



# Daily Planet

University of Michigan College of Engineering

WINTER 2010  
The Department of  
Atmospheric,  
Oceanic and Space  
Sciences Newsletter

## AOSS Looks to Strengthen Programs

*“We have a very strong impetus to critically evaluate our programs, with the goal of developing a ‘leaner-meaner’ curriculum, especially for undergraduates ... to return to our mission of providing quality, specialized educational opportunities while retaining our renowned research capacity.” AOSS Chair Tamas Gombosi, January 2004. Upon becoming chair in 2003, Tamas set out an ambitious agenda for departmental changes. Critical to the success of AOSS was a revamped undergraduate program and an increase in masters of engineering students. As Tamas nears the end of his eight year tenure as chair, AOSS has mounted two new initiatives to continue and build upon these two programs because, as we have repeatedly learned, there is no rest for the wicked or for academic programs that want to remain strong, viable and relevant in today’s ever changing world – and universe.*

### AOSS Undergraduate Initiative

AOSS Professor Mark Moldwin

This year AOSS has kicked-off a new undergraduate initiative in an effort to recruit more students to the department and provide enhanced opportunities for majors to become engaged in the life and research enterprise of the Department. A new Undergraduate Student Faculty Committee has been established to assess the current strengths of the AOSS undergraduate program and to develop new mentoring, advising and research opportunities for our undergraduate majors. Several years ago the Department developed a revised undergraduate Earth System Science and Engineering BSE curriculum and the first few cohorts have now completed this degree. The new committee will use graduation surveys and interviews with current students to assess the effectiveness of the curriculum in preparing

**continued on page 10**



### Space Engineering Advisory Board

AOSS Research Scientist Darren McKague

On September 29 we had our first meeting of the MEng in Space Engineering Advisory Board. The board, made up of space mission industry experts, advises the program on issues relevant to the preparation of our students. The hope is that through our interactions we can forge closer ties to these experts to both connect our students to future employers and to get their assistance in teaching our students on the many facets of space system engineering. Aspects of the both include sponsor student design projects, assisting with the development of educational materials, and providing formal

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# AOSS Accolades

## Faculty

In the summer of 2005 AOSS Associate Research Scientist **Jason Daida** became the first University of Michigan faculty member to teach ENG 100 at the UM-Shanghai Jiao Tong University Joint Institute. This past summer, Michigan Public Media interviewed Jason for a feature story about the Joint Institute on “Out of the Blue”, a series carried by the Big Ten Network. In 2001 U-M became the first non-Chinese academic institution approved to offer graduate engineering degrees to students in China, at SJTU.



At the request of U-M President Mary Sue Coleman, AOSS Professor **Mark Moldwin** has been appointed to a two-year term on the President’s Advisory Commission on Women’s Issues. Since 1989 the PACWI has provided recommendations to University leaders on a wide range of issues affecting women students, faculty, and staff.



**Joyce Penner**, Ralph J. Cicerone Distinguished University Professor of Atmospheric Science, will again be a member of the United Nations Intergovernmental Panel on Climate Change (IPCC) that has begun work on the next report on climate change. She will be a Review Editor for the chapter on Clouds and Aerosols in the “Working Group I Contribution to the IPCC Fifth Assessment Report Climate Change 2013: The Physical Science Basis”.



### On the Web

You can view the feature story about the UM-SJTU Joint Institute at:  
<http://www.ootb.tv>

### On the Web

Additional information about the PACWI is available at:  
<http://www.umich.edu/~cew/PACWI%20/index.html>

### On the Web

Find out more about the IPCC at:  
<http://www.ipcc.ch>

# New Grants

June - September 2010

Principal Investigators are listed first followed by Co-Is

**Stephen Bougher**, *Structure and Dynamics of the 60-120 km Region on Mars*, \$30,000, NASA

**Stephen Bougher, Steven Nelli**, *Characterization of the Mars Middle Atmosphere (~60-130 km) Using Modern Spacecraft Datasets*, \$378,908, NASA

**Stephen Bougher, David Pawlowski**, *Coupled MGCM-MTGCM Mars Thermosphere Simulations and Resulting Data Products in Support of the MAVEN Mission*, \$149,263, JPL-NASA

**Paul Drake, Carolyn Kuranz**, *Investigation and Control of Electron Transport in Laser X-Ray Sources*, \$445,996, DOD-Defense Threat Reduction Agency

**Charles Edmonson Jr.**, *Spectrometer Qualification Testing*, \$1,091, Electrodynamic Applications, Inc.

**Lennard Fisk, Liang Zhao**, *Analysis of the Current Unusual Solar Minimum (Solar Cycle 23/24 Minimum)*, \$10,000, NASA

**Mark Flanner**, *Collaborative Research: Aerosol Concentrations, Sources, and Transport Pathways within the Arctic Polar Dome During Recent Millennia*, \$185,210, NSF

**George Gloeckler, Susan Lepri**, *WIND-SMS Investigation FY11-FY13*, \$233,616, NASA

**Tamas Gombosi, Kenneth Hansen, Xianzhe Jia**, *Interdisciplinary Scientist (IDS) for the Cassini Interdisciplinary Magnetosphere and Plasma Investigation: MO&DA Efforts, Solstice Mission*, \$791,000, JPL-NASA

**Enrico Landi**, *Element Abundance Measurements in the Chromospheric FIP Fractionation Region*, \$66,852, NASA

**Susan Lepri**, *Characterizing Solar Wind and Its Source Regions as Empirical Constraints for Investigating Solar Wind Formation*, \$50,459, DOE-Navy

**Susan Lepri, Jacob Gruesbeck**, *Suprathermal Particles Near the Sun*, \$30,000, NASA

**Michael Liemohn, Shannon Curry**, *Analysis of Pick-Up Ion Loss at Mars*, \$30,000, NASA

**Michael Liemohn, Roxanne Katus**, *Statistical Data-Model Comparisons of the Inner Magnetosphere During Geomagnetic Storms of the IMAGE Mission*, \$30,000, NASA

**Ward Manchester IV**, *Remote Diagnosis of the Solar Wind: Interpreting Solar Wind Structure from Cometary Observations: University of Michigan Participation*, \$78,000, UCLA-NASA

**Ward Manchester IV, Bartholomeus van der Holst**, *Modeling CME Initiation with Magnetic Flux Emergence*, \$382,744, NSF

**Darren McKague, Christopher Ruf**, *GMI Vicarious Calibration Tool*, \$276,159, NASA

**Mark Moldwin**, *A 3D Climate and Weather Global Topside Ionosphere and Plasmasphere Model*, \$450,756, NASA

**Mark Moldwin, Julie Feldt**, *Improving Topside Ionosphere and Plasmasphere Density Models: A Model and Observational Approach*, \$30,000, NASA

**Rick Niciejewski, Wilbert Skinner**, *Mesosphere/Lower Thermosphere Tidal Strength Products*, \$191,811, NASA

**Joyce Penner, Xianglei Huang**, *Coupled GMI-Climate Models and Aerosol/Cloud Interactions*, \$600,000, NSF

**Derek Posselt**, *An Observation-Based Examination of the Relationship Between Aerosols, Cloud Vertical Structure, and Cloud Radiative forcing in Midlatitude Cyclones*, \$598,658, NASA; *Toward an Operational Particle Filter-Based Ensemble Data Assimilation System*, \$193,868, DOE-Navy; *Year 1 Supplement, Improved Representation of Diurnal Precipitation Patterns in the NASA GEOS 5 General Circulation Model*, \$48,242, NASA

**Nilton Renno**, *Miniature Sensor for Electrical Field Measurements in Dusty Environments: Balloon Flight*, \$133,910, NASA

**Aaron Ridley**, *PENGUIn AAL-PIP System Integration and Software Development*, \$174,572, VPI-NSF

**Christopher Ruf**, *Development of the Kurtosis-based RFI Detection Algorithm for SMAP*, \$341,282, NASA; *Development of the Aquarius Science Algorithm and Calibration/Validation Plan*, \$355,382, NASA

**Christopher Ruf, Sidharth Misra**, *Development of Radio Frequency Interference Mitigation Algorithms for the Aquarius and SMAP Spaceborne Radiometers*, \$30,000, NASA

**Christopher Ruf, Rachael Kroodma**, *Using the Global Precipitation Measurement Microwave Imager as a Transfer Standard for the GPM Constellation of Satellites*, \$30,000, NASA

**Allison Steiner**, *The Climatic Relevance of Pollen in the Atmosphere*, \$599,940, NSF

**Gabor Toth**, *SHINE: Understanding the Impact of Non-MHD Effects on the Coronal Mass Ejection Dynamics in the Inner Heliosphere*, \$78,887, George Mason University

**Thomas Zurbuchen, Jim Raines**, *Ions from Mercury: Magnetosphere, Sputtering and Transport*, \$30,000, NASA

**Thomas Zurbuchen, Daniel Gershman**, *New Operating Mode for a Quadrupole Mass Spectrometer*, \$30,000, NASA

**Thomas Zurbuchen, Lennard Fisk, Susan Lepri**, *The Wind from the Open-Closed Field Interaction Region*, \$922,147, NASA

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## CLIMATE BLUE

*“There was exposure to community-based adaptation, financing responses to climate change, new transportation technology, and the complete spectrum of the U.S. approach to climate change. The list could go on. Some of these efforts are simply inspiring. On the other hand, the complex issues that motivate interest groups and rich and poor countries, issues that confound the development of a policy response, are revealed in their total rawness.”*

*R. Rood*

When the U-M Delegation to the UN Climate Change Conference returned last December, they saw the opportunity to build upon their experience and to continue the work they knew still needed to be done. From this, Climate Blue was born.

Today it is a growing community of graduate students, professors, business people, non-governmental professionals, and public servants from across the United States. Climate Blue is devoted

to examining energy- and climate-related problems and potential solutions from an interdisciplinary perspective. In the future, the site will also be a home for reference materials, multimedia items, datasets and scientific reports.

Climate Blue enthusiastically welcomes your participation. Please visit and join the growing community of people engaged in moving toward solutions rather than away from problems.

### On the Web

Visit Climate Blue and join in the lively discussions happening at:

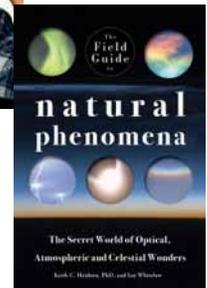
<http://climateblue.org>



In 2009 the University of Michigan sent its first delegation to COP15. This year, more than 30 U-M students, alumni and faculty are attending COP16. A feature article by AOSS doctoral student Kevin Reed, who also attended COP15, will be in the Spring/Summer issue of the Daily Planet. You can read their daily posts on the ClimateBlue website.

## Alumni News

Atmospheric, Oceanic and Space Sciences, which was then known as Meteorology and Oceanography, alumnus Keith C. Heidorn (BS '69, MS '71) has written his third book, *The Field Guide to Natural Phenomena*, published



this Autumn by Firefly Books, with coauthor Ian Whitelaw. The book is available in bookstores or online through

Amazon and other booksellers. Now semi-retired in the Robson Valley of Valemount, British Columbia, Dr. Heidorn continues to produce his long-running website “The Weather Doctor” and is active in the local arts community as an artist.



## 2010 AOSS Alumni of the Year Nathan Schwadron

*This year's honored alumnus, Nathan Schwadron (PhD '96), was a doctoral student under AOSS Chair, Tamas Gombosi. As someone who came to know Nathan quite well – as with most professors and doctoral students – during his introduction before the Alumni Lecture, Tamas shared a few “insights” into Nathan’s life at the University of Michigan. Here are some excerpts.*

Nathan Schwadron is an associate professor of physics at the University of New Hampshire, where he is also a member of its Institute for the Study of

Earth, Oceans and Space. For the past five years, he was an Associate Professor of Astronomy at Boston University. Nathan is the Science Lead of the Interstellar Boundary Explorer Mission (IBEX) that is exploring the interaction of our solar system with the interstellar medium. This exciting mission has made a number of important discoveries and it continues to explore our place in the galaxy.

Among his honors, he has been recognized with a NASA Group Achievement Award as a member of the New Horizons Spacecraft Development Team. He has also received the Ulysses Achievement Award for his part in the Ulysses solar orbiter that gathered data about the 3-dimensional interplanetary space for an astounding 18 years and 8 months.

Nathan is a native Ann Arborite, and we are pleased to welcome him back to his home. He was one of my most talented and certainly most colorful PhD students. I cannot resist telling you that at one time he considered giving up his scientific career, moving to LA and becoming an actor. We're glad he didn't. In addition, Nathan managed to do what even Chelsea Clinton could not do. He got married in the White House. Not the one on Pennsylvania Avenue, but the President's house on South University.

*Nathan and Tamas also shared two different versions about a bullwhip. You can hear their quips on the podcast of Nathan's lecture available online.*

### On the Web

Watch Nathan's lecture at:  
<http://tinyurl.com/24ovm2u>



### ALUMNI OBITUARIES

Allan L. Darling (BSEAA '60), June 19, 2010

Thomas L. Dunlap (BSEAA '46), August 28, 2010

Donald R. Marble (BSEAA '60), August 22, 2010

Richard F. McClure (BSEAA '49), August 19, 2010

Robert H. McGovern (BSEAA '50), July 25, 2010

Marvin L. Michael (BSEAA '36), August 17, 2010



When talking about tornadoes, most people would think the speaker was referring to being safe and secure, away from the storms. When you're a member of the AOSS community, and the speaker

is AOSS Associate Chair Perry Samson, you know he's referring to seeing up close and personal many, many tornadoes. And, if you're an alumnus who has been away from meteorology for a number of years, you jump at the chance to get back to your roots.

Last May, Jim Sterken (BSMO '72) did just that when he got the call to join the AOSS Vortex 2 team in Oklahoma City.

"Perry called me on a Tuesday afternoon and said tornadoes were 'a lock' for Wednesday, and if I could get to Oklahoma City by noon, I could join him and the team chasing the storm in western Oklahoma. I made it there that night, waking to clear blue skies in the morning. Color me skeptical. But, Perry and the Vortex team were right – there

were huge thunderstorms and a dozen tornadoes in western Oklahoma that day, and we came within a mile of one of them. Even with the eerie tornado sirens

blaring, and a tornado in sight, I felt safe given all the instrumentation the Vortex team members had to monitor the storm location and direction.

"The scariest time for me came about 30 minutes later when Perry and I got a call saying that two storm cells had just merged directly over us and that we should get out of there 'right now' – and we did!

"Tornado chasing may sound exciting to some, and crazy to others, but after meeting the Vortex team members who spent a whole tornado season living in motels and chasing storms over five states, I was impressed with their dedication doing hard and dangerous scientific work to advance our understanding of extreme weather."

While we can't all join a Vortex team – and probably most of us don't care to – we probably can relate to the AOSS version of "Wish us Luck".

Epilogue: Perry did promise not to damage Jim during the excursion. He kept his word.

## AOSS Gets Spooky (er?)

The GSO Halloween Party organized by Alex Bryan and Julie Feldt in the AOSS Lounge on Oct. 28 included pumpkin carving, costumes, caramel apples, Rice Crispy treats, face painting, and a grand time for all.



# AOSS Student: Marshall Scholarship Nominee

*Dara Fisher  
Undergraduate Space Weather Student  
(Minoring in International Engineering)  
U-M Marshall Scholarship Nominee*

As the daughter of a Michigan alumnus (class of '73), Dara knew about Michigan, but it was the three days spent on campus as a part of the Shipman Scholar recruitment program that sold Dara on attending U-M. "I knew Michigan was the place for me."

Now in her senior year, Dara was selected as one of only six U-M students nominated for the prestigious Marshall Scholarship.

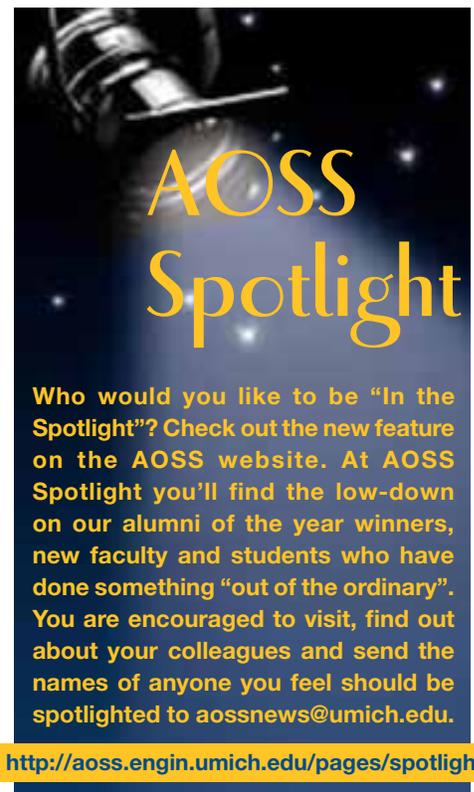
Dara will use the scholarship to attend the joint program through University College London and Imperial College, which is called the London Centre for the History of Science, Medicine, and Technology.

"I plan to study Science, Technology, Medicine and Society in preparation for my return to the US, when I will pursue a Master's of Public Policy at a university here."

To be eligible for the Marshall Scholarship, Dara had to have a high GPA, at least 3.8, and have shown leadership and commitment through her other activities. Not difficult for

her by most standards as she has been president of the Shipman Society and the U-M Engineering Council as well as editor-in-chief of the all-nighter, the CoE student newspaper. During her sophomore year, Dara received a UROP first prize for her research poster, Improving X-Ray Radiography for Astrophysics Experiments, and junior year she received the College of Engineering Distinguished Leadership Award. Just for good measure, Dara is a member of Tau Beta Pi and the Epeians, the engineering leadership honor society, and is currently a member of both the CoE Undergraduate Student Advisory Board and the U-M Dean of Students Advisory Board.

To "balance" her incredible list of service activities and awards, Dara was a research assistant in AOSS Professor Paul Drake's astrophysics laboratory and in SPRL Director Chris Ruf's signal processing laboratory, an office assistant in the CoE Office of Student Affairs, and was the Lloyd V. Berkner Space Policy Intern at the National Research



**AOSS  
Spotlight**

Who would you like to be "In the Spotlight"? Check out the new feature on the AOSS website. At AOSS Spotlight you'll find the low-down on our alumni of the year winners, new faculty and students who have done something "out of the ordinary". You are encouraged to visit, find out about your colleagues and send the names of anyone you feel should be spotlighted to [aossnews@umich.edu](mailto:aossnews@umich.edu).

<http://aoss.engin.umich.edu/pages/spotlight>

Council Space Studies Board this past summer.

In her "spare" time, Dara has managed to fit in being the props director for MUSKET, the University's largest student-run musical theater group, during her sophomore year. And, like most U-M students and alumni, she is a "diehard Michigan football fan."

"I've only missed one quarter of one home game since arriving in Ann Arbor in 2007."

Let's hope she'll be yelling "Go Blue" from London next year.

# Great Lakes water quality is focus of new \$5-million grant

by Nicole Casal Moore

AOSS Professors Anna Michalek and Allison Steiner are part of a team of 27 researchers from U-M and other institutions who have been awarded a \$5 million grant from the National Science Foundation to determine how climate change and our response to it affects the quality of the water from the Great Lakes. The researchers will focus on extreme weather events caused by climate change.



Great Lakes from space. Provided by the SeaWiFS Project, NASA/Goddard Space Flight Center, and ORBIMAGE.

The Great Lakes hold 84% of North America's surface fresh water, and their basin is home to 10% of the US population.

"The suspicion is that climate change will have negative impacts on water quality," said Principal Investigator Michalak. "Climate change is expected to bring about more extreme precipitation events, which will cause pulses of water and whatever it's bringing with it, including nutrients, pesticides and sediment. It's these episodic events that can have a significant impact on the water quality."

Michalak is an associate professor in AOSS and Civil and Environmental Engineering. Researchers from these departments as well as the School of Natural Resources and Environment and

the School of Education are also involved. The educational component of the grant involves work with Ypsilanti New Tech High School, as well as collaborations with Michigan Sea Grant and the Investigate the State program, along with other K-12 outreach.

AOSS Assistant Professor Allison Steiner leads a group that will explore how climate and land cover changes can influence the regional precipitation cycle. The climate group will look, for example, at how ice cover in the Great Lakes can influence wind and precipitation patterns, and how agricultural changes could influence summer rain, which is affected by soil moisture levels.

"The lakes serve as a source of drinking water and water for agricultural irrigation. They are used for recreation such as boating, swimming and fishing. They are also a key component of the regional economy," Michalek said.

The researchers will first examine current climate, land use, precipitation and water governance patterns. They will combine this data with future climate change models to forecast how warming will affect:

- Rain and snowfall frequency and quantity
- Human migration
- Land use and agricultural crop changes
- Phosphorous pollution in the Great Lakes

They will also explore what strategies watershed councils and other government entities could employ to reduce water quality impacts.

While much research exists about how global warming could affect the amount and availability of water, less is known about its effects on water quality, Michalak said.

# Dust storms and electrical charges

by Nicole Casal Moore for [lablog.engin.umich.edu](http://lablog.engin.umich.edu)

“You can see clouds forming on the updraft from several miles away and as the gust front moves closer, the world seems to shrink. The horizon gets a little fuzzy. The light dims. And the whole sky turns a very dramatic red.

“In the midst of it, it’s essentially a blizzard, except getting sandblasted hurts a whole lot more. Your eyes burn. It’s hard to breathe. And you can barely stand against the wind. It’s dark enough that if you’re driving you’ll need to turn your headlights on. After 15 or 20 minutes, the rain starts and the dust falls out of the sky like the drop of a curtain.”

That’s AOSS student Harvey Elliott’s description of a Haboob – an intense sand storm that kicks up in arid places like the African Sahel. Elliott spent a month in Niamey, Niger this summer – one of two field trips to study the electrostatics of airborne dust and sand. The other trip was to Boulder City, Nevada, where he studied dust devils, ran into their vortices with a video camera and then spent a day cleaning their remains out of his rented Chevy Malibu.

A YouTube video has some of Elliott’s footage, plus some from other students who have worked on this project with AOSS Professor Nilton Renno over the past five years.

With his colleagues in 2008, Renno

demonstrated that dust and sand grains get electrified as they bounce along a surface. They also developed a unique electric field sensor to measure this. Now Elliott is working with Renno to use this sensor to better understand the phenomenon. The research has practical applications on Earth and on Mars.

Understanding the physics of dust- and sand-lifting could help scientists come up with more precise climate change models, as these aerosol particles and their effects on global warming are still uncertain.

And in the semiconductor and electronics industries, unpredictable electrostatic “shock” discharges (exacerbated by dust and human handling of parts) cause billions of dollars in damage per year, Renno says. Right now, there’s no reliable way to measure electric fields and charged particles in manufacturing plants on an ongoing basis. Renno’s sensor can do this. It would allow mitigating measures to go into action before a shock discharge occurred, preventing damage.

Electrostatics in Martian dust storms could affect our instruments on landers there, and could also have major implications for future human explorers.

The sensor is being commercialized through the U-M spin-out company EngXT.

**“It’s essentially a blizzard, except getting sandblasted hurts a whole lot more.”**

## Upcoming Events

**Dec. 15, 6:00 PM, Grand Hyatt San Francisco**

Annual AGU Reception

**Dec. 19, 11:00 PM, Michigan Union Ballroom**

Winter Commencement Brunch

**Dec. 15, 6:00 PM, Grand Hyatt San Francisco**

Annual AGU Reception

**Jan. 13, 3:30 PM, SRB Auditorium**

Prof. Timothy Garrett, Atmospheric Sciences, University of Utah

**Jan. 15**

Fall 2011 MS Application Deadline

**Jan. 27, 3:30 PM, SRB Auditorium**

Prof. Mitchio Okumura, Caltech

**Jan. 23**

91st American Meteorological Society Annual Meeting

**Feb. 3, 3:30 PM, SRB Auditorium**

Prof. Cari Kauffman, UC-Berkeley

**Feb. 10, 3:30 PM, SRB Auditorium**

Dr. Stephen Leroy, Harvard University

**Mar. 10, 3:30 PM, SRB Auditorium**

Prof. John Seinfeld, Caltech

**Mar. 17, 3:30 PM, SRB Auditorium**

Prof. Jonathan Makela, University of Illinois

**Mar. 20**

2011 CoE Leaders and Honors Brunch

**Mar. 24 AOSS Spencer Lecture**

Dr. Joel Parriott, White House OMB

**Mar. 31, 3:30 PM, SRB Auditorium**

Dr. Robert Pappalardo, JPL

**Apr. 7, 3:30 PM, SRB Auditorium**

Prof. Roger Ghanem, USC

*Moldwin continued from page 1*

students for graduate programs or the job market. The new committee is also developing mechanisms to formally assign faculty advisors to every major and to make it easier for majors wishing to pursue research within AOSS to find research mentors.

Another aspect of the initiative is to develop undergraduate student awards for those students who excelled in academics, community service or research while U-M students. Finally, the initiative has launched a new AOSS Undergraduate Student Fund (AUSFund) to help recruit students to the department. During the first year, the Fund will be targeted toward transfer students, but will be expanded to include U-M Engineering or LSA sophomores who declare as an AOSS major. Please consider donating to the AUSFund and help support scholarships and the new AOSS Undergraduate Initiative. Contact Sandee Hicks ([sandee@umich.edu](mailto:sandee@umich.edu)) or Prof. Mark Moldwin ([mmoldwin@umich.edu](mailto:mmoldwin@umich.edu)) for more information about the Initiative and the Undergraduate Student Fund.

*McKague continued from page 1*

lectures and general mentoring on key space system topics to provide a “real-world” perspective.

At our first meeting, the board members were introduced to the program’s overall goals, student constituency, specifics of the curriculum, detailed syllabi from our core courses, and examples of the project work performed by our students. For each topic, the board members provided detailed feedback on their perceptions of our program and on our preparation of students based upon interactions with our graduates with whom they now work. We also came up with a list of topics on which the board members will be providing material and mentoring for our students, a number of ideas for future student projects, and had an excellent brain storming session on how better to connect our students to their institutions for mutual benefit. We very much look forward to future board interactions to further facilitate the growth and strengthening of the MEng in Space Systems program.

# AOSS Happenings



On December 4, 2010, a horse-drawn buggy will transport Cheri Champoux (AOSS SPC) and Bob Johnson from the Bavarian Inn in Frankenmuth, MI, to where their wedding guests wait in front of the oh so romantic covered bridge. They’re hoping a few lacy snowflakes will come drifting down as they exchange their wedding vows.



Welcome to Everett Sauter Harding, born to Eric Harding (Applied Physics 2010 graduate) and Erika Roesler Harding (AOSS grad student) on Sept. 22, 2010, at 12:46 am, weighing 7 lb 9 oz, 21.5” long. The sweetest pumpkin in the patch.



Jan Beltran, AOSS/CRASH Administrative Assistant, finally has a daughter (in-law)! Jan’s son, Stephen Beltran, was joined in wedlock to Lindsay Ursitti on July 7, 2010, at The Henry Ford.



Wave HI to Julian Antoni Michalak Erickson, born to Anna Michalak (AOSS Associate Professor) and Tyler Erickson on Oct. 5, 2010, at 1:59 am, weighing 8 lb 5 oz, 21” long. He’s already on the go.

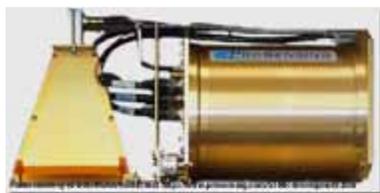
# HIRad Reads the Foam

by D.K. Eddy

While Hurricane Earl was churning up the Atlantic and aiming for the US coastline, AOSS Professor Christopher Ruf and his colleagues were staring at foam.

No, they weren't down at the local beer hall commiserating with the coastal residents. They were studying data from the Hurricane Imaging Radiometer (HIRad), which flew into the storm aboard a NASA aircraft to gather information on the speed of the winds and the rate of the rainfall near the ocean surface. Such data give forecasters the guidance they need to let people know when and where the hurricane is going to hit land, which hatches to batten down, and whether to seek shelter or evacuate before the approaching tempest.

HIRad is just the latest in a series of instruments designed to read storms. At one time, the best estimates of how a storm would develop were provided



Stepped Frequency Microwave Radiometer

by probably insane, definitely daring men who flew into the maelstroms to gather information on the force and direction of the winds. Scientists then

extrapolated the difference between the winds at the altitude of the plane and the winds at the surface, where the true force of the hurricane resides. However, these efforts tended to underestimate the surface-level wind speeds.



Lightweight Rainfall Radiometer-X

As a grad student in the 1980s, Chris Ruf got a chance to jump into the fray and contribute to the efforts to get a better read on the storms. Stepped Frequency Microwave Radiometers (SFMRs), developed in 1984 and under continual improvement, have flown for years on NOAA aircraft to measure nadir brightness temperatures and provide wind speed estimates. However, SFMRs provide measurements only directly below the aircraft, a very limited window on a large and turbulent target. And in the extreme winds of a Category 5 hurricane such as Katrina their estimates still come in on the low side. "Excess emissivity measurements in these conditions were correlated to surface wind speeds that were on average underestimated," according to a 2007 paper by E.W. Uhlhorn et al., "The excess emissivity" – microwave radiation – "is a function of the foam coverage."

Enter HIRad, developed by NASA's Marshall Space Flight Center, the University of Central Florida, RTI International, and a team at the University of Michigan led by Professor Ruf. HIRad takes the measure of the hurricane by reading the microwave radiation given off by the foam atop the churning ocean.

HIRad is based on SFMRs and the Lightweight Rainfall Radiometer (LRR), a NASA/U-M (SPRL) airborne synthetic thinned aperture radiometer. LRR can



Hurricane Imaging Radiometer (HIRad)

estimate rain rate or wind speed, but not both, and is limited to light to moderate rain rates, whereas

SFMR can work in the extreme winds of a hurricane to record rain rates and surface wind speeds, but is confined to a narrow view directly below the spacecraft. HIRad combines the best of both, expanding LRR's ability to the torrents of rain within the hurricane walls, while widening SFMR's field of view and improving on its spatial resolution.

As Hurricane Earl built up winds of 145 mph in early September 2010, a NASA aircraft plunged in and out of the storm with HIRad attached to its belly, on its maiden flight as part of the Genesis and Rapid Intensification Processes mission (GRIP experiment). Professor Ruf says HIRad worked well. "We are currently analyzing the data."

*The new HIRad instrument brings Chris Ruf full circle as he was a doctoral student who helped develop the first generation of instruments for NOAA in the 1980s.*

So when future storms surge across the oceans, gathering force, threatening to slam into the coastline with flooding rains and home-destroying winds, those intrepid pilots will once again pierce the rain shrouded storm walls, and instruments devised by scientists like Professor Ruf will ride along to gather the data needed to predict the destructiveness of the storms. Part of that data is written in the churning of the ocean waters, and Professor Ruf and his colleagues are using HIRad to better interpret the language of the foam.

# AOSS/GS Climate Cluster Highlighted in State of the University Message

*In 2008 President Mary Sue Coleman launched an initiative to hire 100 junior faculty. One of the original clusters is a collaboration between AOSS and Geological Sciences called “Global Change: Cryosphere and Sea-Level Impacts.” AOSS Assistant Professors Jeremy Bassis, Mark Flanner, AOSS and GS Assistant Professor Brian Arbic and GS Professor Sarah Aciego are members of the team that is conducting research on the impacts of sea level change as a result of global warming. In her 2010 State of the University message, President Coleman spoke directly about this faculty cluster. The following is excerpted from her message.*

“Three years ago, we launched an initiative to hire 100 junior faculty-up-and-coming professors committed to interdisciplinary teaching and research that explores the truly complex issues of our day. Our faculty and deans have collaborated on fascinating proposals for these new teams, and to date we have funded more than 70 positions, with 25 faculty already hired and on campus.

“I’ve been particularly intrigued by the number of proposals to expand teaching and research in the areas of climate change, sustainability and energy. We know our students are hungry for this knowledge, with huge enrollment jumps in undergraduate and graduate programs that address environmental issues.

“One of those challenges is how climate change affects polar ice sheets. We’ve all seen dramatic footage of disappearing glaciers and massive chunks of ice crashing into the ocean. The story



doesn’t end there, because that melting ice raises sea levels and threatens the lives and livelihoods of millions who live in coastline communities.

“One of our new faculty teams is dedicated to explaining how and why great sheets of ice move and sea levels rise. We need to know more about the earth, the atmosphere, and the ocean, and how they all interact. Most important, such knowledge can help mitigate this threat.

“And so we have recruited exceptional faculty to elevate our leadership in this field. Brian Arbic is a physical oceanographer and world expert on tidal calculations. Sarah Aciego is an isotope geochemist pioneering new techniques for dating glacial ice. Modeling how ice sheets flow is the work of **Jeremy Bassis**, a geophysicist. And **Mark Flanner** is an earth systems scientist who investigates how black carbonaceous particles emitted by humans affect climate and snowpack.

“Their training and skills are distinct, and their new academic homes are in different departments and colleges. But they are singularly focused on bringing their knowledge to bear on a monumental challenge.

“To quote Professor Bassis, ‘Coming at the problem from very different perspectives makes this such a powerful initiative and the University of Michigan an appealing place to be.’”

# Iceberg Calving Follow-up

In the Summer/Fall issue of the *Daily Planet*, we carried a story about AOSS Asst. Professor Jeremy Bassis' research on icebergs breaking loose from glaciers, also referred to as iceberg calving. In an effort to understand how fast sea level could rise as the climate warms, Jeremy has developed a new theory to describe how icebergs detach from mainland ice sheets and glaciers.

Iceberg calving isn't well understood and while scientists believe it currently accounts for roughly half of the mass lost in shrinking ice sheets, says Jeremy, current sea level rise models don't take it into account. His paper on the new theory has been published online in the *Journal of Glaciology*. It will appear in print in the January edition.

"Our models cannot predict about half of the mass balance. We don't know how much of an effect this will have, but we've seen several prominent examples where calving is connected with speed-up of the ice-retreat process."

The Larsen B ice shelf in Antarctica – a 2,000-square-mile, 700-foot-thick slab that had been stable for thousands of years – disintegrated in about six weeks between January and March of 2002. Scientists believe rising temperatures

and ice fracturing primarily caused the disintegration, but they don't have a handle on exactly how it happened.

When ice breaks off of ice shelves, it doesn't directly or immediately cause melting and sea level rise. But, it is



**A helicopter view of a crack in the Amery Ice Shelf in East Antarctica. Photo by R. Coleman**

believed to contribute to and hasten those processes. The icebergs can float into warmer parts of the ocean and melt. And ice calving can perhaps lead to more fracturing.

"What we've been lacking is a way to quantify whether calving will increase or decrease in the future, and to do it in a way that doesn't involve information from a particular glacier. There are thousands and thousands of glaciers that might break up because of climate change. We'd like to have a theory that explains how this happens for any regime and this is a step in that direction," Bassis said.

Bassis' theory is a statistical methodology that allows him to predict the average iceberg calving rate and how much that can be expected to fluctuate for a given region based on the amount of stress within the ice and its thickness. He was able to construct a more general model, he says, because he assumed that this cracking happens somewhat randomly. He didn't try to predict where every fracture would happen.

"You don't need to understand what every glacier is doing if you know what glaciers are doing on the whole," Bassis said.

Current predictions of sea level rise range from about four inches to 2.5 feet by 2100. This is a wide range that Bassis' theory could help narrow.

"From a societal perspective, a significant portion of the Earth's population lives very close to sea level. We'd like to be able to better predict how much sea level will rise so we can build defenses or, if necessary, plan for migrations," Bassis said.

The paper is called "The statistical physics of iceberg calving and the emergence of universal calving laws." Bassis is also an assistant professor in the Department of Geological Sciences. This research is funded by NASA.

# RedZeppelin News



In 2007 AOSS graduate students Shintaro Taniguchi and Matt Trantham launched the co-ed *RedZeppelin* softball team for students to get to know each other and to exercise. “By doing so we hoped to provide cultural exchange opportunities among future scientists and engineers for better scientific and technological collaboration,” said Shintaro.

Over the past 10 seasons (3 seasons per year), more than 55

students have played for *RedZeppelin*, including students from more than 10 University programs and 10 countries.

Kevin Reed, who has managed *RedZeppelin* since season 7, will enter his fifth season as head manager for the '11 spring season. Kevin has managed three winning seasons, including the undefeated summer '10 regular season, and is now the all-time winning manager of *RedZeppelin* with the most playoff victories.

“I’m thrilled to be the head manager again,” said Reed shortly after the announcement of his re-appointment. Joining him in management duties are Gina Dibraccio and Rachel Kroodsma, who will be the co-captains for the upcoming season.



## Some Facts

- Jacob Gruesbeck, a *RedZeppelin* player for all 10 seasons, set the all-time record for the most games played – 45 games.
- John Puckett, a seven-time AOSS All-Star, who graduated and retired during the '10 summer season, became the first Lifetime Emeritus Distinguished Leader of *RedZeppelin* Softball, for his service and leadership.

*RedZeppelin* is always looking for other students to join. Please contact Kevin Reed (kareed@umich.edu) or Rachel Kroodsma (rakro@umich.edu) for details.

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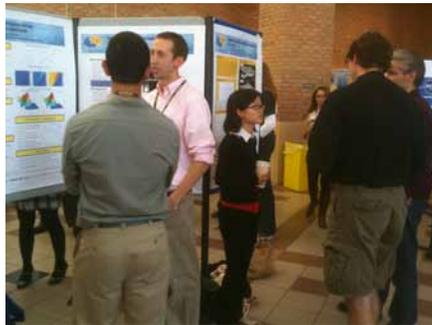
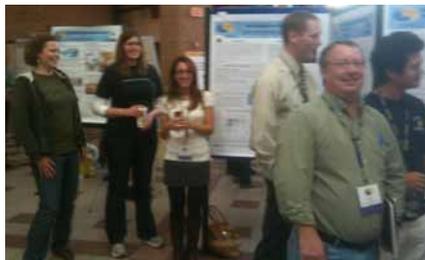
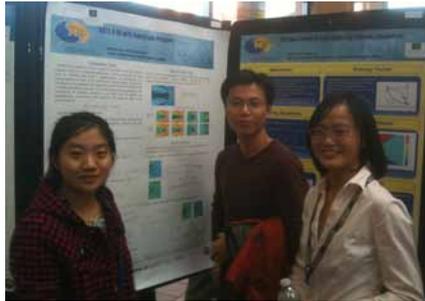
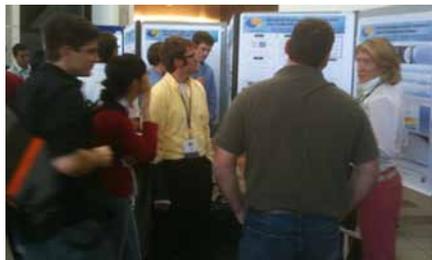
## AUSFund GETS FIRST DONORS

As an example to faculty, friends and alumni, AOSS Chair Tamas Gombosi and Professor Mark Moldwin gave the AUSFund a good start by becoming the first donors to the AUSFund.

“This ambitious initiative has great potential to increase awareness of the AOSS undergraduate program among high school and transfer students while, at the same time, reward students for exceptional work,” said Tamas. “We encourage everyone to make such a commitment to the educational mission of the department.”



# Proudly Representing AOSS



**Kevin Reed** took first place in the 2010 CoE Graduate Symposium – AOSS Session for his poster *Evaluating the Impact of CAM5 Dynamical Core in Idealized Tropical Cyclone Simulations*.

**Paul Ullrich** was a nominee for the Outstanding PhD Student Research Award for his poster, *High-Order Finite-Volume Schemes for Simulating Atmospheric Flows*.

Kevin's and Paul's advisor is AOSS Asst. Professor Christiane Jablonowski.

Prof. Mark Flanner, Dr. Kenneth (K.C.) Hansen and Dr. Sue Lepri were judges and **Rona Oran** and **Chuan-Yuan Hsu** represented AOSS on the symposium organizing committee.

Students who participated in the AOSS Session were:

- Kiran Balasubramanian
- Iverson Bell
- Alexander Bryan
- Shannon Curry
- Fang Fang
- Julie A. Feldt
- Eric D. Gillman
- Zhenguang Huang
- Yuni Lee
- Xing Meng
- Colin Miranda
- Kevin Reed
- Scott Stapleton
- Ahmed Tawfik
- Paul Ullrich
- Catherine Walker
- Yiqun Yu
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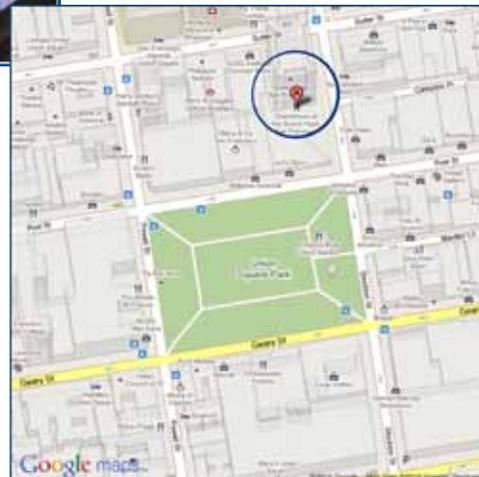
Did you know that as an alum you can stay connected with a U-M Lifetime Email account that includes free lifetime forwarding? To find out more, visit:

<http://tinyurl.com/2wuw3vb>



# AGU 2010 Fall Meeting Reception is moving...

Across Union Square and around the corner to the **Grand Hyatt San Francisco**, at the corner of Stockton and Sutter Streets. Mark your calendars for Wednesday, December 15, 6:00 – 8:00 PM in the **Bayview/Union Square Rooms** of the **Grand Hyatt San Francisco**. The Bayview/Union Square is on the 36<sup>th</sup> floor. Please forward the invitation to AOSS alumni and friends. Stop and visit the AOSS booth, in the Academic Showcase – in Moscone Center South in the center in front of the posters– look for the Michigan flag.



You can make a *Michigan Difference today* by using the form below

Your tax-deductible gift to AOSS will provide opportunities for students and keep our programs strong. AOSS strives to offer our students the best possible educational and research opportunities. Your gift to the Department will enable us to make awards to AOSS students who have financial need, are outstanding students or have exemplified exceptional leadership and character.

Enclosed is my gift of \$_____ for the AOSS Undergraduate Student Fund.	
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