Autumn 2008
Atmospheric Circulation
Newsletter of the University of Washington Atmospheric Sciences Department

Let It Snow!

by Mark Stoelinga

The snow study research site at Stevens Pass during winter 2007/2008.

As was widely reported in the local media, the winter of 2007/2008 witnessed a bountiful snow season in the Cascade Mountains, providing a boon to skiers, utility providers, and Research Associate Professor Mark Stoelinga. Stoelinga's research group conducted field studies at Stevens Pass this past winter to study the microscopic properties of falling and accumulating snow particles, with an eye toward improving weather forecasts produced by the computer weather prediction models on which the National Weather Service, and ultimately the public, rely.

The field work actually began in the previous winter of 2006/2007, during which Stoelinga's research team, which included Research Scientist John Locatelli and graduate students Hafen McCormick and Jerry Casson, resided at Snoqualmie Pass for three months in two small A-frame cabins immediately adjacent to their research trailer. While that winter provided near normal snowfall in the Washington Cascades, the low elevation of Snoqualmie Pass (3020 ft/920 m) resulted in significant portions of the precipitation falling as either wet snow or even rain, not ideal for studying the behavior of snow crystals. So the team decided to relocate to Stevens Pass for this past winter's observations. Stevens Pass Ski Area took an interest in the scientific endeavor, and generously allowed the research team to locate their research trailer at the base of the ski area, with unlimited electric power and snow removal services provided. The higher elevation of Stevens Pass (4060 ft/1240 m), coupled with a snow year that produced 180% of normal snowpack in the central Washington Cascades, made for a very good winter of observations.

The research endeavor was motivated by an increasing recognition of the importance of snow microphysical processes in precipitation production, coupled with a lack of data on the properties of snow that relate to the physics of precipitation growth, and a general oversimplification of the representation of snow properties in computer weather prediction models. Essentially, most computer models treat snow particles as "little snow balls," or spheres of constant density, regardless of the conditions that lead to their growth. However, snow particles are known to take on a variety of shapes and densities. This variability is related to both the habit type of ice growth (e.g., "dendrites," "plates," "needles," etc.), which is determined by the temperature and humidity conditions at which the particle grew by vapor deposition; and by the degree of riming growth, which occurs when a snow particle encounters and collects supercooled liquid water cloud droplets that subsequently freeze onto the snow particle, making it denser. Different habit types and degrees of riming can result in large differences in important properties of falling snow particles such as their mass, fall speed, and ability to grow further by deposition or riming. Also, the properties of the snow that accumulates on the ground, such as density, depth, and structural strength, are affected by the shapes and densities of snow particles that fell. These properties of accumulated snow are important for forecasting of snow depth and avalanche potential.

During both winter seasons, observations were conducted with essentially the same routine and strategy. Particle samples were collected by an observer on a glass slide every 15 minutes during snowfall events, and examined under stereomicroscope within the research trailer (see photo) to assess the relative percentages of habit types seen, and degrees of riming. At the same time, a series of other manned and automated observations were taken of precipitation rate, new snow depth, particle size distributions, and particle fall speeds. Other tests were conducted on accumulated snow, such as rate of compaction under load, and shear strength. The key goal was to be able to relate all these properties to the habit and riming composition of the snow particles.

The data set collected during the observational studies provides an unprecedented long-term record of snow particle types that occurred throughout many different orographic winter storms in the Cascades. One application of the data set is to estimate the total mass of different habit types that comprise the snow accumulation during typical storms in the Cascades. The analysis indicates that, for example, dendritic (intricately branched) crystals comprise around 40% of the total mass of Cascade snow fall, whereas hexagonal plates comprise only about 2%. This kind of information is valuable for determining which habits are important to predict and which are not. Another important parameter that was measured is particle fall speed. These measurements were gathered with an automated imaging instrument known as a video disdrometer, mounted on the roof of the research trailer, which measured the size and fall speed of every particle that fell through a 6"×6" opening. In conjunction with the habit type observations, the disdrometer observations allowed the researchers to develop relationships between particle fall speed and both habit type and degree

(Continued on page 4)

Graduate student Hafen McCormick examines snow particles under a stereomicroscope.

Chair's Column

One of my favorite features, in both *Atmospheric Circulation* and the alumni newsletters I receive from my alma maters, is the section on alumni news. So I'd like to begin by thanking David Mechem (Ph.D. 2003) for sending us the news about his daughter's science fair project. I hope that many more of you will send us bits on news about your current family or activities that we can share in next year's edition of *Atmospheric Circulation*.

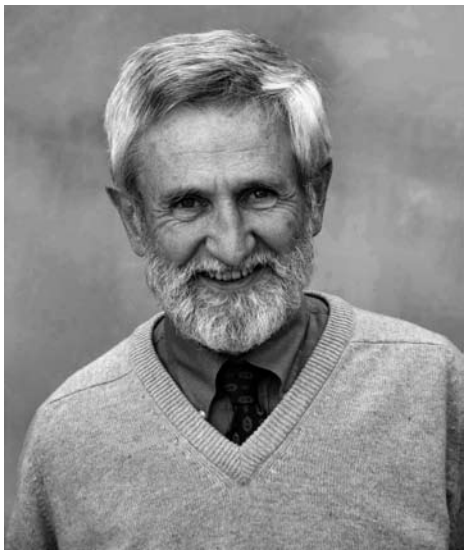
Aside from the consistency of the Husky football program this fall, perhaps the biggest piece of news at UW is the creation of a new College of the Environment. This is likely to impact our department in many ways. The first way is that it has drawn Dennis Hartmann, who just finished a five-year term as our departmental chairman, back into the treacherous rapids of university administration. Dennis has agreed to serve as the Interim Dean for the new college. Due to his busy administrative schedule, winter 2009 is likely to be the first quarter since 1994 during which Dennis does not teach ATMS 552 (Objective Analysis).

There is also a reasonable chance that our department will find itself moving from the College of Arts and Sciences to the College of the Environment. Forecasting future administrative decisions, some of which may be influenced by the economy, is not a whole lot easier than forecasting the weather, so you may need to wait for the next issue of *Atmospheric Circulation* to find out how the College of the Environment develops. In the mean time you can read more about the new college on this page.

Before closing I'd like to call your attention to our new effort to put alumni theses online (see p. 8). We would love to have you submit a pdf of your thesis for our new online library. As always we also greatly appreciate all donations that have been given to the department by our alumni and friends. Your help this past year has made a tremendous difference.

Best wishes,
Dale Durran

Featured Professor: Mike Wallace



Mike Wallace

John Michael Wallace began his preparation for graduate school in meteorology by obtaining a B.S. in Naval Architecture in 1962 from the Webb Institute of Naval Architecture in Glenn Cove, N.Y. Even as an undergraduate, Mike's first love was meteorology, which he proved during his time at Webb by staying up all night to watch a blizzard instead of studying for a final exam in Boiler Design. After graduation, Mike had offers to study atmospheric science from two graduate schools: M.I.T. and UW. Having roots in the northeast, he elected to attend the school closest to his neighborhood. While at M.I.T., Mike was an early user of computers, starting with a Librascope General Precision 30, a twin to the machine used by Ed Lorenz in his studies of predictability. Soon after his arrival at M.I.T., Mike, working under the guidance of Reggie Newell, switched to the new super computer of its day, an IBM 7090 (which according to Wikipedia, could be rented for $63,500 a month in 1960). Working on the IBM, Mike was able to switch from paper tape to the convenience of computer punch cards, and also to program in a high-level language: FORTRAN. Mike's Ph.D. thesis involved an analysis of the quasi-biennial oscillation and an entire closet of punch cards filled with data from all over the globe.

Mike graduated from M.I.T. in 1966 and was interviewed for a position as a UW assistant professor of Atmospheric Sciences one Saturday morning in Boston. There he met the chairman of our department, Phil Church, who was simultaneously repairing a grandfather clock at the headquarters building of the American Meteorological Society and recruiting faculty. The repair was evidently successful, as was Mike, who soon received a job offer from UW. Mike took the job, married Susie, and headed west.

Once at UW, Mike began work with Dick Reed, Jim Holton and grad student Vern Kousky that led to Mike and Vern's seminal paper on the quasi-biennial oscillation. In the early 1970s the department began to attract physics students who had little background in atmospheric science, so Mike developed the ATMS 501 course (Fundamentals of Physical Meteorology) that he continues to teach to this day. Mike must have really figured out how to present that material, because he was honored with the departmental teaching award in both 1990 and 2003. Mike, collaborating with Peter Hobbs, used his 501 course notes to write the first edition of *Atmospheric Science: An Introductory Survey* in 1977. A thoroughly reworked second edition of Wallace and Hobbs appeared in 2006.

Mike served as chairman of our department from 1983–1988, during which time he also became the director of the Joint Institute for the Study of the Atmosphere and Ocean (JISAO). Although he remained very active in the department, he moved his office over to JISAO after stepping down as chair. We finally welcomed Mike back into his current fifth-floor office in the ATG building in early 2006, and we have loved having him so available ever since.

ATMS May Join New College of the Environment

by Dennis Hartmann

Advancing the human condition will require that we live sustainably and maintain a well functioning natural environment that we value for its own sake and because we depend upon it for survival. Achieving this is one of the great challenges of the current century. The UW aspires to contribute to this challenge by developing a world-leading College of the Environment, in which research and learning contribute to a better future. UW has existing strengths that can contribute to this effort (e.g., ATMS), and seeks to integrate and build upon those strengths in a way that both supports the excellence, core competencies and culture of existing units, while creating greater connec-

(Continued on page 3)

In Memoriam

Richard J. Reed, Professor Emeritus of Atmospheric Sciences, passed away on February 4, 2008. He was 85.

Richard Reed

After serving in the Navy during World War II, Reed graduated from the California Institute of Technology and in 1949 received his doctorate in meteorology from Massachusetts Institute of Technology. In 1954 Reed joined the UW faculty. As a researcher he was highly regarded and helped guide the careers of current UW faculty members and promoted educational opportunities for students. Anonymously Prof. Reed and his wife, Joan, endowed a scholarship for undergraduates now called the Richard J. and Joan M. Reed Endowed Atmospheric Sciences Scholarship.

In the 1950s he discovered the quasi-biennial oscillation. The oscillation has been found to affect monsoon precipitation in the tropics and stratospheric circulation during winter in the northern hemisphere. In this phenomenon the wind in the tropical stratosphere alternates between easterly and westerly approximately every 28 months and during that time gradually moves lower in the stratosphere.

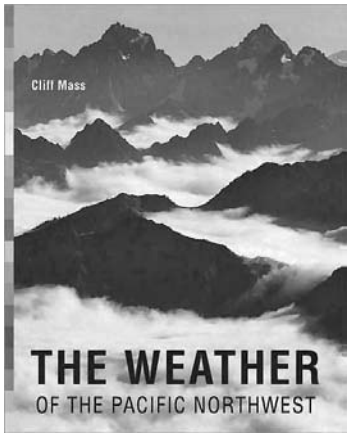
In 2002 the American Meteorological Society held a special symposium—A Half Century of Progress in Meteorology: The Richard Reed Symposium—at the AMS Annual Meeting, honoring his extraordinary scientific achievements. In the program it was noted he was being honored for more than just his influential research "but also for his leadership in the national and international science community, his teaching and advising of three generations of graduate students, and the inspiration he has provided to these students and others over the course of the last half of the 20th century."

Reed was a member of the National Academy of Sciences and a fellow of the American Meteorology Society, the American Geophysical Union, and the American Association for the Advancement of Science.

For further information on Richard Reed go to http://www.atmos.washington.edu/Reed. Also available is a slide show at http://www.atmos.washington.edu/Reed/Slides.pdf.

New Book by Cliff Mass on Northwest Weather

University of Washington Press has recently released a book on Northwest weather by department faculty member Cliff Mass. Written for a lay audience, yet of interest



to a professional meteorologist, *The Weather of the Pacific Northwest* is a comprehensive guide to the weather of the region, reviewing snowstorms, windstorms, floods, and other major regional weather events. It also describes the climatology of the Northwest, the potential local effects of global warming, how weather forecasts are made, and local weather features like the convergence zone and diurnal winds. Other sections talk about regional dust storms, avalanches, how to interpret the sky, the meteorological influence of the Mount Saint Helens eruption, and even mountain wave clouds that resemble UFOs. Much of the book is based on research completed within the department. For more information on the book please visit: http://www.washington.edu/uwpress/search/books/MASWEA.html.

***New College**, cont. from page 3*

tions among natural science, social science and policy disciplines.

The new college will have core departments like a traditional college, and it is proposed that this might include geosciences departments like Atmospheric Sciences, natural resource units like forestry or fisheries, as well as social scientists, and policy experts to integrate the human dimension of environmental problems. Novel aspects of the new college will be a research institute in which interdisciplinary teams will be assembled to undertake timely and intensive investigations of key problems. Problems could be interdisciplinary within the natural sciences, or between and among the natural, social and decision sciences. A further novelty of the new college is that it is challenged to promote and encourage environmental research and learning across the whole campus, extending beyond its core schools and departments. This "porosity" can be achieved through the institute, through new interdisciplinary academic programs, and through joint appointments of faculty.

The Board of Regents formed the new college in June of 2008, and Professor Dennis Hartmann of the Department of Atmospheric Sciences was appointed Interim Dean of the new college as of July 1, 2008. The immediate challenge is to decide which units should form the core of the new college by becoming inaugural units. The plan proposed to the Regents included six schools and departments, plus the Program on the Environment. This would give the new college a huge impact from the start, incorporating all of geosciences, plus forestry, land ecology and fisheries. This would make the new college the third or fourth largest at the UW, and highly visible on the national and international scene. The process of changing the organizational structure of the UW is a deliberate one that involves the faculty of the affected units in internal and campus-wide discussions that will take some time to complete. The faculty of the Department of Atmospheric Sciences strongly support the new college, and we are likely to be one of the first units to join. More information about the new college can be found at http://coenv.washington.edu/.

Second Fleagle Lecture

Dr. Ralph Cicerone was the Robert Fleagle Endowed Lecturer for 2008. He gave two lectures while visiting the department. On May 13 he gave the public lecture entitled "Climate Change and Human Energy Usage: Constraints and Options" and on May 14 he gave a department seminar entitled "World Energy Usage: Finding a Sustainable Trajectory."

Dr. Cicerone is the president of the National Academy of Sciences. He received his Ph.D. from the University of Illinois. He is an atmospheric scientist whose research in atmospheric chemistry and climate change has involved him in science and environmental policy nationally and internationally. His work with Richard Stolarski in 1973 led to the discovery of the C10X chain mechanisms for depletion of stratospheric ozone. His research was acknowledged on the citation for the 1995 Nobel Prize in chemistry awarded to his colleague F. Sherwood Rowland. Cicerone was also the 1999 laureate for the Bower Award and Prize for Achievement in Science. He was awarded the 2002 Roger Revelle Medal by the American Geophysical Union, which recognized his outstanding research contributions to the understanding of Earth's atmospheric processes, biogeochemical cycles or other key elements of the climate system. He was honored with the Albert Einstein World Award of Science in 2004 by the World Cultural Council for his research of "true benefit to mankind." Cicerone was the chancellor of the University of California, Irvine, before becoming president of the National Academy of Sciences.

***Let it Snow!**, cont. from page 4*

of riming, that are more statistically robust than previous studies have provided. A third application of the data is a study of the relationship between the density of new snow and particle type. Previous studies have recognized the potential importance of particle type in determining new snow density, but have instead focused more effort on the relationship of density to surface temperature at the time of snow fall, since it is more easily measured. The observations obtained in the snow study indicate a much more robust relationship between density and particle type (both habit and degree of riming) than between density and surface temperature, except for wet snow in above-freezing temperatures.

The observational study being conducted by Stoelinga's team is only half of the story in this research project. The second important endeavor is to develop improvements to the representation of snow and related processes in weather prediction models, including new capabilities to predict snow habit type and degree of riming, and to use the observations to assess the accuracy of the new prediction schemes. Hafen McCormick's research has been directed at developing the habit and riming prediction capabilities. Not only does this capability allow for a more realistic and accurate representation of snow in the atmosphere, but may also yield a better capability to predict new snow density. In related work, Jerry Casson, who came to the UW with a background in avalanche forecasting, is working on adding snow particle type-related refinements to an avalanche forecasting model developed here at the UW by Earth and Space Sciences Professor Howard Conway.

While the rather snowy winter was a boon to the quantity and quality of observations taken, it also presented challenges. As with many types of meteorological field studies, there is the ironic risk that an abundance of the very thing one wants to study can render the entire operation logistically impossible. Unlike in the previous winter when the observers resided at the research site itself, there was no lodging available at Stevens Pass, so the team stayed in U.S. Forest Service cabins in the town of Skykomish, about 10 miles west of the pass, requiring the observers to drive between the cabins and the observation site. Even in Skykomish, at an elevation of only 940 ft/290 m, snow accumulated up to a depth of 5 feet, causing several roof collapses and snow removal challenges throughout the winter. A KOMO television news team reporting on the situation happened upon one member of the research team attempting to clear snow off the roof of their residence and away from its windows, to avoid structural damage (see photo). Avalanche danger

A 25-ft wall of snow blocks the "Hairpin Turn" of U.S. Highway 2 at Tunnel Creek, after one of several large avalanches released from a slope above the road. The road was closed for 54 hours.

was also high throughout much of the season, not surprisingly with 180% of normal snow accumulation. Several avalanches led to closures of U.S. Highway 2 in the Stevens Pass vicinity, including one major slide from a chute that had not been active since the 1970s. The slide left a 25 foot-deep wall of snow across the highway at Tunnel Creek (see photo). Fortunately, the research team was able to minimize adverse impacts of the heavy snow on their observational efforts, through planning, good forecasting, and tireless efforts at snow shoveling at both the Skykomish cabins and the Stevens Pass research site. Invaluable snow removal assistance was also provided by the big machines from Stevens Pass Ski Area. These efforts, in addition to many long and usually unglamorous hours of observations by the research team, made possible the collection of a unique and valuable data set that will continue to provide insights into the behavior of snow and improvements in the forecasting of winter precipitation for a long time to come.

Research Associate Professor Mark Stoelinga shovels snow from the roof of the U.S. Forest Service cabin in Skykomish to prevent damage to the roof and windows. (Photo: Courtesy of KOMO 4 News.)

VOCALS Regional Experiment

by Robert Wood

During October and November 2008, some 150 scientists from 40 institutions in 8 nations, including several from UW Atmospheric Sciences, are taking part in the VAMOS Ocean-Cloud-Atmosphere-Land Study Regional Experiment (VOCALS-REx). VOCALS-REx is an international field program, led by the department's Assistant Professor Robert Wood, designed to make observations of poorly understood but critical components of the coupled climate system of the southeast Pacific, a region dominated by strong coastal upwelling, extensive cold SSTs, and home to the largest subtropical stratocumulus deck on Earth. A total of five aircraft including the NSF C-130, the DoE G-1, the CIRPAS Twin Otter, and two aircraft from the UK, and two research vessels (the NOAA *Ronald H. Brown* and the Peruvian IMARPE *José Olaya*) are sampling the lower atmosphere and upper-ocean during VOCALS-REx. These platforms are complemented by two land-based sampling sites with research groups from Chile, Sweden, and the United States. Specific foci are processes controlling the properties of stratocumulus clouds including continental aerosols from smelters and volcanoes, processes controlling the ocean transport of cold, fresh water offshore, and the chemical and physical interactions between the lower atmosphere and upper-ocean. "VOCALS-REx provides a unique multidisciplinary opportunity to understand the physical and chemical couplings between different components of a regional climate system," says Robert Wood, the US Principal Investigator on VOCALS-Rex. Other members of our department who will participate in the field phase include Professor Chris Bretherton, Dr. Duli Chand, and graduate students Rhea George, Chris Terai, and Andy Berner.

First Hobbs Memorial Endowed Lecture to be Presented in October

The inaugural Peter V. Hobbs Endowed Lecture will be presented this October by Emeritus Professor Keith Browning, FRS. Browning did his Ph.D. at Imperial College at about the same time as Peter Hobbs and, amongst other things, they pursued parallel research into the mesoscale structure of extra-tropical cyclones. Browning spent five years in the United States but most of his work was done in the UK within the Met Office, where he later became Director of Research before becoming a professor at the University of Reading. He is now semi-retired and conducts research into convective storms at the University of Leeds. He is a Fellow of the American Meteorological Society, receiving the Rossby Medal in 2003, and is an Honorary Member and Past President of the Royal Meteorological Society, receiving their Symons Gold Medal in 2001. He was elected Fellow of the Royal Society in 1978 and is a Member of the Academiae Europaeae and Foreign Associate of the (U.S.) National Academy of Engineering.

Peter V. Hobbs Symposium at the American Meteorological Society Annual Meeting

"When Peter Hobbs Flew, the Clouds Imparted Wisdom"

Reprinted with permission from the American Meteorological Society ("The Daily BAMS," Issue 4, January 24, 2008)

In a landmark flight above Mt. St. Helens hours after it erupted in 1980, Peter Hobbs urged his pilot to fly into the edge of the plume down wind.

Photo: Courtesy of ©Rich Frishman (richfrishman.com)

"At this point bank, bang, bang…things were hitting the plane and I thought that was it because these were rocks."

It turned out instead to be a discovery of flimsy balls of particles packed by electric charge. Hobbs later called them "volcanic hail," one of many discoveries this calmly determined traveler of the clouds made in the face of danger.

The symposium in Hobbs' honor today, a year and a half after his death, might as well have been named for the clouds themselves, because the British-born meteorologist is practically synonymous with them now, given the time he spent among them and the way he shaped our understanding.

In addition to his steady stream of discoveries about all aspects of clouds—published in 340 papers—Hobbs advised more than 50 graduate students after arriving at the University of Washington in 1963, repopulating the field of atmospheric physics.

The program today is a comprehensive overview of cloud physics and its future because Hobbs was so comprehensive.

In weather modification, he turned his coolly experienced eye to reevaluating some of the most famous examples of successful cloud seeding. His continual insistence on rigorous assessments helped define the statistical and evidential standards still necessary to prove the scientific validity of cloud seeding. Cloud condensation nuclei and the growth to precipitation occupied much of his research, as did mesoscale organization, which he found often affected the way clouds grew.

Equally notable were his cloud chemistry studies motivated by understanding acid rain when it first became a major concern, according to Mary Barth of NCAR, who collaborated with Hobbs in this area.

None of this would have been possible had Hobbs not had a talent for stringing together the funds for aircraft for 40 years, starting with a WWII vintage bomber previously owned by eccentric billionaire aviator Howard Hughes.

Hobbs' first love in meteorology was not flying but observing instruments he built as a teen, and then laboratory work with the famed cloud physicist B.J. Mason.

"I quickly became disillusioned with trying to understand the complex processes that occur in clouds through laboratory experiments," Hobbs recalled in 2002. After attempting to research clouds on the inhospitable slopes of Mount Olympus in Washington, Hobbs took to the skies.

"Peter was undoubtedly the leading airborne meteorologist of his generation," colleague Cliff Mass told the UW Alumni magazine.

With a penchant for high-drama Wagnerian opera, Hobbs somehow managed to downplay the excitement in the air and focus on observing through oil plumes over Kuwait, lightning strikes, and heavy turbulence.

"No matter how rough it gets he was very cool and collected…either he didn't realize or maybe he's an extremely brave person," one of his pilots, Ken McMillen, remarked a few years ago.

Hobbs explained that clouds are "one of the most important problems that one can work on for the fact that life on earth depends on clouds being there."

Alumni News

The UW Atmospheric Sciences Alumni Reunion Reception will be held in Phoenix in conjunction with the AMS Annual Meeting (Jan. 11–15). Watch our home page for updates on date and time.

Brian Garcia, Class of '03, is now working with NOAA's Ocean Prediction Center in the D.C. area, within NCEP's world weather building. Brian said, "It is very exciting to be with NOAA and surrounded by not only operational meteorology, but terrific research and computing resources that provide the world with global forecast models." Joe Sienkiewicz another UW alum is the science and operations officer of the Ocean Applications Branch.

David W.J. Thompson (alum 2000) is now an associate professor at Colorado State.

Baby News—Brian and Heidi Magi were very happy to announce the birth of their daughter Anja Davin on November 10. Katie (Crahan) and Brian Kaku welcomed their son Sebastien on May 5.

A Scientist in the Making—Sarah Mechem, daughter of alum David Mechem (Ph.D. 2003). She's posing with her project at the Washington Elementary science fair in Norman, OK. Notice she's wearing a UW Atmospheric Sciences t-shirt. Her project was entitled "Electromagnetic Investigations." She constructed an electromagnet from a very large spike (nail) and telephone wire. It was powered by a DC power supply her father had sitting around. Sarah varied the number of coils of wire wrapped around the spike and hypothesized that a greater number of coils would lead to a stronger magnet. She measured magnet "strength" by the number of BBs it could pick up. I don't recall how many different "turns" she experimented with, but it didn't really make much difference. [I think the fewest number of turns saturated the medium, so more turns or current wouldn't increase the field strength any more.] Still pretty fun, all in all. –David Mechem

Sarah Mechem

August in Brazil

by Bonnie Brown

Most students relish their course-free summer break, but this August a group of atmospheric sciences undergraduates eagerly anticipated taking an extra math class. We were headed to Rio de Janeiro, Brazil, to learn about climate modeling. Every summer, groups of UW students fan across the globe to participate in University-organized Exploration Seminars. This seminar, organized by Applied Math chair Prof. Nathan Kutz, focused on climate and ocean interactions. Starting with the simplest climate models from the 1960's, we worked our way up through ENSO and the shallow water equations, finally ending with a group modeling project presented to the class. Final project topics ranged from modeling the greenhouse effect of water vapor to using the shallow water equations to recreate Hurricane Katrina to coupling phytoplankton productivity to temperature and carbon dioxide levels.

When we were not hard at work on our models, there was plenty of time to explore the second largest city in Brazil. The class visited popular sights including Sugarloaf Mountain, Corcovado and Christ the Redeemer (the largest art deco sculpture in the world!) and Jardim Botanico (Botanical Gardens). Some members of our group managed to visit Copacabana Beach every day of our trip. We even ventured out of the city as a group to tour the islands of Angra dos Reis by boat, south of Rio. Other activities included soccer games, hang-gliding and hiking. Overall, the sentiment of the students as well as that of out instructor was that the trip was a tremendous success.

Congratulations to Graduates

Doctor of Philosophy

Larissa Back, *Towards an Improved Understanding of Deep Convection Patterns over the Tropical Oceans* (Bretherton)

Peter Caldwell, *Subtropical Stratocumulus and its Effect on Climate* (Bretherton)

Stephen Hudson, *Solar Radiation Processes on the East Antarctic Plateau: Interaction of Clouds, Snow, and Atmospheric Gases* (Warren)

Mary Celeste Johanson, *Satellite Inferred Atmospheric Temperature Trends Since 1979 and an Analysis of Hadley Cell Widening in Observations and Models* (Fu)

P. Alex Reinecke, *Mountain Waves and Downslope Winds: Forecasts, Predictability, and Data Assimilation* (Durran)

Kevin Rennert, *Relationships Between Wintertime Modes of Atmospheric Variability on Intermediate and Long Timescales* (Wallace)

Sarah Strode, *Mercury in the Atmosphere and Ocean: Sources, Transport, and Global Impacts* (Jaeglé)

Michael Town, *Investigations into the Climate of the South Pole* (Warren)

Justin Wettstein, *Storm Track Variability and Interaction with the Background Flow on Daily, Interannual and Climate Change Time Scales* (Wallace)

Jian Yuan, *The Dependence of Clouds and their Radiative Impacts on the Large-scale Vertical Velocity* (Hartmann)

Master of Science

Chaim Garfinkel, *External Sources of Interannual Variability of the Polar Vortex* (Hartmann)

Brigid Dotson, *Major Windstorms of the United States Pacific Northwest* (Mass)

Deanna Hence, *Kinematic Structure of Convective-scale Elements in the Rainbands of Hurricanes Katrina and Rita (2005)* (Houze)

Clark Kirkman IV, *Mechanisms of the Southern Ocean Warming Delay* (Bitz)

Rahul Mahajan, *Spatial Growth of Perturbations in Turbulent Baroclinic Flows* (Hakim)

Steven Robinson, *Improvements to the Cirrus Radiative Properties Parameterization in the Fu-Liou Radiation Model and an Evaluation of its Dependence on Ice Crystal Shape* (Fu)

Mark Zelinka, *Evolution of Humidity and Clouds in Association with Tropical Deep Convection* (Hartmann)

Bachelor of Science

Domenick Alessi (NROTC)
Fumiya Bito
Bonnie Brown
Jennifer Chang
Zachary Oliver
Michael Soltow
David Weir

Undergraduate and Faculty Research

The following undergraduate students and faculty members worked together during the past year:

Helen Amos/Theodore Anderson: CALIPSO satellite data analysis.

Jayson Stemmler/Theodore Anderson: CALIPSO satellite data analysis.

David Weir/Robert Wood: Using satellite and ship cruise data to understand aerosol-cloud interactions over the southeastern Pacific Ocean.

Helen Amos/Becky Alexander: Investigating acidification mechanisms of Saharan dust using oxygen isotopes of sulfate and nitrate aerosols.

Bonnie Brown/Greg Hakim: Thermodynamic profiles of cyclonic tropopause vortices, as well as their predictability.

Welcome to New Graduate Students for 2008–2009

Andrew Berner, Principia College

Bonnie Brown, University of Washington

Nicole Feldl, 2nd Year Grad., transferring from UW Earth & Space Sciences; University of Colorado

Beth Friedman, Carleton College

Bryce Harrop, University of Illinois–Urbana Champagne

Benjamin Hillman, Western Washington University

Matthew Hills, University of Reading, UK

Yurong Luan, Chinese Academy of Meteorological Science, China

Jacob Scheff, University of Illinois–Urbana Champagne

Adam Skalenakis, Harvey Mudd College

Christopher Terai, Amherst College

Tyler Thorsen, Pennsylvania State University

Scholarships and Awards

2008 American Meteorological Society Fellows:

Bonnie Brown, Jacob Scheff

2008 Program on Climate Change Fellows:

Bryce Harrop, Jacob Scheff

2008 Hobbs Scholarship:

Matthew Hills, Jacob Scheff

2008 Fleagle Scholarship:

Tyler Thorsen

2008 Interdisciplinary and Policy Dimensions of the Earth Sciences Fellowship:

David Reidmiller

2008 National Defense Science and Engineering Graduate Fellowship:

Anthony Didlake Jr.

Best Student Paper at the 2008 Western Snow Conference:

Joseph Casola

Mary Gates Scholarship:

David Weir

2008 Reed Scholarship:

Felipe Lopez-Hilfiker, Nicholas Wayand

Phil Church Award:

Michael Soltow

The Phil Church Award is given to the graduating senior in the Department of Atmospheric Sciences with the most outstanding record of scholarship, leadership and service. Professor Phil Church was the founder and first Chair of the Department of Atmospheric Sciences.

Atmospheric Sciences Achievement Awards:

Domenick Alessi **Fumiya Bito**
Bonnie Brown **Jennifer Chang**
Michael Soltow **David Weir**

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Department News

Professor Dennis Hartmann has been named the interim dean for the new UW College of the Environment. This year he was also elected to serve on the UCAR Board of Trustees.

Conway B. Leovy was named a fellow by the American Association for the Advancement of Science. He was recognized for pioneering studies of the Martian atmosphere and the dynamics of the Earth's upper atmosphere, and service to the planetary and atmospheric sciences communities. Conway is an Emeritus Prof. of Atmospheric Sciences and Geophysics who received a doctorate from the Massachusetts Institute of Technology. He has been a UW faculty member since 1968.

Philip Mote, Research Scientist, Climate Impacts Group (JISAO) and Affiliate Professor of Atmospheric Sciences received a UW Distinguished Staff Award.

Robert Wood was awarded the 2007 American Geophysical Union Editors' Citation for Excellence in Refereeing the *Journal of Geophysical Research–Atmospheres*.

Harry Edmon, computer facility director, was honored for his 30 years of service to the university.

John Locatelli retired in July after working for Hobbs' Cloud & Aerosol Research Group (CARG) and later with Mark Stoelinga. He received his B.S. in 1967. He started with the CARG in 1968 as a Meteorologist, was promoted in 1976 to Res. Assoc., then in 1991 to Res. Assoc. Prof. He resigned his position as Res. Assoc. Prof. in 2001 to build his log home. In 2001 he was rehired as a Research Scientist.

Don Atkinson retired in September. He received his B.S. in Physics (New Zealand) and an M.B.A. at the UW in 1978. He worked for the CARG starting in 1970 as a Meteorologist, became the Dept. Manager/Administrator in 1978 after a hiatus to complete his degree, and the Building Manager/Research Coordinator in 2005.

Phil Swartzendruber won an outstanding student paper award at the 2007 AGU meeting for his paper entitled "Investigating Sources of Reactive Mercury in the free Troposphere: Is the Stratosphere Important?"

Tim Bertram, who is working with Prof. Joel Thornton, also won an outstanding student paper at the 2007 AGU meeting for his paper "Observations of Reactive Nitrogen over the North Pacific: Comparisons, Implications and Chemical Constraints." This was for work done as part of his Ph.D. at UC Berkeley.

Baby News—The Hakim family welcomed Vivienna on December 2. Rob and Jennifer Nicholas announced their newest son, Levi Oliver, born on June 13. Celeste and Norm Johanson's son Lewis Ivar was delivered on September 16.

Online Thesis Archive

We have recently created an online thesis archive which enables us to post pdfs of departmental theses on our website for easy access. You can see the archive here: http://www.atmos.washington.edu/academic/grad/html/gradtheses.html

We are currently inviting submissions of past departmental theses from UW Atmos Sci graduate alumni. If you would like to have your thesis added to the online archive, please go to the thesis submission page and complete the online form: http://www.atmos.washington.edu/academic/grad/html/submitthesis.php

PLEASE NOTE—We can ONLY accept pdf files—please do not submit any other file format. The pdf file should be compatible with Adobe Acrobat Reader 5.0.

Once we have received your submission, we will post it to the archive as soon as possible (please allow one to two weeks before inquiring).

If you have any questions about the archive or submission process, please contact Samantha Scherer, sam@atmos.washington.edu.

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