work in this field was not very active between 1982, when Dr. Isaac M. Held published his conceptual model of the tropopause with the radiative and dynamical constraints, and 1998, when Dr. Klaus P. Hoinka presented a paper on the statistics of the global tropopause pressure. A real publishing explosion happened in 2003, when the number of papers published on the tropopause was twice that in 1996, according to the ISI Web of Knowledge. The

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next years, with the SPARC Tropopause Initiative and other ongoing projects such as TRODIM (http://ft2dc.uvigo.es/trodim), were (and are) an extremely interesting and exciting time for tropopause research, as evidenced by the last SPARC Assembly (see "Stratospheric Processes and their Role in Climate" on Page 8).

One of the goals of the SPARC Tropopause Initiative is to improve the understanding of what horizontal and vertical resolutions, and what representations of small-scale processes are required for these effects to be captured correctly in global climate or chemistry-climate models. This initiative is connected with others from SPARC such as CCCMVal (http://www.pa.op.dlr.de/CCMVal/) and DynVar because the vertical resolution is critical for the models when working with this layer.

For example, the tropopause is very important for water vapor fluxes from the upper troposphere to the lower stratosphere. The research in this field has clear links with other programs of the World Climate Research Programme such as the Global Energy and Water Cycle Experiment (GEWEX: http://www.gewex.org).

Currently, the SPARC Tropopause Initiative has not organized any meetings but many researchers are working actively on this research topic and more movement is foreseeable in the next months.

For more information on DynVar or the Tropopause Initiative, visit these web pages:

- http://www.acd.ucar.edu/sparctrop/
- http://www.sparcdynvar.org/

About AS Horizons: remember, you can submit your projects or suggest one that you know of to be highlighted in AS Horizons. Submission procedures can be consulted in the AGU/AS section webpage (http://atmospheres.agu.org) in the Volume 2, issue 2 of the AGU AS Newsletter.

Section News

Alan Robock

New Editor-in-Chief Wanted

Anna Harper, the founding Editor-in-Chief of the Atmospheric Sciences Newsletter, has announced her intention to step down at the end of the year. During her very successful two-year period as Editor, Anna has started the Newsletter and made it into a publication for our section that we can be proud of.

If you would like to help us to continue this success, please send an application to me at robock@envsci.rutgers.edu, with a statement of your philosophy and ideas for the newsletter and a brief resume. Please send everything in one pdf file, and submit it by December 15, 2008. Anna has agreed to serve as a mentor and assistant to the new Editor-in-Chief, to allow for a smooth transition. I look forward to receiving all applications, and remind you that article submissions for the newsletter are always welcome.

Atmospheric Sciences Chinese Banquet

The Third Annual Atmospheric Sciences Chinese Banquet will be held on Tuesday, December 16, 2008, during the 2008 AGU Fall Meeting. The pre-registration deadline for the Fall Meeting is November 14. Please sign up for our banquet when you register. As always, we offer a discount for students and will have entertainment, as well as the presentation of the Holton Award. This year, we are delighted to announce that folk singer Christine Lavin will perform at the banquet. This year the banquet will be better than ever, with wonderful companionship, great food, and world-class entertainment. Don't miss it.

Yoram J. Kaufman Unselfish Cooperation in Research Award

The Atmospheric Sciences Section of the American Geophysical Union is pleased to announce the establishment of a new Section Award for senior atmospheric scientists, the Yoram J. Kaufman Unselfish Cooperation in Research Award. We first told you about this award in an earlier issue and we now have more specifics.

The AS Section will make the first annual Kaufman Award at the Joint Assembly (Spring Meeting) in Toronto in May, 2009. The citation will read: "The Yoram J. Kaufman Award for broad influence in atmospheric science through exceptional creativity, inspiration of younger scientists, mentoring, international collaborations, and unselfish cooperation in research."

The Kaufman Award will consist of a certificate and a $1,000 credit toward AGU services. The credit may be used for journal subscriptions, book purchases, and AGU meeting registration fees, to be spent over a period of not more than three years from receiving the award. When the award is presented outside the recipient's home country, it will consist in addition of a travel grant of $1000 specifically to attend the AGU meeting at which it is presented.

Now is the time to submit nominations for the Kaufman Award. **The deadline is December 1, 2008**. To be eligible, the candidate must be a member of the AGU, and be at least ten years past the award of the Ph.D. (or equivalent).

The nomination package must consist of:

- a nomination letter,
- the candidate's curriculum vitae, and
- three letters of recommendation, at least one from a collaborator of the nominee from a different nation.

The nomination and supporting letters should clearly state how the nominated individual has exhibited the qualities noted in the citation. **Nominations must be submitted by December 1, 2008 (as one combined pdf file) to the Atmospheric Sciences Section President-Elect, Professor Anne M. Thompson,** anne@met.psu.edu**.** If you are unable to access Adobe to create a single pdf file, inform Dr. Thompson by e-mail and send the nomination package by Express Mail to: Anne M. Thompson, Penn State University, Meteorology Department, 503 Walker Building, University Park, PA, 16802-5013, USA.

This award is named in honor of Yoram J. Kaufman, an outstanding atmospheric scientist, mentor, and creator of international collaborations who worked on atmospheric aerosols and their influence on the Earth's climate for his entire 30-year career. Yoram was tragically killed in a bicycle accident just at the peak of his career at NASA Goddard Space Flight Center. He grew in the 1990s to be a leading light in aerosol research, both as an author of many new theoretical ideas and as a leader of field campaigns such as SCAR-B. He also captained the first NASA Earth Observing System platform, Terra, as its Project Scientist. He advised and mentored a large number of students and junior scientists, and was known for his quick insight, great heart, deep wisdom, and outreach to national and international collaborators.

GRASP

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opportunity gave the GRASP participants the chance to interact professionally with other atmospheric science researchers.

At the completion of this program, participants will have gained a considerable amount of experience. Hopewell believes this experience will prepare her for her future career. She said, "Creating a project over nearly six months gives us a taste of what we may be required to do frequently as a condition for employment or graduate school." She also added that she would recommend the GRASP program to anyone wanting to strengthen his or her skills. "It is truly a once in a lifetime chance to study in a location with unsurpassed natural beauty and to meet scientists who are some of the most knowledgeable, talented people in their respective specialties."

For more information on the GRASP program, you can visit their website at http://www.grasp.stormpeak.dri.edu/.

Top: GRASP participants visit Fish Creek Falls near Steamboat Springs. Pictured are (from left to right) Shorma Bianca Bailey, Asia Dowtin, and Christina Hopewell
Bottom: GRASP participants tour NCAR's C-130 aircraft. Pictured are Shorma Bianca Bailey, Ian McCubbin, Christina Hopewell, Asia Dowtin, Wanda Vargas, Gannet Hallar, and Brittan Hallar.

How Prepared are Undergraduate Students for the Job Market in Atmospheric Sciences?

Efforts from Brazil

Paula Doubrawa Moreira (Federal University of Pelotas) and Michel Mesquita

The job market in Atmospheric Sciences is very demanding. Undergraduate students not only need to be able to understand atmospheric phenomena, but also to have necessary computational skills to master the ever-growing computer technology. But these are not the only necessary skills. According to *Fiske* [2001], author of the AGU book *Put Your Science to Work*, "Employers in the new millennium are seeking individuals who are independent problem-solvers, quantitative thinkers, and articulate communicators. They are seeking individuals who have carried out complex projects, overcome obstacles through creative thinking, and operated with a minimum of supervision." Preparing students to accomplish all that is a huge task universities face.

For this reason, Brazil has implemented a program called PET (Programa de Educação Tutorial – Tutorial Education Program). PETs are formed by a group of undergraduate students in sciences departments throughout Brazil. A professor is assigned as the advisor/tutor of the group, and helps to develop academic activities that improve the graduation quality and broaden the educational reach beyond the University. The Brazilian Education Ministry Government sponsors PETs, and students receive a scholarship as a reward for their work. The PET program aims at assembling students who have high academic achievements. It is oriented under the principle of unity among research, instruction and extensive activities, which are mainly interdisciplinary. The co-operative and the collective nature of the program develops not only team work, responsibility and reliability but also enhances the critical spirit and grounds a professional work which is based on ethics and is aware of its social duties. The result is the formation of professionals who are highly qualified technologically, scientifically, socially and academically.

There are many PET groups in various universities throughout Brazil, but only one is dedicated to Meteorology students. This PET-Met is located at the Federal University at

Students involved in the Tutorial Education Program at the Federal University of Pelotas (PET-Met)

Pelotas, in the southern part of the country. Today, the Pelotas group is comprised of 12 students, and every year new students are recruited as the older ones graduate. However, it is not very easy to become a PET member. Highly selective procedures are used, since it is very competitive. The selection process consists of an interview, a resume check, GPA analysis and an essay-type examination.

The Pelotas PET-Met current activities involve scientific research, academic lectures, advertisement of the Meteorology program, greeting and helping freshmen students, a program of curiosities about meteorology on the radio, and the enrichment of the scientific library, which is available to all academics. The PET-Met members also have a large responsibility to set an example to the undergraduate students who are not members of the PET group. They provide homework/lecture assistance to help those who encounter difficulties across the disciplines. They also participate in outreach programs through the PET Newsletter, which publishes news, projects and climatological bulletins for that part of Brazil. The group in Pelotas also organizes trips to workshops, congresses and courses throughout the country and carries out meteorological scientific experiments in schools to spread basic understanding about the atmospheric sciences, which is poorly taught over middle and high school.

The PET group has helped many students improve their skills to better compete in the job/academic market. Paula, a current member of the Pelotas PET-Met, and I (former member of the Pelotas PET-MET) hope that such efforts can be established in many other Universities. If you have any questions about the Pelotas PET-Met, contact them at petmeteorologia@grupos.com.br. And if you have any stories about what other universities are doing to help students improve their skills, write to mmeclimate@me.com.

The Next Level: Arctic Field School for Graduate Students and Post-docs

Modeling of Arctic Climate: Fairbanks-Barrow Top of the World Summer School

John Walsh, Vladimir Alexeev, and Elena Sparrow (University of Alaska Fairbanks)

Arctic climate is the result of a complex interplay between the atmosphere, the ocean, sea ice and a terrestrial component in which freezing and thawing are critical to variations over a range of timescales. In view of the delicate balances between these components and their poorly documented sensitivities, it is not surprising that global climate models show the largest disagreement, and also the strongest greenhouse-induced changes, in the polar regions. Since changes in the Arctic may well have global implications, it is essential that Arctic climate simulations be enhanced in order to reduce the uncertainties in projections of climate change. Given the challenges and opportunities in Arctic modeling, the International Arctic Research Center's (IARC) 2008 summer school at the University of Alaska Fairbanks (UAF) was designed to bring the next generation of climate modelers to the Arctic.

The two-week summer school brought together a group of 16 graduate students and young scientists, as well as specialists in Arctic climate and climate modeling, for two weeks – the first week in Fairbanks and the second in Barrow. The young scientists gained a perspective on the key issues in Arctic climate from observational, diagnostic and modeling perspectives and received hands-on experience in the analysis of climate model output or in climate model experimentation at a level consistent with the students' expertise.

The summer school consisted of background pedagogical lectures in the mornings, and mini-projects and informal discussions in the afternoons. The mini-projects have been performed in collaboration with lecturers, and utilized existing databases and available models. The second week was spent observing and experiencing Arctic research first-hand in Barrow, Alaska in coordination with the Barrow Arctic Sciences Consortium (BASC).

Key topics covered in the lectures included key characteristics and processes of Arctic climate; an overview of global climate models; Modeling of the sea ice and the Arctic Ocean; Modeling of frozen soil regimes, especially permafrost; Arctic ecosystems and climate change; Feedbacks in the Arctic system; Past, ongoing and projected Arctic climate variations; and Trace gases, aerosols and chemistry and their importance for climate changes. The students were taken on a guided tour to the permafrost tunnel near Fairbanks where they could see and read a slice of history as far as 40,000 years back in time. Typical Northern landscapes such as polygonal tundra familiar to many only from their models or textbooks could be directly seen or even stepped on during our excursions around Fairbanks. Students witnessed and participated in taking borehole temperature measurements in Barrow's permafrost. They went to see major observational sites of the Atmospheric Radiation Measurement program as well as hydrology and carbon cycle programs.

Fairbanks is not a usual environment for people from the contiguous United States, or as it is called by Alaskans, "the lower 48." Probably, being in Fairbanks was a shock for several students. Going to Barrow made the shock complete. Can you imagine what people from California were thinking when they were asked to bring to Alaska the warmest possible clothes in June? But the moment of landing in Barrow, when it was snowing lightly, was the first proof that those parkas were actually needed. Spending a week in Barrow most likely changed their personal perspectives on how many very different places and climates exist where people can actually live, including this U.S. northernmost location.

We were all very busy with the projects and field trips during that week and the final round of presentations turned out to be very interesting. We all went to the end of the whale hunting season festival in Barrow and everyone had a chance to try whale meat, which was a challenge for some people. We saw that all the students could really appreciate coming back to Fairbanks, which looked very friendly, sunny and warm after the cloudy and cold weather in Barrow.

Student Comments

Justin Glisan, Iowa State University

"While the summer school was packed full of seminars, field excursion and project time, I never once felt overwhelmed or bored. In fact, far from bored. Our class time each day was very informative and intellectually stimulating and the fieldwork and expert guidance caught me early on and held me the entire time. Being able to explore the Tanana River bluffs and the Arctic sea ice in Barrow still gives me goose bumps today, as I write this, 3000 miles away.

"The connections that were produced in the sunlit nights of Fairbanks and on the sea ice near Point Barrow will stay with me forever. These memories will always remind me that each of our individual fields do more than just work to advance the science; they forge life-long friendships and scientific collaborations built upon the ideals and knowledge base the faculty and staff at the IARC Summer School worked so hard to instill in us."

Maria Tsukernik (NCAR)

"I first learned about the IARC summer school program in 2005 … The summer school of 2005 was held on board of the Russian icebreaker *Kapitan Dranitsyn* in the Arctic Ocean. Not only the summer school fulfilled my hopes in learning about other disciplines and interdisciplinary research, I also met wonderful people from all over the world. I started a new project in collaboration with other scientists onboard and participated in many interesting discussions.

"In 2008, when I became a postdoc I once again applied to participate in the IARC summer school project. Once again, the suite of lecturers and students in the school exceeded my (already high) expectations. The setting of the school also provided a much-needed reality-check – Arctic research seems closer to home in Alaska. I am very grateful to IARC for these opportunities and I recommend all early career Arctic scientists to participate in this summer school program."

South American Cyclogenesis

David Mendes (Centro de Ciência do Sistema Terrestre/ Instituto Nacional de Pesquisas Espaciais, Brazil), Enio P. Souza (Federal University of Campina Grande, Department of Atmospheric Sciences, Campina Grande, Brazil) and Michel S. Mesquita

Most atmospheric phenomena are directly related to heat-to-work conversion. In nature, all these processes are constrained by the Second Law of Thermodynamics, which has at its core the entropy concept. The idea of the atmosphere behaving as a heat engine that converts heat to work is long recognized [e.g. *Brunt*, 1926]. However, only in recent decades has this concept been extended to atmospheric vortices ranging from dust devils [*Rennó et al.*, 1998] to hurricanes [*Emanuel*, 1988]. The general idea is that the energy made available through the heat-to-work conversion is used by the system to overcome dissipation thus maintaining the system during its life cycle.

Extratropical cyclones play a central role in the maintenance of global climate and are responsible for the transport of heat and moisture through the troposphere [*Peixoto and Oort*, 1992; *Simmonds and Keay,* 2000]. The South Atlantic is one of the regions of the globe where cyclones preferably occur. According to *Frederiksen* [1985], the observed location of the primary storm track just downstream and poleward of the polar jet stream in the southern hemisphere is accounted for by linear baroclinic instability theory.

However, *James and Anderson* [1984], using one of the first years of analyzed data for the Southern Hemisphere, provided by the European Centre for Medium-range Weather Forecasts (ECMWF), found that the linear dry-baroclinic theory was unable to explain the observed storm track in the South Atlantic sector. At the same time, these authors noted the anomalous low level wind field over the South American continent, with a strong mean north-south flow east of the Andes Mountains. Such flow could imply an extra source for cyclogenesis, through moisture entrainment into the low-level westerlies at midlatitudes downstream of the source in the Amazon basin [*Mendes et al.*, 2007].

In order to investigate that relationship more closely, Dr. Mendes, from the Centro de Ciência do Sistema Terrestre/Instituto Nacional de Pesquisas Espaciais (CCST-INPE, Brazil) and Dr. Souza, from the Federal University of Campina Grande, Brazil, used NCEP/NCAR data to set up their study. They used various meteorological variables for the region of 120°W–0°, 60°S–0°S, spanning the period from 1979 through 2003. The data were used to study the thermodynamic state of the system through two variables: the equivalent potential temperature (θ_e) and the saturation equivalent potential temperature (θ^*_e). These variables can be related to entropy [*Emanuel*, 1989], and were therefore used for understanding cyclogenesis.

Figure 1 displays the JJA mean distribution of 850 hPa wind and 1000 hPa θ_e, and θ_e variance. It shows important meridional low-level flow on both sides of the Andes Mountains. The region of maximum θ_e (indicated by the contour lines) lies east of the Andes, extending southward along the northerly warm and moist flow from the Amazon basin, i.e. the low level jet [*Marengo et al.*, 2004]. The region of maximum θ_e variance (indicated by the shading) is much further to the south, centered near 25ºS, 60ºW, over Argentina, and coincides with a region where extratropical cyclones occur [*Gan and Rao,* 1991; *Satyamurty et al.,* 1998]. The high variance over latitudes south of 60ºS marks the mean position of the circumpolar winter storm tracks [e.g., *Simmonds and Keay*, 2000]. The fact that the region of most frequent cyclogenesis is located slightly to the south of the region of maximum θ_e variance suggests a link between the build-up of anomalous θ_e in the continent and the cyclogenesis process [e.g. *Mendes et al.,* 2007].

In summary, the mid-latitude cyclones that are produced in the southern South American region are largely controlled by interactions between the mid-latitude circulation and the tropics, through north-south flow over the continent along the east slope of the Andes Mountains. The mean circulation in the region, reinforced in the days prior to cyclogenesis (not shown here), transports moist air from the Amazon basin into eastern subtropical South America, near 15ºS 70ºW, very close to the Andes [*Mendes et al.,* 2007].

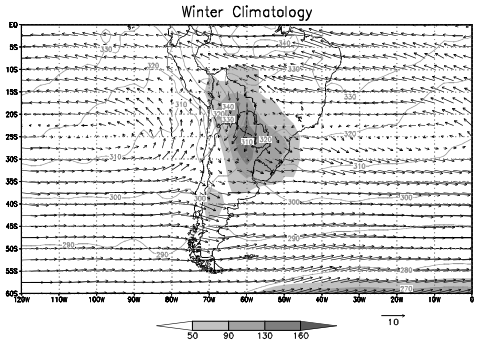

Figure 1 - Winter (JJA) climatological mean (contour lines; K) and variance (shaded; K²) of equivalent potential temperature at 1000 hPa, computed for the 1979-2003 period. Arrows represent the mean wind vector (ms⁻¹) at 850 hPa, for the same period.

Studies such as this one are important for understanding cyclogenesis in the Southern Hemisphere. The authors investigated other issues related to this subject matter that are not shown in this article. For more information, please contact Dr. Mendes at dmendes@cptec.inpe.br.

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Atmospheric Scientists Recognized by the International Radiation Commission

Charles Gatebe

The International Radiation Commission (IRC) recognized three scientists at the quadrennial International Radiation Symposium held in Foz do Iguacu, Brazil, August 3-8, 2008 for making extraordinary contributions to radiation research. Prof. Graeme L. Stephens from Colorado State University (U.S.) was awarded the IRC Gold Medal, while Drs. Ilan Koren of Weizmann Institute of Science (Israel) and David C. Tobin, University of Wisconsin (U.S.) were presented with the IRC Young Scientist Award.

Dr. Graeme L. Stephens, a distinguished professor of atmospheric science, was awarded the IRC Gold Medal award for making "important contributions across a range of areas that include the development and analysis of models of all types (from climate models to cloud process models) to understand how clouds affect our climate, to pioneering applications of remote sensing information..." The outgoing president of the IRC, Prof. Terry Nakajima, described Dr. Stephens as "one of the most active and most influential scientists in the atmospheric science especially in the atmospheric radiation and remote sensing societies."

Dr. Ilan Koren was awarded the IRC Young Scientist award for his remarkable contributions to the understanding of the interactions between atmospheric aerosols, clouds, and radiation. Dr. Koren received his PhD in 2002 and has already published over 25 papers, three of which appear in high impact journals such as *Science*.

Dr. David Tobin was also awarded the IRC Young Scientist award for making exceptional advances in the measurement and semi-empirical representation of the water vapor continuum absorption, notably, "development and validation of the latest water vapor continuum model, MT(Tobin)_CKD, which is now used in state-of-the-art line-by-line radiative transfer models." Dr. Tobin received his PhD degree in 1996.

The awards are presented every four years to one senior scientist who has made contributions of lasting significance to the field of radiation research and to one or two young scientists who have made noteworthy contributions to radiation studies and are regarded as becoming leading radiation scientists of lasting significance to the field of radiation research.

German Climate Computing Centre Boosted by High-Performance Computing Capacities

Hans von Storch

For 21 years, the "German Climate Computing Centre" (DKRZ) has provided the much needed computational resources for German climate research. To do so requires a multi-million investment to keep the hardware up-to-date and on a competitive level. Now, 60 million Euros have been made available to allow a successful continuation of the services of DKRZ - 26 million Euros by the City of Hamburg for a new building and 33 million Euros by the Federal Ministry of Education and Research (BMBF) for a new high-performance computer and a new data archive for the new facilities.

The German Climate Computing Centre

The DKRZ is formally a joint company run by four shareholders, namely the Max Planck Society, the City of Hamburg and the two Helmholtz Centers (GKSS in Geesthacht and Alfred Wegener Institute for Polar and Marine Research in Bremerhaven). The latter two together hold a little less than 20% of the shares, the Max Planck Society about 50% and the City of Hamburg the remainder. The task of the shareholders is to provide a budget to cover the costs for running DKRZ, while the BMBF covers the costs for buying new hardware. This is now the fourth time that such an investment has been made, after earlier installments in 1988, 1994, and 2001 (for an account of the changing hardware, refer to the Terraflops newsletter from April 2004).

In exchange for the ministerial investment, half of the available computer time is distributed among projects mostly run by German institutes and funded by the ministry, the European Union or the German Science foundation. Also, so-called "consortial simulations" are executed, which are of interest for a broader community. They are run to an equal extent on the "BMBF account" and the accounts of the shareholders. So far, two consortial simulations have been concluded recently, namely IPCC-type climate change simulations with the global ECHM5/MPI-OM and with the regional CLM models. A third one, "Millennium," is presently being executed – its purpose is to simulate the past 1000 years with realistic forcing and an interactively described carbon cycle. The outcomes of such simulations are freely available for the global climate community.

The selection of consortial simulations and the distribution of resources are overseen by a scientific steering committee (Wissenschaftlicher Lenkungsausschuss) whose members represent the shareholders and scientific organizations such as the German Science Foundation.

New Computing Resources

The new supercomputer is an IBM Power6 system. Its capacity exceeds that of the present NEC SX-6 system by a factor of approximately 60. With a peak performance of nearly 150 Teraflop/s (150 trillion floating point operations per second) the computer will be one of the largest supercomputers being used for scientific purposes. The computer consists of 250 nodes that are connected by a high-speed infiniband network. Each of nodes contains 32 IBM Power6 processor-cores with a clock speed of 4.7 GHz.

This system will produce unprecedented amounts of simulation data. DKRZ will therefore also upgrade its storage capacity. The new data archive consists of six Storagetek tape silos with a total capacity of 60,000 magnetic tapes. The expected annual data production rate is expected to be more than 10 PetaByte and will be amongst the highest in the world. To handle this data traffic DKRZ will use the High Performance Storage System (HPSS) to manage these data (http://www.hpss-collaboration.org/).

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This new acquisition allows computing projections of future climate in more detail, because more complex processes and interactions can be included in the models. At the same time, the spatial resolution of the climate models will be enhanced. Thus regional phenomena can also be described in substantially more detail than today.

The new facility constitutes an outstanding research infrastructure for model-based simulations of global climate change and its regional effects, as required for the High-Tech-Strategy for Climate Protection of the German government.

The DKRZ is a brainchild of Professor Klaus Hasselmann, the legendary founding director of the Max-Planck Institute of Meteorology. Dr. Hasselmann laid the foundation of modern German climate Research during his 25-year leadership (1976-2001), during which the establishing the DKRZ was an important step (for an account of the context, refer to the interview with Dr. Hasselmann).

Klaus Hasselmann (right) and Wolfgang Sell (left) founded the German Climate Computing Center and made it scientifically and technically a stunning success.

Stratospheric Processes and their Role in Climate

Juan A. Añel

The SPARC (Stratospheric Processes and their Role in Climate) 4th General Assembly (http://www.cmcc.it/web/public/sparc-ga2008) was held in Bologna, Italy from Aug. 31 to Sept. 5. The scientific program was divided into six different topics for the oral presentations and extensive poster session: crosscutting issues, stratosphere-troposphere dynamical coupling, extratropical upper troposphere/lower stratosphere (UTLS), detection and attribution of stratospheric change, tropical tropopause layer and atmospheric chemistry and climate. Dr. Peter Haynes and Dr. Thomas Peter were the Scientific Organizing Committee Co-Chairs. The Local Organizing Committee members were Dr. Elisa Manzini, Dr. Susanna Corti, Dr. Chiara Cagnazzo, Dr. Federico Fierli, Dr. Micaela Pantano and Dr. Elisa Palazzi.

Dr. Susan Solomon gave the Opening Lecture. It was an overview of the last IPCC assessment and its links with the current research on the stratosphere and the UTLS. She pointed out one of the recurrent subjects in the first days of the conference – uncertainties in the Brewer-Dobson circulation. The mechanisms involved in its changes and derived implications were more specifically addressed by Dr. Rolando García, Dr. Charles McLandress and Dr. Richard Scott.

The chemistry of the UTLS and the exchange between the upper troposphere and lower stratosphere was one of the major issues during the Extratropical UTLS session with two invited presentations in the morning by Dr. Daniel Murphy and Dr. Markus Rex. Moreover, Dr. Thomas Birner gave an invited presentation about the dynamical aspects of the tropopause inversion layer.

Ozone loss and recovery and water vapor transport were two major issues during the session about detection and attribution of stratospheric change with two interesting presentations by Dr. Paul Newman and Dr. Neil Harris. One of the topics was the estimated time for the recovery of the Antarctic ozone hole, which according to the last results could be as late as in the 2070's. Climate change could be accelerating this recovery but not by much.

The day dedicated to the tropical tropopause focused mainly on observations, while several issues about stratospheric modeling, including the representation of several stratospheric features, were addressed during the last session. For example, Dr. Stephan Fueglistaler showed the advantages of the ERA Interim reanalysis with respect to ERA-40 and how it is a big step forward for stratospheric research.

As mentioned above, during the conference there was a series of extensive poster sessions covering the following topics: Dynamical Coupling, Gravity Waves, Data Assimilation; Extratropics, Detection and Attribution, Variability and Climate Change, Water Vapor; and Tropics, Chemistry-Climate Coupling. In total, there were 57 oral presentations (21 invited), 336 posters were presented, and 335 people attended the meeting.

In conclusion, the SPARC 4th General Assembly was a big, exciting and useful assembly, showing the state of the art in the field of stratospheric research and the latest and more promising research lines. You can download many of the materials presented during the assembly from the SPARC web page: http://www.atmosp.physics.utoronto.ca/SPARC/.

Opportunities

Note: You may be asked for your AGU member # to open the following links. Visit the AS Section website for links to other job opportunities not listed here: http://www.agu.org/sections/atmos/ click on Job Listings/Resources.

These job postings and others can be found at:

http://www.agu.org/cgi-bin/membership_services/joblistings.cgi

Atmospheric Sciences

- NOAA Climate and Global Change Postdoctoral Fellowship Program through UCAR, Deadline Jan. 15, 2009.
- Assistant Professor Positions, Environmental Sciences and Engineering, Harvard University, Reviews begin Nov. 30
- Assistant Research Professor, Environmental Analysis Facility, Desert Research Institute

- Postdoctoral position in atmospheric chemistry modeling, Atmospheric Sciences and Global Change Division at Pacific Northwest National Laboratory
- Research Associate, Cooperative Institute for Research in Environmental Sciences, Position available starting Dec. 1
- Postdoctoral fellow in climate modeling, Institute for the Study of Society and Environment, NCAR, apply by Nov. 14
- Faculty position, Atmospheric Chemistry in the Air Pollution Research Center, University of California, Riverside. Reviews begin Dec. 1
- Postdoctoral fellow in atmospheric chemistry, Dept. of Atmospheric Science, Colorado State Univ.
- Postdoctoral position, Atmospheric Biogeosciences program, University of Georgia. Reviews begin Nov. 15
- Visiting scientist, NOAA Air Resources Lab, Silver Springs, Maryland
- U.S. CLIVAR Climate Predictions Applications Postdoctoral Program, deadline Dec. 15

Interdisciplinary

- Meteorologist position with NASA/ George C. Marshall Space Flight Center: atmospheric modeling and data assimilation, Huntsville, Alabama.
- Postdoctoral research fellowships, Harvard University Center for the Environment, deadline Jan. 15
- Faculty position in coupled ocean-atmosphere modeling, Florida State University, Deadline Dec. 5
- Faculty positions in terrestrial carbon and water cycle science, Boston University. Reviews begin Dec. 15
- Ph.D. opportunities in Alaskan paleoclimate, Las Vegas Isotope Science Lab
- AAAS Science and Technology Policy Fellowhsips, Deadline Dec. 15
- Cormack Postdoctoral Fellowship in Global Change, Johns Hopkins University. Deadline Dec. 1
- Postdoctoral fellowships in the Earth, Environmental and Ocean Sciences, Lamont-Doherty Earth Observatory. Deadline Jan. 9
- Postdoctoral and senior research awards, summer faculty fellowships, and Davies teaching fellowships, National Research Council of the National Acadamies. Next deadline is Feb. 1
- Tenure-track faculty position in atmospheric and oceanic sciences, Department of Geosciences, Princeton University, Reviews begin immediately
- Three modeling positions, Potsdam Institute for Climate Impact Research
- Visiting fellowship opportunities, CIRES, deadline Dec. 31

Student Opportunities

- NSF graduate fellowships for research on vegetation-climate interactions in the Amazon, University of Arizona or Harvard University, Deadline Dec. 8
- Ph.D. and M.S. research assistantships in Interdisciplinary Hydrology Program, New Mexico Tech
- Assistantships to study atmosphere-biosphere exchange and aerosol formation; or remote sensing, Michigan Tech
- Ph.D. positions in land surface modeling, Department of Civil and Environmental Engineering, University of Michigan
- Undergraduate summer program, NSF's Research for Undergraduates Program, Arecibo Observatory in Puerto Rico

Conferences

- **2008 Fall Meeting, December 15-19, 2008, San Francisco, California, USA** **http://www.agu.org/meetings/fm08/**
- **International Conference on Climate Change: Impacts and Responses**, Jan. 9-11, 2009, Bharati Vidyapeeth Institute of Environment Education and Research, Pune, India http://www.climate-conference.com
- **Fifth International Conference on Technology, Knowledge and Society**, Jan. 30-Feb. 1, 2009, Huntsville, Ala. http://www.Technology-Conference.com
- **2009 National Storm Conference**, March 14, 2009, Colleyville, Texas http://www.tessa.org/meeting.html
- **2009 World Congress on Computer Science and Information Engineering**, Mar. 31-Apr. 2, 2009, Los Angeles, Calif. http://world-research-institutes.org/conferences/CSIE/2009
- **Chapman Conference on Effects of Thunderstorms and Lightning in the Upper Atmosphere,** May 10-15, 2009, University Park, Pennsylvania http://www.agu.org/meetings/chapman/2009/bcall/
- **2009 AGU Joint Assembly - Meeting of the Americas**, May 24-27, 2009, Toronto, Canada www.agu.org/meetings.ja09
- **Third International Conference on Knowledge Generations, Communication and Management**, July 10-13, 2009, Orlando, Fla. http://www.2009iiisconferences.org/kgcm
- **Second International Symposium on Academic Globalization**, July 10-13, 2009, Orlando, Fla. http://www.2009iiisconferences.org/AG
- **Seventh International Conference on Computing, Communications, and Control Technologies**, July 10-13, 2009, Orlando, Fla. http://www.2009iiisconferences.org/CCCT
- **6th GKSS School of Environmental Research: Statistical Analysis in Climate Research**, Oct. 6-16, 2009, Lecce, Italy http://coast.gkss.de/events/6thschool