

September 2001

Atmospheric Circulation

Newsletter of the University of Washington Atmospheric Sciences Department

What Is Atmospheric Circulation?

Welcome to the inaugural edition of Atmospheric Circulation, the UW Atmospheric Sciences Department's annual newsletter for alumni and friends. We want to keep you updated on activities and pass on news from your former classmates. We welcome your news - whether it's professional or personal, a book announcement or a wedding announcement, a job promotion or news of your hiking trip to Katmandu - you get the idea. The more news we get, the better.

Last spring, members of the department were invited to suggest newsletter names. Over two dozen names were submitted. Some of the wittier suggestions included AtmosTimes, Mare's Tales, and the Latent Heat Release. A vote and then a runoff vote were taken, and Atmospheric Circulation won over the Convergence Zone, the Zephyr, and the Thunderbird. Let us know what you think of our first issue, and tell us what you are doing.

MM5 Aids Forecasters

Over the past five years a group in the Atmospheric Sciences department has explored the value of ultra high resolution numerical weather prediction over the Pacific Northwest. This effort, directed by Professor Cliff Mass and staff members Dave Owens and Mark Albright, has run the Penn State/NCAR mesoscale model (MM5) twice daily at horizontal grid spacings of 36, 12, and 4-km, making it the highest resolution operational computer forecasting enterprise in the country. Such fine resolution allows the simulation of local weather features ranging from the Puget Sound Convergence Zone, and flow in the Strait of Juan de Fuca, to the rain shadow in the lee of the Olympics Mountains.

The MM5 weather prediction model also drives a regional hydrological model (DHSVM) that was constructed by Professor Dennis Lettenmaier and associates in Civil Engineering. This coupled system allows the prediction of streamflow on many western Washington rivers. So far the results have been very promising. Another project has been to use the MM5 to provide meteorological conditions for a regional air quality model (CALGRID) to forecast ozone levels around the region. (see Page 8)

New Faculty Join Atmospheric Sciences

In the past year, Atmospheric Sciences appointed two new Assistant Professors. Lyatt Jaeglé joined the department in July 2000. Professor Jaeglé's specialty is atmospheric chemistry. Her research deals with analysis and modeling of the chemistry of the global troposphere, with particular attention to the emerging problem of trans-national air pollution. Before coming to UW, Professor Jaeglé was a Research Associate in the Department of Earth and Planetary Sciences at Harvard. She received her "Diplôm d'Ingénieur" from Ecole Centrale de Lille, France, in 1992, and her M.S. and Ph.D. degrees from the California Institute of Technology in 1992, and 1996, respectively.



Assistant Professor David Catling begins his appointment this September. Catling comes on board as part of the University Initiatives Fund Program in Astrobiology. His specialty is planetary atmospheres and his experience includes theoretical modeling of planetary geochemistry and planetary atmospheres, development of miniature space instrumentation, and Mars mission design. His current research interests include the geochemical-atmosphere interaction on early Earth and Mars, the co-evolution of life and atmospheres on habitable planets, and involvement in NASA missions to Mars. Catling received his B.S. from the University of Birmingham in 1990, and his D.Phil. from the University of Oxford in 1994. Prior to joining the faculty, Catling was a Research Scientist at the Search for Extraterrestrial Intelligence Institute based at the NASA Ames Research Center.



The department also appointed four post-doctoral Research Associates in the past year. Robert Wood joined the department in March, and works with Professor Dennis Hartmann on cloud parameterization and the testing of ideas using satellite data from EOS. Wood received his Ph.D. from the University of Manchester in 1997, and then was a Research Scientist at the Meteorological Research Flight of the UK Meteorological Office. (see Page 2)

Welcome back to Madhu Narayanan, a junior who returns this fall from a year as an exchange student at the University of Cairo, Egypt, and David Inge, another junior returning from a year spent studying in Spain.

The department is hosting two exchange students this year. We welcome undergraduate Nicholas Eckstein from Bowling Green State University in Ohio, and Alexandra Jahn, a graduate student from the Free University of Berlin, Germany.

College senior Amy Haase is the recipient of the Association for Women in Sciences Scholarship and the UW Alumnae Board Scholarship for 2001-02.

Graduate students Ulrike Dusek and Daniel Vimont have been awarded Ford Foundation Fellowships during 2001-02.

Christopher Woods, a first year graduate student, was named a recipient of the Achievement Reward for College Scientists (ARCS) Fellowship for 2001-02.

Graduate student Jeffrey Yin received an Outstanding Student Presentation Award from the AMS in June for his talk entitled, "A detailed GCM study of the factors influencing the location and strength of storm tracks."



Chair's Column

With this issue the Department of Atmospheric Sciences launches the newsletter *Atmospheric Circulation*, which we plan to distribute to alumni and friends of the Department on an annual basis. The newsletter provides us with a medium in which to share with you news about the Department and its activities. More importantly, we hope to make *Atmospheric Circulation* a vehicle for alumni of the Department to share news of their own activities with other alumni and friends. We invite you to write or e-mail to us and tell us about your activities so that we may include an item about you in the next issue.

The past two years have been exciting ones for the Department of Atmospheric Sciences. In addition to the two new faculty featured in this issue (Dr. Jaeglé and Dr. Catling), we were joined earlier by Dr. Greg Hakim, specializing in synoptic/dynamic meteorology, and Dr. Qiang Fu, specializing in atmospheric radiation. We believe that these young faculty members will all make excellent contributions to the Department's teaching and research, and will help to maintain and develop the distinguished record of the Department during the early decades of the new century.

The Department faces many opportunities and challenges in the coming years. The complex interaction between energy policy and global warming, and the threats posed by intercontinental-scale air pollution, as well as increasing economic losses related to drought and to severe weather events, are making the atmospheric sciences an ever increasingly important discipline. As one of the leading academic centers for the atmospheric sciences in the United States we have a responsibility to educate the next generation of atmospheric scientists and to carry out world-class research. The demands of government and the public for information on weather and climate have placed considerable demands on members of our faculty for service on national and international panels and committees, and interactions with the media and the public. Maintaining a balance among our obligations in teaching, research, and service in an era of declining financial support from the State of Washington is a continuing challenge.

Near the end of September, you should receive an Annual Fund letter asking you to support the Department by making a gift to the Atmospheric Sciences discretionary fund. Please consider making a contribution to this fund. Your gift will help bridge the gap between public funding and the true costs of quality higher education for undergraduate and graduate students. For information on how to give please see page 7 of this newsletter. Your gift will help us continue to achieve the highest degree of excellence in education and research.

James R. Holton
Professor and Chair of Atmospheric Sciences

(Continued from Page 1) Research Associates Soline Bielli and Masakazu Taguchi also work with Hartmann. Bielli, who started in July, plans to conduct regional modeling experiments and data analysis relevant to the effect of the Madden Julian Oscillation on the American Summertime Monsoon and the development of tropical cyclones in the east Pacific region. She received her Ph.D. from the University of Toulouse in 1998, and then was a Research Associate at Oregon State University working on regional scale modeling. Taguchi joined the department this summer and will study numerical simulation of the interannual variability of the coupled troposphere-stratosphere climate system. Taguchi received his Ph.D. in 2001 from Kyoto University, and he holds a Research Fellowship from the Japan Society for the Promotion of Science. Sarah Masonis began her appointment in March at the Joint Institute for the Study of the Atmosphere and Ocean. She received her Ph.D. in 2001, from the University of Washington. Masonis works with Research Professor David Covert on studies related to aerosol optical properties and radiative forcing of climate by aerosols.

Faculty Elected to National Academy of Engineers

Emeritus Professor Joost A. Businger and Affiliate Professor Kristina B. Katsaros were elected to the National Academy of Engineers in February. Election to the NAE is among the highest professional distinctions accorded an engineer. Academy membership honors those who have made "important contributions to engineering theory and practice, including significant contributions to the literature of engineering theory and practice," and those who have demonstrated "unusual accomplishment in the pioneering of new and developing fields of technology." Joost A. Businger was cited for "contributions to the field of atmospheric turbulence transport and its applications." Kristina B. Katsaros was cited for "basic advances of ocean-atmosphere energy exchange through innovative measurement techniques."

Excellent Teachers

Assistant Professor Qiang Fu was awarded the Atmospheric Sciences Department's 2001 Annual Teaching Award. John Armstrong won one of the UW's Excellence in Teaching Awards that are given to graduate teaching assistants who demonstrate outstanding skills in the classroom. Armstrong is a graduate student of Conway Leovy in the Astrobiology Program and the Astronomy Department. The Sigma Kappa Sorority honored Professor Dale Durran as an "Excellent Instructor" at their Professor's Banquet held in May.

Program on Climate Change Awarded University Initiatives Funding

The Program on Climate Change was chosen this summer for funding in the third round of the University Initiatives Fund (UIF) Program. President Richard L. McCormick established the UIF in 1996 to allow the University to invest in innovative, cutting-edge initiatives through internal reallocation of funds. A one-percent assessment on all UW operating budgets has supported the UIF each biennium. The climate change project is a collaboration between the College of Arts and Sciences and the College of Ocean and Fisheries Sciences. It will create an interdisciplinary program that will integrate existing strengths in various groups including the School of Oceanography, the Departments of Atmospheric Sciences and Earth and Space Sciences, JISAO, the Center for Climate Impact Studies, the Quaternary Research Center, the Applied Physics Laboratory, and NOAA Pacific Marine Environmental Laboratory.

Professor James Murray of Oceanography is the principal investigator, and other key faculty include Peter Rhines, J. Michael Wallace, David Battisti, LuAnne Thompson, and Paul Quay. The project aims to add components in the areas of climate dynamics, the global carbon dioxide cycle, and paleoclimate. It will consolidate existing observational strengths in climate change and carbon cycling with a process oriented modeling analysis of past, present, and future climate prediction. The UIF program will provide for faculty additions, and support graduate students, visiting scholars, startup and operations expenses. Murray envisions that the program will make UW the leader in this field. The Program on Climate change is one of five projects that received a funding award.

Graduate Student to Race in Ironman Triathlon



Graduate student Sasa Gabersek qualified for the Ironman Triathlon World Championship in Kona, Hawaii, on 6 October, by finishing 66th of 1992 participants in the Ironman Canada competition held on 26 August in Penticton, B.C. The Ironman triathlon race consists of a 2.4 mile swim, 112 mile bike ride and 26.2 mile run.

In December 2000, Research Professor Robert Brown received the Distinguished Scientist Medal from the Pacific Ocean Remote Sensing Congress in Goa, India.

Graduate Student Jessica Mjelde received a scholarship to the 3rd Annual PIMS Fluid Dynamics Summer School at the University of Alberta.

Catherine Plesko, an undergraduate student in the Program on the Environment, has been awarded a Mary Gates Endowment for Students research training grant to be used in the 2001-02 school year.

Graduate student Ulrike Dusek received the Peccei Scholarship from the International Institute for Applied Systems Analysis in Austria for her work with secondary organic aerosols in the atmosphere.

Congratulations to graduate student Sungsu Park and his wife Ming-Jung, who became the proud parents of Brian Park on August 1, 2001.

Best wishes to Professor Stephen Warren and Phoebe Caner who were married in July!

Spring Break Storm Chasing

Contributed By Stan Rose, Graduate Student

Statistically, the last couple weeks of May are the best time to chase storms in tornado alley. Unfortunately, May turned to July, confronting us with 500 mb ridges, a jet on vacation in Canada, and a hellish cap seemingly made of cement. So, we made the best of a grim situation, and enjoyed the long ride through some beautiful country. We set off Saturday and arrived in the badlands of North Dakota just in time for a great sunrise. We drove off-road to get a closer look at several magnificent bison. A low in Canada had been prognosticated to bring the threat of severe storms to the Dakotas, but overnight the models weakened the low and left us with blue skies and temps in the 90s.

The next day we drove toward Minnesota. In a park along the Red River, we were amazed to see many large fish struggling to swim in puddles left by receding flood waters. Once again, the cold front could not break a stubborn cap, and we baked in temps that topped out at 98 degrees! Meanwhile, storms fired along the warm front in Wisconsin.



Tuesday we abandoned the cold front and headed for the warm front in Wisconsin. In the space of less than ten miles, temps plummeted from 95 to 75 degrees--now that's a front! Once again, the weather played a dirty trick on us as a short wave ridge moved over the state and effectively sealed off 5000+ J/kg of CAPE, while storms fired behind

Above left is the mesocyclone spotted in Nebraska. On the right is a shelf cloud, or gust front of a thunderstorm seen along the Kansas-Oklahoma border.

us along the cold front and dropped a weak tornado in Northern Minnesota - the only one reported during our drive!

Wednesday we headed to Nebraska, expecting storms along a quasi-stationary boundary across the southern portion of the state. Early afternoon, I spotted a fine line of popcorn cumulonimbus forming to the south, and satellite imagery confirmed the boundary and showed storms forming in northwest Kansas. We rode the boundary west, and after a rest stop I suddenly recognized that a cell had exploded almost directly to our south.

We took off after it and soon found ourselves behind a caravan of chase vehicles. When we pulled off the road to the southeast of the core, I discovered that most of the people jumping out with video cameras were from Silver Lining Tours. We watched as the supercell attempted to get its act together. It had a mesocyclone that was rotating noticeably, and managed several funnel clouds, but its base was too high and nothing reached the ground. Later, we chased a large cell all the way to the Iowa River, as it put on an amazing non-stop lightning display.

Thursday we continued south to catch storms along the advancing cold front in southern Kansas. We drove through a large embedded cell south of Wichita and got pelted with half-dollar sized hail,



and then rode along its southeast boundary to witness a series of beautiful microbursts. We then headed west into another developing cell, which reminded me of a tropical storm, due to the torrential rains and 70+ mph winds.

Friday we headed home, stopping in Cheyenne, WY. On the way out we were treated to a fine light show from a thunderstorm south of town. Passing through Utah was terrific, with snow-capped peaks, flower covered hills and multi-colored sandstone. At sunset we drove through the Cascades and hit our low temp (40 °F) at Snoqualmie Pass. Our first day back, and of course a major tornado outbreak is expected in Oklahoma. Sigh...there's always next year. ☹️

Faculty Report on Global Warming

Professors John M. Wallace and Ed Sarachik were members of a National Academy of Sciences Panel that produced a “fast-track” report on Global Warming for the Bush Administration. This spring Wallace also testified before U.S. House and Senate Committees on the subject of global warming. Wallace also chaired an Academy panel that produced a very influential report on surface and tropospheric temperature trends. He and Sarachik have served on a number of other recent committees and panels related to climate change and the human impact on climate.

Bruce Caldwell and Atmospheric Sciences Endowment Fund Scholarship Winners

Undergraduates Scott Guhin, Charles Parks, Brian Rice, Victor Stegemiller, J.D. McAlpine and Amy Haase were named recipients of scholarships from the Atmospheric Sciences Endowment Fund, and the Bruce Caldwell Memorial Fund. The Atmospheric Sciences Endowment Fund was founded by a generous gift from an anonymous donor and is only awarded to undergraduate students. The Caldwell Memorial Scholarship was started by contributions from the parents and friends of Bruce Caldwell, an undergraduate alumnus of the department. Both scholarships are awarded for academic excellence and financial need.

Atmospheric Sciences Gets the Gold Star

The UW Graduate and Professional Student Senate (GPSS) presented the “Gold Star Department Award for Excellence in Student Service” to Atmospheric Sciences. This is the second straight year that Atmospheric Sciences received this award. The Gold Star Program committee considers departments’ efforts in the areas of departmental communication, Teaching Assistant working conditions, student funding, student success, diversity, departmental governance, career placement, professional development, access to technology, and GPSS support. The award acknowledged a real commitment to enhancing the student experience and awarded departments that showed true excellence in student services. Atmospheric Sciences was one of five departments to win the award.

Forecasting Competition Winners

Graduate student Justin Sharp, under the pseudonym “Droughting Thomas,” won this year’s Spring Forecast Contest. Scores were also computed for temperature and precipitation separately. Sharp won the temperature section, and another graduate student, Brian Ancell, under the name “Rivan,” won the precipitation portion. The just for fun forecasting competition open to all members of the department – faculty, staff, graduates and undergraduates alike was begun in

1972. Participants forecast precipitation and daily maximum temperature for Seattle-Tacoma Airport (KSEA) for the 24-hour period from 12Z to 12Z. Observations are taken over a grassy area near the runway, at an elevation of 452 feet above mean sea level. The winner gets their name on the forecast trophy and is treated as a forecast God for approximately two minutes. Twenty-eight individuals participated, plus the usual non-persons such as various kinds of model output, climatology, persistence and the National Weather Service’s public forecast. Last year Jeremy Wolfe, an undergraduate in the program, won the contest.

Professor Cliff Mass won the snow depth forecast contest that ended in April. Last October, Mass predicted 5.0 inches – exactly matching the average of the ten observations made on the UW north lawn during the one snowstorm in February.

Holton Double Medals in Lifetime Achievement

Reprinted from *A & S Perspectives*

Professor James Holton won the prestigious Roger Revelle Medal from the American Geophysical Union, awarded for “outstanding accomplishments or contributions toward the understanding of the Earth’s atmospheric processes.” A month later, he also received the Carl Rossby Research Medal, which is the American Meteorological Society’s highest honor.

Holton’s research focuses on the lower stratosphere and upper troposphere. He looks at large scale dynamics – things like wind patterns developing and changing over long time periods – to understand how trace constituents such as chemicals are transported skyward and affect the environment. Holton has served on numerous National Research Council panels and as a principal investigator on NASA’s Upper Atmosphere Research Satellite (UARS) Science Team, a program to study global ozone change. “Many people studying the ozone layer have been chemists,” explains Holton. “But atmospheric ozone is not confined to a test tube. Rather, it is transported by the winds. To understand how chemicals produced by humans get into the ozone layer and cause ozone depletion requires an understanding not only of the chemistry but of how these chemicals are transported by winds.”

Holton’s current research focuses on how trace chemical constituents may be contributing to the greenhouse effect. He and several colleagues are studying whether changes in the stratosphere may lead to short-term climate changes in the northern hemisphere in winter. Will he slow down now that he has received two “lifetime achievement” awards? Hardly. “I’m very keen to stick with the research,” he says. “I’m pretty excited about what we’re doing now.”

Discosity Wins Intramural Frisbee Championship

The Atmospheric Sciences-Oceanography intramural ultimate frisbee team "Discosity" had an amazing year. In the spring, our green team bounced back from a winless regular season to win the Rainier Division Co-rec Ultimate Intramural Championship, in a hard-fought game against the Astronomy team "Warped Disc." In the summer, Discosity went 4-1 in the regular season, with our only loss to Warped Disc, and then came back to defeat our old rivals from astronomy in the finals for the Overall Co-rec Ultimate Championship. The team represented a cross section of students from Atmospheric Sciences and Oceanography, and in particular was bolstered by members of the AS first year class: Katie Crahan, Tony Eckel, Rob Elleman, and Kevin Rennert. Other atmospheric scientists on the team included Matt Carr, Ralph Foster, Kristin Larson, Gabe Vecchi, and Jeff Yin. We were joined by oceanographers James Girton and Elizabeth Steffen, and honorary meteorologist Hollis Lau. Other intramural championship teams in the past year include the undefeated Co-rec Volleyball team "Lightning", the Men's Volleyball team, and the undefeated Men's Quickball (Wiffleball) team "Adiabats."
-Jeffrey Yin and Ian Kraucunas

Recent Degrees Awarded in Atmospheric Sciences

December 2000

Imke Durre, Ph.D., Dissertation: *Factors Influencing the Diurnal Temperature Range in the U.S.*

David Thompson, Ph.D., Dissertation: *Annular Modes in the Atmospheric General Circulation*

March 2001

Matthew Carr, Ph.D., Dissertation: *Convective Momentum Transport over the Tropical Pacific*

Scott Eichelberger, M.S., Thesis: *A Mechanistic Model of the Coupled Troposphere-Stratosphere Annular Mode Oscillation*

David Groves, M.S., Thesis: *The Moisture Budget of the Arctic Atmosphere from TOVS Satellite Data*

Sarah Masonis, Ph.D., Dissertation: *An Empirical Study of the Lidar Ratio and its Variability, with Implications for Determining Climate Forcing by Satellite-Borne Lidar*

June 2001

Ian Kraucunas, M.S., Thesis: *Equatorial Superrotation: The response to tropical eddy heating in a multi-level general circulation model*

Bachelor of Science Degrees: Casey Anderson, Steven Andreason, Mary Jean McDermott, Janae Nash, Jeffrey Rood, Robert Schaff, Jacob Tomco

Alumni News

Varavut Limpasuvan (Ph.D., 1998) was named the "Distinguished Professor of the Year" at Coastal Carolina University in his first year of teaching. Limpasuvan wrote, "This is the first time that a first year prof has ever won it, let alone from the school of science. I am very proud of this recognition since I was in competition with 70 other profs who were nominated by the students and since I had never taught before!"

Kevin Perry (Ph.D., 1995) and Tim Garrett (M.S., 1995; Ph.D., 2000) were recently appointed to the teaching faculty in the Department of Meteorology of the University of Utah.

Nathan Mantua (PhD, 1994) joined the Climate Impacts Group (CIG), housed at the Joint Institute for the Study of Atmosphere and Ocean, in 1995 and investigates the connections between El Nino-Southern Oscillation and climate variations in the Pacific Northwest. He teamed up with Atmospheric Sciences' Mike Wallace, Fisheries' Bob Francis and two of their students to produce a paper titled *A Pacific Interdecadal Climate Oscillation with Impacts on Salmon Production*. The paper is widely known within the climate research community and in the fishing industry. It has led to a steady stream of speaking engagements before audiences like the Salmon Cannery Association, and to a Presidential Early Career Award for Scientists and Engineers. Philip Mote (PhD, 1994) joined the CIG's outreach efforts in 1998. Mote gives invited talks on climate and climate change (including briefings for elected officials) about once a week, organizes workshops to bring CIG research to natural resource managers, and dabbles in research as well. CIG recently began a high-level effort to prompt the region's policymakers to consider the impacts of climate change on the region's water resources.

After graduating, Misti Hilter (B.S., 2000) worked as a research assistant with a Seattle-based research and consulting firm that specializes in detection of ultra-low trace metals. She specifically worked on the methylation potentials of different mercury compounds in sediment. In the fall she will start a PhD program in Atmospheric Sciences at UCLA where she received the Eugene V. Cota-Robles four-year fellowship.

From the grapevine, we hear that... David Groves (M.S., 2001) will begin working on his Ph.D. in Policy Analysis at the RAND Graduate School... Ian Horton (B.S., 2000) made a significant career change in entering the Landscape Architecture graduate program at the University of Virginia.

Support the Activities of the Atmospheric Sciences Department

Please consider supporting the activities of the Atmospheric Sciences Department. Your gift can help us to recruit and retain world-class faculty, and can help support both undergraduate and graduate students. Gifts to the Department help bridge the gap between limited state funds and the costs of maintaining the excellent quality of our educational and research program. Help us to ensure that the Atmospheric Sciences Department continues to be a leader in weather and climate research, and in educating new generations of atmospheric scientists.

Contributions to the **Atmospheric Sciences Discretionary Fund** can be used at the discretion of the Department to provide support where the need is greatest. In recent years this fund has helped defer travel costs for graduate student recruitment, provided support for refurbishing the undergraduate instrument laboratory, and helped support student orientation activities.

If you wish your contribution to provide direct financial support for students, the **Atmospheric Sciences Fund** provides a mechanism to support undergraduate scholarships and financial aid for graduate students.

Thank you for your consideration and support.

✂

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Atmospheric Circulation is published annually for alumni, friends, and members of the University of Washington Atmospheric Sciences Department. This is the first issue.



Do you have comments, questions, alumni news or just want to update your address? Please send them to Laurie Wildt, or call (206) 543-4250.

AMS Plans Reed Symposium

The American Meteorological Society plans a one-day symposium in honor of the career and accomplishments of Emeritus Professor Richard Reed at the AMS annual meeting in Orlando Florida, Tuesday, 15 January 2002.

The symposium, entitled "A Half Century of Progress in Meteorology: The Richard Reed Symposium" will consist of 4 sessions of invited talks covering many of the areas in which Professor Reed has made important contributions. These include fronts and frontogenesis, stratosphere-troposphere exchange, stratospheric dynamics, numerical prediction, tropical meteorology, polar lows, extratropical cyclones, and mesoscale flows. Speakers include Drs. Lance Bosart, Melvin Shapiro, Brian Hoskins, James Holton, Taroh Matsuno, Richard Lindzen, Robert Burpee, Tony Hollingsworth, John Perry, Clifford Mass, Erik Rasmussen, and Ying-Hwa Kuo.

The scientific talks will be followed by a banquet featuring presentations by Professors J. Michael Wallace and Frederick Sanders. A monograph is planned that will contain papers based on the scientific talks at the symposium plus notes on Professor Reed's career. For more information consult the AMS website: <http://www.ametsoc.org/AMS/meet/82annual/index.html>

(Continued from Page 1) In addition to these modeling efforts, the group also built an operational ensemble forecasting system, in which the MM5 is run eight times with varying initial conditions and model physics. Such ensemble forecasting provides useful information on the range of possible forecasts and gives guidance regarding the reliability of forecasts.

An important aspect of this project has been its support by the Northwest Regional Modeling Consortium, a group of local, state, and Federal agencies and cooperating private companies.

The regional modeling forecasts are nearly all available on-line at http://www.atmos.washington.edu/pnw_environ/



Graduate students Steve Hudson and Mike Town spent the whole year in Antarctica. It's difficult to tell from this picture how they have weathered the storms. Photo submitted by S. Hudson.

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