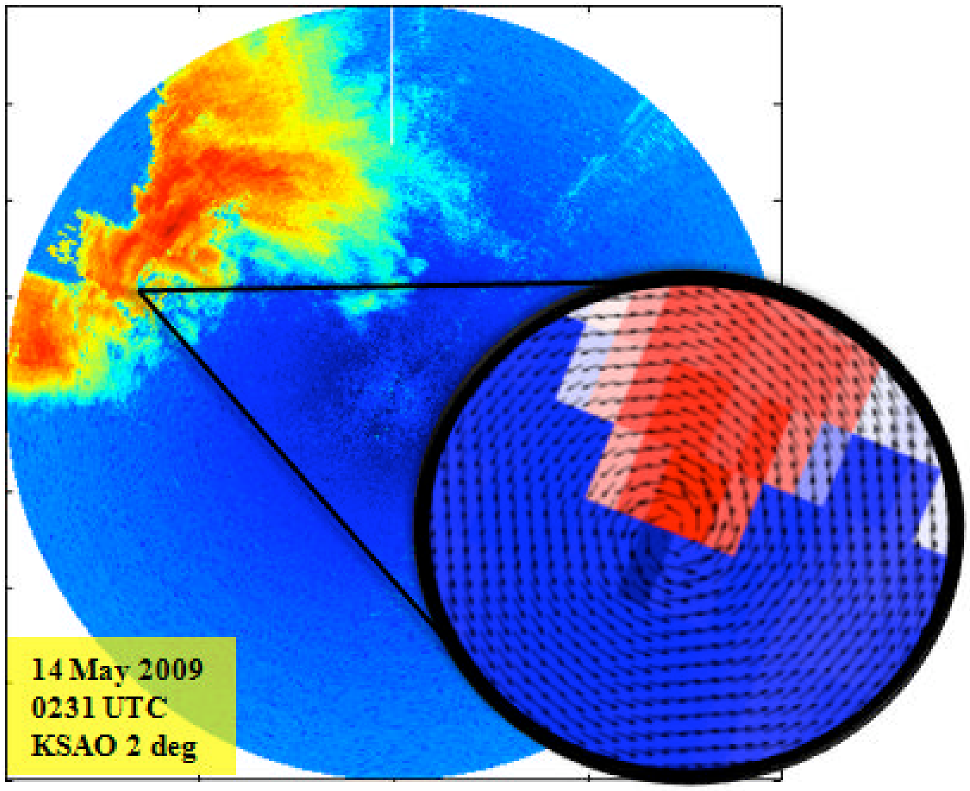

casa Engineering Research Center for Collaborative Adaptive Sensing of the Atmosphere

Journal of the Collaborative Adaptive Sensing of the Atmosphere

CASA Student Leadership Council (SLC)

Volume III
Spring 2009

Introduction

The goal of the SLC is to provide a platform for interdisciplinary and intercollegiate collaboration for students currently involved with all aspects of CASA. With this in mind, the SLC Journal was started in spring of 2007 and will continue this year with its third volume. The SLC Journal provides a concise summary of CASA research in the form of abstracts and autobiographies written by student researchers, from the level of undergraduate to graduate, across all disciplines of CASA.

The purpose of this journal is to help facilitate communication between the universities and departments, fostering multi-campus, multi-level, and interdisciplinary research. Journal readers and writers are encouraged to utilize the information contained in the journal to identify connections between their work and that of others, and to then communicate with fellow contributors to further develop research collaboration between universities and disciplines.

I would like to thank the hard work of the students who contributed to Volume 3 of the journal, including Brian Donovan for his continued CASA support, the SLC Chair Members who collected the works, and in particular, Corey Potvin and Jorge L. Salazar for their work in the editing room. Special thanks also to Dr. Paula Sturdevant Rees for her continued support and input. Please continue the excellent research that makes CASA the world class ERC it is.

Sincerely,

Anthony P. Hopf
SLC President
ahopf@ecs.umass.edu

Thank you for reading and please feel free to contact me with any questions. All issues of the journal can be found at the CASA SLC Quickplace, which is linked to the CASA Quickplace homepage at http://casa-ibm.cs.umass.edu/casahome.

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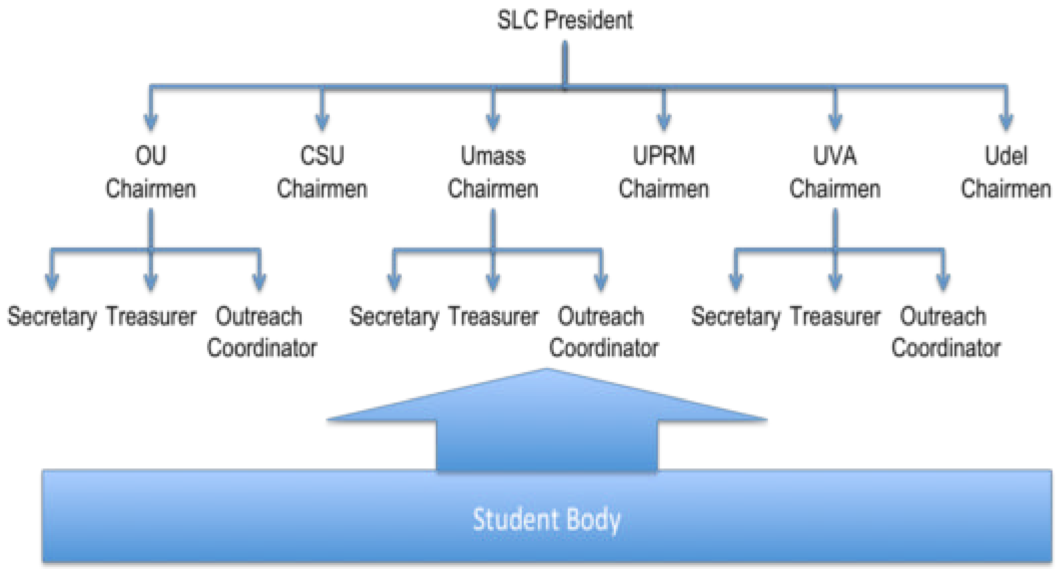
Roles of an Engineering Research Center (ERC) Student Leadership Council (SLC)

- Organize student activities to help achieve ERC goals
- Bring student concerns to attention of ERC leadership
- Keep ERC leadership and NSF informed on how well ERC is achieving its goals from students' perspective
- Help ERC leadership determine how to deal with weaknesses and threats
- Reach out to pre-college students to encourage/maintain interest in STEM (science, technology, engineering and math)
- Promote student involvement with industrial partners
- Engage in social activities to promote inter-student relationships
- Create opportunities for students to discuss research projects with each other
- Assist at ERC retreats, site visits, etc. (e.g. poster session setup)
- Provide leadership opportunities to students
- Provide service to community
- Organize student-sponsored seminars (e.g. ethics training, team building, time management)
- Encourage student involvement in SLC

Advantages to Involvement in an SLC

- Increased involvement with advancement of ERC
- Leadership experience
- Increased awareness of other students' research
- Opportunity to serve surrounding community
- Increased knowledge of how an ERC functions
- Resumé booster
- Getting to know your fellow students better
- Networking opportunities

SLC structure organization



Interview with CASA's Brian Donovan

Brian Donovan is a former CASA student and distinguished alumnus of the University of Massachusetts Amherst with a Bachelor of Science and Ph.D. in Electrical Engineering. He is now an engineer at BBN Technologies. Brian was kind enough to sit down with Alex Trefonas to talk about CASA has impacted his career successes.

Q: How did you first get involved in research with CASA?

Brian: I started working with Prof. McLaughlin as an undergraduate research assistant in the MIRSL lab during my sophomore year at UMass. The CASA ERC had not been started at the time. I started with CASA during the proposal phase.

Q: How long did you work at the CASA ERC?

Brian: I worked at CASA from the start of the project in the Fall of 2003 until the completed my degree and left UMass during the summer of 2008.

Q: What projects did you worked on and which was your favorite?

Brian: I worked on the student leadership council, the student testbed (STB) and the off-the-grid (OTG) project. I think my favorite project was the STB. Working across multiple campuses was difficult initially but it was very rewarding to see the project develop as students in Puerto Rico completed their installations.

Q: Was it ever difficult to manage your time between research work for CASA and your classes?

Brian: Managing time between research work and study is a difficult and important task independent of CASA. Now that I am in industry my current job responsibilities require that I complete research work while learning areas of new fields. Yes, I did find it difficult to manage both research and classes but having to do so made me better prepared for industry.

Q: How long did it take for you to make a meaningful contribution to CASA?

Brian: There are so many ways that a participant in CASA may make a meaningful contribution to the project, I don't remember when I made my first contribution. Perhaps you should ask Prof. McLaughlin or Michael Zink. Aside from this I would argue that any student who has voiced an idea and thought critically about the problems that CASA is trying to solve has made a meaningful contribution to CASA.

Q: Could you describe the work environment at CASA?

Brian: This is lab dependent, in my case I worked with a lab with a number of students on both CASA and non-casa project. Some time was spent in a lab working with hardware, ie, designing, wiring and testing. Other time was spent developing software to work with the data or control the hardware.

Q: Do you feel that the work environment encouraged creativity and innovativeness?

Brian: The University by its very nature encourages creativity and innovativeness. Being on a university provides students with access to resources unavailable elsewhere, i.e., the hundreds of people on campus, most experts in their field, to discuss problems and develop solutions with. The library resources allow students to research and learn anything that interests them. The resources of the university provide the resources for creativity, and it is up to the students to take advantage of them.

Q: How did your position at CASA fit into your overall career plan?

Brian: In retrospect CASA prepared me to be able to rapidly adapt to a new field in industry and make contributions to my company from the first day. It was not the research that I completed in CASA that prepared me, but rather the education in working in unfamiliar fields and learning how to learn new technologies quickly.

Q: Where are you currently working?

Brian: BBN Technologies, Cambridge, MA.

Q: Has your experience at CASA helped prepare you for your position at BBN?

Brian: Absolutely, the software and hardware work that I completed has a graduate student with CASA has been directly applicable to BBN. I am not using the same software tools, nor am I working with radar, but the concepts required to work with radar apply to the new sensors and systems that I do work on.

Q: What similarities and differences have you noticed between academic research and industry?

Brian: The industrial research that I am now working on operates at a faster pace - work must be completed more quickly. Also the industrial research has a greater emphasis on a customer, their needs, and the product that we are developing.

Q: What suggestions would you make to undergraduates in the school of engineering?

Brian: Find a professor who is working on a problem that interests you and ask to work in their lab.

University of Massachusetts

Separation of Sensor Control and Data in a Closed-Loop Meteorological Sensor Network

Victoria Manfredi, Jim Kurose, Naceur Malouch,
Chun Zhang, Michael Zink
University of Massachusetts, Amherst, MA USA

Under submission Sensor networks are prone to congestion due to bursty and high-bandwidth data traffic, combined with wireless links and many-to-one data routing to a sink. Delayed and dropped packets then degrade the performance of the sensing application. In this work, we investigate the value of prioritizing sensor control packets over data packets, during times of congestion, in a closed-loop meteorological sensor network. We analyze a meteorological tracking application, running over a network of X-band radars. Our application measures reflectivity (a measure of the number of scatterers in a unit volume of atmosphere known as a voxel) and tracks storms (i.e., regions of high reflectivity) using a Kalman filter. Considering data quality, we show that prioritizing sensor control packets over data packets decreases the round-trip control-loop delay, and consequently increases either (i) the number of voxels V scanned with N_c reflectivity samples per voxel or (ii) the number of reflectivity samples N obtained per voxel scanned. In the former case, the utility increases linearly with the number of scanned voxels. In the latter case, since sensing accuracy improves only as a function of $\sqrt{N}$, the gain in accuracy for the reflectivity estimate per voxel as N increases is relatively *small* except when prioritizing sensor control increases N significantly (e.g., when sensor control packets suffer severe delays). Because accuracy also degrades as a function of $\sqrt{N}$, however, the system can still perform well during times of congestion for this latter case, but only when sensor control packets receive priority and remain unaffected by packet drops. Considering the performance of the tracking application, we show that during times of severe congestion, not prioritizing sensor control packets over data packets can actually lead to tracking errors accumulating over time.

Velocity Unfolding in Network radar System

Edin Insanic,
University of Massachusetts, Amherst, MA, USA

This paper presents an algorithm that derives the vector velocity estimate in a radar network environment considering the velocities that exceed the maximum unambiguous velocity of its observing sensor nodes. At first, an analytical derivation with underlying assumptions is presented and then simulation results are shown and discussed. This unfolding vector velocity algorithm is based on maximum likelihood theory operating on the first three weather radar spectral moments and can potentially provide a real time velocity detection of broader range of velocities than given by the nodal maximum unambiguous velocity.

SRCP: Simple Remote Control for Perpetual High-power Sensor Networks

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Remote management is essential for wireless sensor networks (WSNs) deployed in inaccessible locations and designed to run perpetually using harvested energy. A natural division of function for managing WSNs is to employ both an in-band data plane to sense, store, process, and forward data, and an out-of-band management plane to remotely control each node and its sensors. This paper presents SRCP, a Simple Remote Control Protocol that forms the core of a non-invasive out-of-band management plane for WSNs. SRCP is motivated by our target environment: a perpetual deployment of high-power, aggressively duty-cycled nodes capable of handling high-bandwidth sensor data from multiple sensors. The protocol runs on low-power always-on control processors using harvested energy, distills an essential set of primitives, and uses them to connect and control a suite of existing management functions on more powerful main nodes. We demonstrate SRCP's utility by presenting a case study that (i) uses it to control a broad spectrum of management functions and (ii) quantifies its efficacy and performance.

Phase-Tilt Array Antenna Design for Dense Distributed Radar Network for Weather Sensing

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University of Massachusetts, Amherst, MA, USA

A new weather radar design concept currently being investigated by the NSF Center for Collaborative Adaptive Sensing of the Atmosphere (CASA) involves the use of dense networks of X-band radars that defeat the blockage effect of earth's curvature by limiting the operating range of each radar to a few tens of km. Such networks would be arranged in deployments comprised of tens (urban environment), hundreds (regional deployment), or potentially even thousands of radar nodes (covering a nation the size of the contiguous US, for example) for comprehensive sampling of lower troposphere and boundary layer. Each radar, or node, in the network would be capable of optimizing its scanning strategy for the given conditions in a concept known as distributed, collaborative and adaptive sensing (DCAS). To achieve a demonstration of DCAS, CASA has built and deployed a network (IP1) of four magnetron based radars which sit atop high speed pedestals that allow for optimized sector scanning on a one minute update cycle. While the IP1 network does demonstrate the benefits of DCAS, the radars do not address the need for physically-small, low-cost measurement-quality radars that would be practical and cost effective to deploy in larger networks. To address this need, CASA is developing an electronic scanning approach referred to as Phase-Tilt. The Phase-Tilt antenna is an array of dual polarized columns that performs electronic phase-steering only in the azimuth direction, while mechanically steering in the elevation plane. These small arrays will be approximately 1meter wide by ½ meter tall and can be installed on a variety of existing infrastructure. The dual-polarized phased tilt antenna is composed of 64 columns, each one excited by a solid state T/R module. Each column is a dual linear polarized (V and H) array composed of 32 aperture coupled microstrip patch antennas interconnected by series-fed networks for each polarization. The columns are fed by a 2W transmit and receive module that features 360° of phase control with 5.6° of resolution, and 31.5 dB of amplitude control with 0.5 dB of resolution. A custom designed TR/Polarization switch was designed to manage the 2 Watt amplifiers and allows for alternating mode operation. At X-band wavelengths associated with CASA's dense radar network designs, the effects of atmospheric attenuation must be taken into account. The use of polarimetric observations is one method to correct for atmospheric attenuation; however, it places certain requirements on the performance of the antenna. This paper will address the synthesis method for designing the dual polarization columns and present measured results from the first prototype, the design of the T/R module, and analyses of the sensitivity and polarization performance of the array based on a deployment within a dense network of radars.

Scalable Dense Radar Network

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Today's national weather radar networks utilize high power, long range, physically large radars to map winds and rainfall in the mid and upper portions of the troposphere. Owing to the curvature of the earth, these radars are blocked from viewing the lower troposphere and in particular the atmospheric boundary layer. Overcoming the earth curvature and defeating this gap in coverage requires that radars operate at shorter ranges and that they consequently be spaced closer to each other than they are today. Reducing the required operating range of a radar permits a decrease in the required transmit power and also permits a migration from the non-attenuating S-Band (3 GHz) frequency to today's weather radars up to X- Band (10GHz) where attenuation, though increased, can be accounted for in the power budget of a radar design. The migration to a shorter wavelength permits a significant reduction in the physical size of the radar antenna - from the 10m antennas used in today's weather radars to 1m in diameter. The reduction in size permits consideration of the installation of large numbers of radars atop rooftops, cellular communication towers, and other elements of the infrastructure. If they can be made cost-effective (eg, $150k per radar) networks of these radars could be deployed over domains of various size, ranging from municipal regions (~ 10 radars deployed over a 100km domain) to regional/mesoscale domains (~hundreds of radars over a domain hundreds of km on a side) to full-scale national deployments (thousands of radars deployed over domains up to several thousand km on a side). The Center for Collaborative Adaptive Sensing of the Atmosphere (CASA), an engineering research center established by the National Science Foundation, is advancing the technology to enable future deployment of such networks. As a first step, the center has deployed a network of four small radars in a research network in Oklahoma. The radars in this test bed utilize mechanically-scanned antennas atop very high speed pedestals, magnetron transmitters, and coherent-on-receive receiver/data collection systems. These radars cost approximately $500k each to build and deploy atop custom towers in the fields of southwestern Oklahoma. The next step in the evolution of this technology, and a means toward reducing the cost by a factor of 2-3, is to realize these radars using solid state electronics and electronically-scanned phased arrays. Use of phased arrays reduces the cost and maintenance compared with mechanical/magnetron systems and simultaneously permits multi-function targeting of radar resources. The same radars that sample the weather also have the potential to observe aircraft, including low-flying airborne targets that are "under the radar" of today's observing technology.

Low-cost X-band solid state phased array radars appear to be achievable through the use of all-silicon (versus gallium- arsenide) transmit-receive functions combined with low cost packaging and surface-mount "computer-like" manufacturing approaches. By limiting the peak transmitter power to 10's to 100's of watts, it appears feasible to realize all-electronic beam steering using flat panels that don't require active cooling systems. Exciter designs for these radars require low peak power combined with high duty cycle and pulse compression waveforms to achieve sensitivity levels below 10 dBZ when operating at ranges up to 30 km. Moreover, by adapting the scan rate of these radars, it appears feasible to achieve sensitivity levels down to 5 dBZ or lower in selected regions of the atmosphere. This paper discusses the design tradeoffs for electronically steered phased arrays suitable for deployment in dense networks for both weather and air surveillance functions. Using as a context a network comprised of ~10-20 radars deployed in tornado alley, we study the interplay between available low cost technologies and key performance parameters, such as sensitivity, resolution, and scan update-time, and network topology. We establish the expected performance of a network for sensing precipitation, clear air winds, and low-flying airborne targets and present the high-level design for a system that is under deployment consideration by the CASA Engineering Research Center.

A Method to Correct for Radome Attenuation in CASA Radars by the Use of a Contiguous WSR-88D Radar

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The Center for Collaborative and Adaptive Sensing of the Atmosphere (CASA) has deployed a Distributive, Adaptive and Collaborative Sensing (DCAS) network of four radars in central Oklahoma working as a close-loop system since 2006. The radars operate at the X-band frequency and are capable of polarimetric and Doppler measurements. The system was developed with the goal of improving weather detection and prediction in the lower troposphere with special attention to weather hazards that affect citizens' lives (e.g. tornadoes, convective cells, supercell detection) while advancing radar technology. A test-bed of four radars was deployed between the area of coverage of two WSR-88D radars located at Frederick (KFDR) and Oklahoma City (KTLX) and the Micronet network of 20 rain gauges in Little Washita.

X-band radar advantages over larger wavelength radars include lower cost, lower power radiation, smaller infrastructure and easier deployment, among others. In addition, X-band radars capable of dual-polarization have demonstrated an improvement in rainfall estimation when compared to single polarization measurements. On the other hand, X-band measurements in rainfall are heavily affected by attenuation. Methods to correct for path attenuation based on specific differential phase shift (K_{dp}) and network-based correction were developed for CASA radars.

It is of common practice in radar systems to protect the radar components (e.g. antenna, transceiver) from the environment using radomes. Operational weather radars that operate at S- band wavelengths have minimal signal attenuation caused by wet radome, but at X-band, rainfall over the radome can significantly attenuate the signal, even to total extinction over short time periods. The use of the network configuration deployed by CASA can mitigate radome attenuation errors and can provide the missing data (in case of extinction) if a contiguous radar is not heavily affected by rainfall. On the other hand, if a widespread storm has an effect on two or more radars, radome signal attenuation can significantly affect quantitative precipitation estimation (QPE).

By comparing data from a single CASA radar to data from the WSR-88D radar, an equation that relates the area average radome attenuation (dBZ) and the rainfall amount over the radome was obtained. The analyzed data has an exponential fit of form $y = \alpha \exp(\beta x)$, where α and β are constants that fit the data using the least-square method and x and y are the rainfall amount over the radome and area average radome attenuation, respectively. In developing the relationship, the WSR-88D data is assumed as the correct data, while the CASA radar data is affected by radome attenuation.

Because the method relies on the WSR-88D radar to generate the relationship, it is subject to the radar's measurement errors (e.g. large sampling volumes, calibration errors). Finally, the CASA radar area data average is compared with the Little Washita rain gauge network to analyze the improvement in QPE by applying the radome attenuation correction to the data.

Alex Trefonas Abstract

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Alexander P. Trefonas is a student at the University of Massachusetts Amherst pursuing a bachelor's degree in electrical engineering. In Summer 2007, he joined CASA to work under Phd. Candidate Jorge Trabal on the graphical display of raw meteorological data, a as well as he storing of raw data into NetCDF format for the CASA PR1 Stefani radar. He now works under Phd. Candidate Anthony Hopf and is creating plans for the fiberoptic interface for the CASA Phase-Tilt Escan Radar System. Last summer, Alexander interned for Cisco Systems and tested simulated Viking routers.

In summer 2006, he interned for Invensys in Foxboro, where he tested fieldbus devices. Alexander's interests include network programming, optical character recognition, graphics rendering, website development, traveling, photography, dirt biking, and archery. He plans to work full-time as a software engineer at Cisco Systems in Boxborough, Massachusetts after graduation in May 2009.

<u>Colorado State University</u>

Ground Scattering Analysis to Identify Targets for Refractivity Field Estimation

Jason Fritz and V. Chandrasekar
Colorado State University

Efforts to estimate the near-surface moisture field using weather radar returns from coherent ground targets has been successfully demonstrated in recent years. A very crucial step to make the moisture retrieval successful is the identification of appropriate targets. The estimation process also depends on adequate spatial distribution of these targets, so it is actually more important to have a good distribution than to have every target be extremely coherent. Presently, however, there is no fully automated technique to identify the targets. The currently accepted method is to manually examine phase difference scans that span approximately an hour to identify a time period where the phase gradient is approximately the same across all azimuths. Unfortunately, this is not simple and improper selection can have drastically different results. In order to design an algorithm to automate this process, one must first understand the phase behavior of ground reflections for this purpose. Previous analysis of ground returns were for the purpose of eliminating them, but the work presented here aims to identify suitable targets for refractivity estimation.

Estimation and Correction of Wet Ice Attenuation at X-band during a convective storm Using the X-band CASA radar network IP1 and WSR-88D KOUN Radar

Leon L., V. Bringi, V. Chandrasekar

Colorado State University

Polarimetric algorithms have been exploiting the specific attenuation and differential propagation phase relationship (Ah-Φdp) in order to estimate attenuation due to rain, and correct reflectivity (Z) at attenuating frequencies such as X-band (either directly or as a constraint) [1][2][3][4][5][6][7]. In convective storms, where rain is commonly mixed with wet ice (hail/graupel), the Ah-Φdp relationship is no longer accurate to correct for the excess attenuation due to wet ice separately from rain. This is due to the insignificant wet ice contribution (assumed to be caused by 'spherical' particles) to Φdp while highly contributing to the reflectivity attenuation.

A dual-wavelength radar technique was used to develop a methodology for estimating the excess attenuation at X-band and was evaluated in a supercell hail simulation (using the Colorado State University Regional Atmospheric Modeling System (RAMS) 2-moment scheme). This was done by emulating dual-wavelength S/X-band system radar propagation through the mixed phase region of the supercell using the S-band as the reference (i.e., un-attenuated) signal. This RAMS model data set provided 'intrinsic' values of rain and wet ice attenuation that were comparable to the retrieved values from the dual-wavelength radar method. This technique was also examined using sample data provided by the X-POL and S-POL radars operated during the International H20 Project (IHOP) experiment from a case on June 16, 2002. In both cases, the X-band Z correction showed good agreement when compared to the S-band un-attenuated signal.

The CASA radar network, first generation system Integrative Project 1 (IP1) operating at X-band, was deployed in Oklahoma during the Spring of 2007. During this period a convective system was detected on June 10th, 2007. The NSSL Polarimetric WSR-88D (KOUN) radar located in Norman, Oklahoma, provided S-band data for the same storm. Comparisons between CASA and KOUN data revealed differences between rain attenuation-corrected X-band reflectivity and the un-attenuated S-band reflectivity. A hydrometeor classification algorithm showed the presence of wet (high density) graupel located at the areas of the largest reflectivity differences between S and X-bands, suggesting the presence of wet ice attenuation contributing to the excess attenuation of the X-band signal. Data from this case are examined and the technique for estimating the wet ice attenuation component at X-band is applied using reference values provided by the KOUN radar.

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Development of a Real-Time Dynamic and Adaptive Nowcasting System

Evan Ruzanski

Colorado State University

Small-scale, high-impact weather events such as fast-evolving supercells and flash floods pose a severe threat to humans,. Forecasts of small-scale storms with short lead times are of significant value for better preparation and response. Several nowcasting algorithms currently exist which provide short-term forecasts of tens of minutes up to a few hours. These nowcasting techniques can be classified into two categories: object-oriented approaches and correlation-based approaches. In the former technique, abstraction of the radar measurement based on centroid analysis is employed to detect major storm features from radar data where a storm cell is modeled as mass-weighted centroids. Nowcasting is realized by tracking such high-level abstractions. This technique has been shown to work well in predicting motion of well-organized, isolated cells of high reflectivity, but essentially this object-oriented description lacks the capability to characterize the space/time variability of the storms. In the latter technique, local area correlations are computed over consecutive radar observations without relying on any abstraction. The distribution of correlations characterizes the storm evolution and can be used to estimate storm motion. Optimal performance can only be achieved with a window size and orientation matching the particular storm's characteristics, and comes at the cost of relatively high computational complexity. Recently, a new nowcasting algorithm, the Dynamic and Adaptive Radar Tracking of Storms (DARTS), was developed using a physical model that is described as a flow equation of the continuous spatiotemporal reflectivity field. The governing flow equation is solved in the spectral domain to estimate the storm motion. In this process, correlation computation is avoided and the storm motion can be efficiently estimated with less computational demand. Various scales of storm motion prediction can be controlled by the choice of the number of spectral coefficients used in the estimate. The estimated motion field can be globally constructed over the whole spatial region where radar images are rendered so that the storm observations can be continuously advected forward. Therefore, the DARTS algorithm exhibits several advantages of particular operational importance over other nowcast methods, especially in the real-time operational environment. This paper presents the development of a real-time DARTS nowcasting system in a networked radar testbed operated by the center for the Collaborative and Adaptive Sensing of the Atmosphere (CASA). In this CASA testbed, radars are controlled in a closed-loop, collaborative and adaptive mode. The system has a fairly high temporal update rate of around one minute. Case studies are presented to demonstrate the nowcasting performance for various storm types.

CONFERENCE: 25th Conference on International Interactive Information and Processing Systems for Meteorology, Oceanography, and Hydrology, Phoenix, AZ, Jan. 12-15, 2009

Attenuation Margin Requirements in a Networked Radar System for Observation of Precipitation

V. Chandrasekar, D. Willie, Y. Wang, S. Lim and D. McLaughlin

Colorado State University

In recent years, it becomes increasingly appealing to move the operating frequency of weather radar systems from non-attenuating frequencies, such as at S-band, to attenuating frequencies, such as at Xband. Through decades of research, the propagation of electromagnetic waves through precipitation has been better understood and the algorithms to correct for wave attenuation have become mature. Operating weather radar at higher frequencies is attractive because it helps to reduce antenna size, system cost, and infrastructure limitation. However, electromagnetic waves become extinct in long and intense rain paths at X band in which case there is potential for missing observations. Therefore, the excess margin for rain attenuation is one of the important metrics in radar system design and the extra attenuation margin needs to be applied to the allocation of power budget to meet the required sensitivity. In order to produce a quantitative baseline for system design for short wavelength weather radar, research has been done to collect the statistics of total attenuation for a single radar node and a database can be created for a specific region from large amount of radar observations at non-attenuation frequencies. Larger total attenuation is more likely for longer propagation paths, especially up to 100 km radius. Therefore, not only the radiation dispersion with range but also the total attenuation increase with range needs to be considered for sufficient sensitivity. At X-band and higher, the attenuation margin can become very high at larger radar range in order to ensure reliable measurements with high probability. The NSF Engineering Research Center (ERC) for Collaborative and Adaptive Sensing of the Atmosphere (CASA) is advancing a new sensing paradigm using networked short-range radar systems to avoid problematic earth curvature blockage. Low cost X-band weather radar enables the deployment of a large number of radar nodes. The CASA ERC has developed a networked radar test bed – Integrated Project 1 (IP1) – in southwestern Oklahoma, using four X-band radar of 40 km range to cover an area of 7,000 km2.

CASA's radar network is also a collaborative and adaptive system with distributed radar nodes densely deployed. Overlapped coverage is one of the most important aspects in designing such networked systems. The overlapped coverage further counters the attenuation margin requirements because of the diversity in the network observations. Rainfall intensity is rarely uniform over large areas; therefore the total attenuation encountered by each radar node can vary widely through different propagation paths. This diversity helps to increase the system availability and system attenuation margin can be designed lower. In this paper the attenuation margin requirements are analyzed in the network context and the metric to design a networked radar system is formed. In CASA's IP1 test bed a substantial common coverage area exists that can be observed by all the four radar nodes. In this paper the field observations in IP1 are analyzed and the distributions of total attenuation of single radar observations and that of network observations in this common coverage are presented in terms of probability of the total attenuation exceeding some a value. At high system availability, the distributions of the total attenuation viewed by the network, of the optimal (min) and the sub-optimal (2nd min) network observation, are consistently and substantially favorable than the distributions of the total attenuation viewed by individual radar. The difference between the distribution for individual radar and the distribution for the network shows the network gain of the attenuation margin.

University of Oklahoma

Impacts and Scanning Strategies of CASA Radars

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The fundamental underpinning of CASA is intelligent sampling of the atmosphere and active roles by end users, that is, extracting as much quantitative meteorological information as possible in order to optimally meet multiple, often competing end user needs while simultaneously making the most effective use of available CASA resources. The understandings thus obtained provide guidance for the design of optimal scanning strategies for different weather scenarios (e.g., supercells, multicells, mesoscale convective systems, linear convection) and applications (e.g., tornado detection, kinematic analysis and NWP). Efforts are focused on evaluating specific scanning strategies for information extraction using radar emulators, and on assimilating simulated CASA data for the short-term prediction of deep convection, especially poorly-organized, transient but locally intense storms (e.g., multicells) that require rapid data updates.

Using the ensemble Kalman filter (EnKF) data assimilation framework of Tong and Xue and Xue et al., different adaptive scanning techniques are simulated using observation system simulation experiments (OSSEs). Assimilations and forecasts are performed by incorporating the simulated CASA and WSR-88D radar data into the Advanced Regional Prediction System (ARPS) using the EnSRF method. After simulating a variety of linear mesoscale convective systems, including unicellular and multi-cellular squall lines as well as lines of supercells, a unicellular squall line in large area, where the four-node CASA network can only cover part of the storms, was choosen as the control simulation. Preliminary results of EnSRF experiments using simulated data from both KTLX and the four-node CASA network for simulated unicellular squall line simulations are promising. The addition of CASA radar to that of KTLX improves the overall model performance. Initial results of increased temporal sampling of the unicellular squall line simulation also show a decrease in error for most model state variables. Future work will focus on determining the most efficient and cost-effective adaptive scanning strategy for each storm type, along with necessary sensitivity and data ingest rates that are needed for optimal modeling.

Using a Low-Order Model to Detect and Characterize Tornadoes in Multiple-Doppler Radar Data

Corey K. Potvin[1,2], Alan Shapiro[1,2], Tian-You Yu[3], Jidong Gao[2] and Ming Xue[1,2]

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[3] School of Electrical and Computer Engineering, University of Oklahoma, Norman, OK

A new multiple-Doppler radar analysis technique is presented for the objective detection and characterization of tornado-like vortices. The technique consists of fitting radial wind data from two or more radars to a simple analytical model of a vortex and its near-environment. The model combines a uniform flow, linear shear flow, linear divergence flow (all of which comprise a broadscale flow), and modified combined Rankine vortex (representing the tornado). The vortex and its environment are allowed to translate. The parameters in the low-order model are determined by minimizing a cost function which accounts for the discrepancy between the model and observed radial winds. Since vortex translation is taken into account, the cost function can be evaluated over time as well as space, and thus the observations can be used at the actual times and locations they were acquired.

The technique is first tested using analytically-simulated observations whose wind field and error characteristics are systematically varied. An ARPS (Advanced Regional Prediction System) high-resolution numerical simulation of a supercell and associated tornado is then used to emulate an observation data set. The method is tested with two virtual radars for several radar-sampling strategies. Finally, the technique is applied to a dataset of real dual-Doppler observations of a tornado that struck central Oklahoma on 8 May 2003. The method shows skill in retrieving the tornado path and radar-grid-scale features of the horizontal wind field in the vicinity of the tornado. The best results are obtained using a two-step procedure in which the broadscale flow is retrieved first.

Analysis of MCV Tornadoes through Storm-Scale Data Assimilation and Simulations

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[1]Center for Analysis and Prediction of Storms and [2]School of Meteorology
University of Oklahoma

The 3DVAR system of the Advanced Regional Prediction System (ARPS) is used to assimilate data from the CASA (Center for Collaborative Adaptive Sensing of Atmosphere) and WSR-88D radars together with more traditional forms of data such as ASOS, RAOBs, wind profiler data, and observations from the Oklahoma Mesonet, for the case of a mesoscale convective vortex (MCV) that developed on 9 May 2007 in southwest Oklahoma during the CASA Spring 2007 Experiment. This convective system, containing a number of multi-cell storms, produced several small tornadoes.

Data assimilation and forecast experiments are conducted on two one-way nested grids that have 2 km and 400 m grid spacings. Data assimilation is performed on both grids. On the 2 km grid, radar data are assimilated every 5 minutes over a 1 hour assimilation window. On the 400 m grid, radar data are assimilated every 5 minutes for assimilation window lengths of between 40 and 80 minutes. In the subsequent forecasts, the model predicts the timing and location of the MCV with great accuracy. Furthermore, forecasts on the 400 m grid generate two tornado-like vortices (one near Minco, OK and another near El Reno, OK) that track within 5 km/10 min of the confirmed tornado location/time.

The model simulations as well as observational data indicate a strong resemblance between the structure and evolution of the MCV and that of a mid-latitude wave-cyclone. An area of persistent shear and convergence associated with the MCV is found to be responsible for the generation and enhancement of the vortices that become tornadic. At later stages of low-level vortex intensification the simulated vertical velocity field shows structures that are similar to those of rear-flank/occlusion downdrafts in supercell thunderstorms.

University of Puerto Rico - Mayagüez

Design of Coplanar Waveguide Fed Tapered Slot Antenna Arrays for High-Power Space Distributed Amplifier Applications

Alix Rivera-Albino
University of Puerto Rico, Mayagüez

Coplanar waveguide fed tapered-slot antenna arrays are designed for a high-power space-distributed solid-state amplifier application at X-band. The amplifier is designed using a tray configuration inside an over-moded waveguide. The waveguide operates in its TE30 mode, which allows the placing of 3, 6 or 9 trays, positioned for optimal power generation. Each tray has four class-E amplifiers, and the input and output to each of the amplifiers are tapered-slot antennas. The input antennas are matched to 50 Ω, and the output antennas are matched to 24 Ω, which is the optimum class-E impedance, for the transistor device used, for maximum output power. This work shows the tapered-slot design for the desired impedance based on the tray position in the over-moded waveguide. The two center antennas and the two edge antennas on each tray are kept the same to simplify the Design of Experiments analysis. In addition it was found that although the center frequency of operation is shifted upwards, the antenna behavior for 3, 6 and 9 trays does not change significantly and the same antenna design can be used for all the trays. The antennas were simulated, built and tested for an input impedance of 65 Ω, and simulated for 24 Ω and 50 Ω. The bandwidth for the antennas was 310 MHz, 180 MHz and 300 MHz, respectively, which is sufficient for the intended application.

Development and Implementation of a Transmit Receive Module for the CASA Student Testbed

Alexandra Litchfield-Santana
University of Puerto Rico, Mayaguez

I have been working on the design of a Transmit Receive Solid State Module for a solid state, X-band (9.5 GHz), Doppler, dual-polarized meteorological radar system for the CASA student testbed. A twelve channel solid State radar is to be designed in the future, then two TR Modules will be needed for each channel (one per polarization) for a total of twenty four solid state modules. The goal of this project is to design a fully operational TR Module and test it with one channel. This system will be the first solid-state system designed and developed at UPRM for precipitation measurements.

Assessing Predictability Limits in Small Watersheds to Enhance Flash Flood Prediction in Western Puerto Rico

Alejandra Rojas-González[1,] Eric W. Harmsen[2,] and Sandra Cruz-Pol[3]
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[2]Department of Agricultural Eng., University of Puerto Rico, Mayagüez, PR
[3]Department of Electrical and Computer Engineering, University of Puerto Rico,

Due to its complex terrain and the tropical influence, Puerto Rico is characterized by small watersheds, high rainfall intensity and spatial variability. The rainfall anomalies are produced by orographic-convective type storms, tropical storms and hurricanes producing flash flooding in susceptible areas. An important source of uncertainty in hydrologic modeling in Puerto Rico is associated with the rainfall. There is typically insufficient rain gauge density to calculate the associated bias nor to obtain spatial variability of point rainfall at scales below level III radar-based (NEXRAD) products (2x2 kilometers). How the uncertainty in rainfall distribution propagates through the hydrologic modeling process is a critical question, and is addressed in this paper. Another challenge to hydrologic prediction occurs when high slopes exist, and soil and land use characteristics change over short distances. Hydrologic models average the hydrologic parameters and topography in lumped, semi-distributed and distributed models to simplify and/or reduce computational time. The lumping process (i.e., grid upscaling) may lead to a loss in flash flood prediction accuracy. However, it is unknown how much lumping can be tolerated before accuracy of flood prediction degrades below an acceptable level.

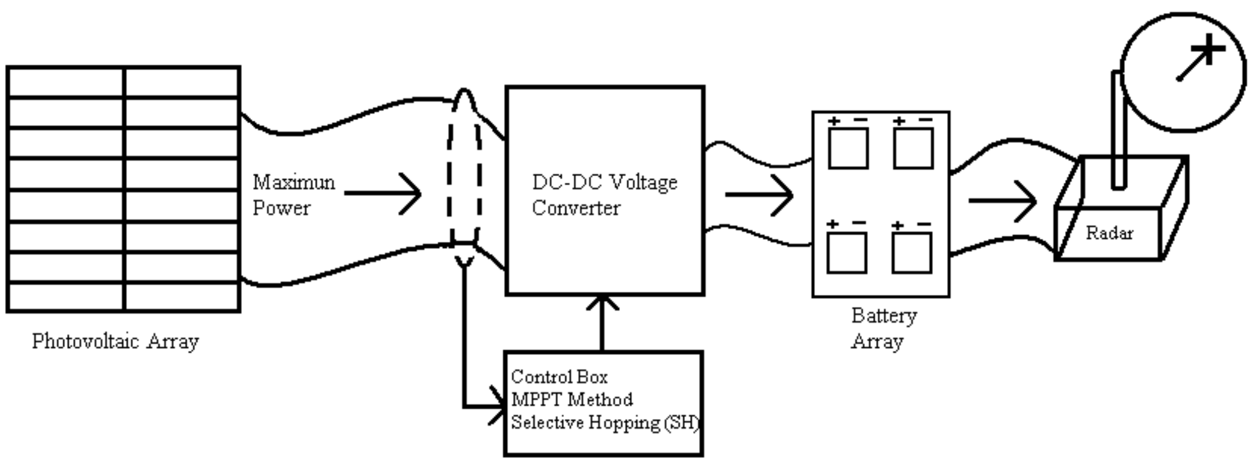
These scientific questions are being addressed within a 4 km x 4 km test-bed watershed, monitored with a network of 28 rain gauges and a stream flow gauge at the watershed outlet. High resolution topography (DEM 10 x 10 meters) and remotely sensed data are being used. The test-bed subwatershed is located in western Puerto Rico and belongs to the Añasco River watershed. The predictability limits in hydrologic response of small watersheds due to grid upscaling methods and rainfall variability are discussed. By quantifying the performance and the prediction limits associated with small sub-watersheds, we can understand the behavior of large basins with similar characteristics. This information is needed for developing a real-time flood alarm system in western Puerto Rico, which is the long-term goal of the project.

Presented at:
ASPRS 2008 Annual Conference Bridging the Horizons: New Frontiers in Geospatial Collaboration, Portland, Oregon, April 28th – May 2nd, 2008. World Environmental & Water Resources Congress 2008. Honolulu, Hawaii., May 12-16, 2008.

Design and implementation of DC-DC converter with maximum power point tracking method, Selective Hopping (SH).

Abel A. Labour Castro
Electrical and Computer Engineering Department
University of Puerto Rico, Mayagüez, Puerto Rico

As part of the effort made by the Collaborative Adaptive Sensing of the Atmosphere (CASA) to realize the concept of radars not connected to the traditional power grid (OTG), there will be a permanent and complete implementation of a photovoltaic system and DC - DC converter to put in optimal operation of the radar in the UPRM with renewable energy only. The optimal operation of the system will be made possible by the method of Selective Hopping (SH) which is responsible for finding the maximum power point in photovoltaic panels, no matter the solar radiation and temperature conditions. The figure below illustrates all the parts involved.



Photovoltaic system for the radar (OTG).

Three-Radar Network Deployment Site Survey for the Western Region of Puerto Rico

Ricardo Ríos-Olmo
University of Puerto Rico, Mayagüez, PR

Due to the lack of reliable weather data, necessary for the estimation of precipitation in the western part of Puerto Rico, a three-radar network has been proposed within this region. Each of these radars will be X-band, Doppler, and dual-polarimetric, which is essential in order to obtain high-resolution data. Prior to installation, site surveys and simulations to determine the optimal location for the deployment of these radars have been performed. These studies take into consideration several factors including technical considerations such as beam blockage due to ground clutter and tower height. In addition, considerations include social aspects such as the vulnerability of the population in the region of coverage. The sites are studied from a single radar perspective in order to determine them as favorable or not, and then analyzed from a three-radar network perspective. At the end of this project an optimal location for the deployment of the three radars is suggested.

A Synoptic Weather Classification for Rainfall Over Western Puerto Rico (August 2006 to July 2007)

Santa Elizabeth Gómez Mesa
University of Puerto Rico, Mayagüez, PR

In order to classify the atmospheric phenomena that cause rain in western PR, a subjective method was development to analyze rainfall. Data from about 15 tipping bucket rain gauges in a 4 x 4 km area in Miradero near the University of Puerto Rico Mayaguez were analyzed. 62 cases of rain during the period August 2006 to August 2007 were identified and studied. Of these, 22 cases were determined to be locally formed by easterly trade winds convergence during early afternoon. The WRF model at 10 km resolution appears to handle these reasonably well. Of the remaining cases, 16 were generated by mid-latitude westerly trough systems, whilst 11 were initiated by tropical easterly waves. Heaviest rainfall was found in 6 cases driven by tropical westerly troughs. Weather forecasters and researchers can use this classification system to better understand and predict Caribbean weather development.

A Visualization Interface for Climate Monitoring Using a Radar in a Grid Environment

Omar X Rivera Morales
University of Puerto Rico, Mayagüez, Puerto Rico

The complexity of the Center for Collaborative Adaptive Sensing of the Atmosphere (CASA) cyber-infrastructure system needs an easy to use interface to manage radars, weather stations and data. The main idea of this project is the development of various interfaces in a grid portal for visualization and manipulation of radar data in real time. An automated set of scripts were develop to: deploy a visualization of the last recorded data of the PR1 radar, transfer radar raw data using a secure protocol between the CASA network nodes in UPRM for data processing, run image processing sequences and obtain web mapping information to be added to the maps. Also as part of the grid portal interfaces core an algorithm for data transformation and format conversion was develop. The new grid portal additions consist of two main portal interfaces. The first one includes the visualization of the real time data of the PR1 radar node using Google map technologies. The second interface allow management of the raw data, presenting to the user the option of transforming the raw data to Dbz and apply the conversion algorithm to obtain the data transformed to Dbz and NETCDF format for easier distribution.

The high-resolution that Google maps support provides a visualization system easy to use with a fully operational configuration, which processes information collected from the X-band radar node PR1. The main feature of this data visualization interface is that will allow the integration of multiples devices that obtain weather data. The use of these new mapping technologies adds a lot of new information to the DCAS Distributed Collaborative Adaptive Sensing (DCAS). The grid portal visualization interface takes in consideration geo-referential information, satellite photos of the area, terrain information, zoom in and zoom out capabilities, current latitudes and longitudes, possibilities of adding other climate overlays in the future such as clouds and geopolitical information for references for exact information of the location of the high reflectivity clusters. The distances of the reflectivity values presented in the interface are accurately presented in the map using Google Maps measuring methods for a real data location.

The program codes developed for this grid portal interfaces will later be applied to the off-the grid radars and weather stations of the DCAS system for evaluation of the improvements that this technology can provided to the CASA project.

Evaluating the Earth Curvature Effect on NEXRAD Rainfall Measurements

Carla J. Carrasquillo Luna
University of Puerto Rico, Mayagüez, PR

A validation was performed for the NEXRAD to evaluate the earth curvature effect with which the performance of the radar could be improved. Puerto Rico was divided into three regions to study the Earth curvature effect on NEXRAD rainfall measurements. The validation consists of comparing the observed (rain gauges) and estimated (NEXRAD) rainfall values at the same time and same place. A discrete (rainfall detection) and continuous validation (amount of rainfall) was made, with which was concluded that the probability of detection decrease through distance and the false alarm increase.

Calibration and Validation of the First Node of the Meteorological X-Band Radar Network for the West Coast of Puerto Rico

Carlos A. Rodríguez-Rivera
University of Puerto Rico, Mayagüez, PR

Great concern exists among the emergency management people and National Weather Service officers with regards to the accuracy of weather data for some regions of Puerto Rico, especially in the western area of the island. Accurate estimation of precipitation within this region is vital to improve weather forecast for the citizens. This thesis describes the final work performed on the radar (PR1) that serves as the first node of a short range X-band radar network. The network will improve the lower troposphere coverage and the resolution of the weather data in the western area. This research work includes implementation and operation of the internal calibration loop channel, external calibration procedures and replacement of several components of the data acquisition system of the PR1. In addition, validation of radar measurements were realized with Nexrad and a network of auxiliary sensors located in the proximity of the PR1 radar.

Processing NETCDF data from National Weather Service in San Juan at University of Puerto Rico in Mayaguez.

Yahira M Quiles Perez
University of Puerto Rico, Mayaguez, Puerto Rico

She worked with the graduate student, Ricardo Rios Olmo, on the source code of the EWR radar that will be installed in Aguadilla, Puerto Rico. Also works processing the data of the National Weather Service radar (Nexrad) to make the validation and comparison of the radars, weather stations, and disdrometers network of CASA UPRM.

University of Delaware

Technology, Weather Forecasts, and End-Users

Jenniffer M. Santos-Hernández

For the past six years, I've had the opportunity to collaborate with a number of researchers in CASA and also to develop my own research. The technology being developed by CASA raises numerous important questions about the social world and therefore provides a unique opportunity for developing research skills among students involved in the project. Throughout the years, the End-user group has reached to a variety of users including forecasters, meteorologists, emergency managers at all levels, media personnel, and the general public. To understand the end user community we have employed a variety of methods and techniques including focus groups, surveys, in-depth interviews, mapping, and phone surveys. Currently, we are conducting a phone survey throughout the U.S., particularly in the Central region. The phone survey explores issues of access, use, and trust on information sources, dissemination of warning information through formal and informal networks, interpretation of warning information and response. In addition to the work in the continental U.S., I am also involved in research taking place within the Student Led Test Bed (STB). As part of my research in the Puerto Rico test bed I completed my MA thesis which is focused on development and social vulnerability to disasters in coastal regions of Puerto Rico. In order to disseminate the findings of this research and to facilitate access to georeferenced information the Disaster Decision Support Tool was developed. My doctoral dissertation research will focus on community vulnerability and preparedness, particularly through FEMA's CERT program, in Puerto Rico. This research will examine how community and kinship networks, norms, culture, and socio-demographic characteristics inform how the CERT program is implemented and how is perceived by community residents. Findings of this research will provide an assessment of the CERT program and will identify potential ways to enhance it by incorporating the perception and recommendations of the community. Because technology is not socially neutral it is very important that we understand the needs and recommendations of all the potential users of CASAs technology.

Public Response to Severe Weather Events: Shelter Seeking Behavior in Three Events

Melody Cotterill

As part of my participation in the End-User trust, our research aims to expand on the current public response literature through exploring those individual and event characteristics that lead individuals to seek protective action from severe weather events. The data for this research comes from telephone interviews of households following these severe weather events. Our research as a group asks the following questions: What factors influence an individual's decision to take (or not to take) protective action during a severe weather event? What factors impact an individual's decision about if and where to take protective action? This research hopes to account for differences in shelter seeking behavior through characteristics of the severe weather event, housing, family, and individual characteristics.

University of Virginia

CASA's Impact on Radar-Based Wind Assessments

Don J. Rude, University of Virginia, Charlottesville, VA;
and E. J. Bass and B. Philips

Severe weather warnings are a great benefit to society, saving lives and property every day. Sensors, training, decision support tools, and policy are continually evaluated and updated through research and operations to improve the effectiveness of these warnings. The CASA project aims to improve the severe warning process by providing lower troposphere, high resolution data to operational forecasters. CASA is an National Science Foundation project that is creating a new paradigm for weather sensors by creating networks of densely spaced, low-cost radars. CASA researchers have conducted experiments with National Weather Service forecasters from around the country using case studies to measure the impact of CASA's data on the warning decision process.

Since wind speed plays a critical role in the definition of severe thunderstorms, the purpose of this study was to measure the impact of CASA radar data on wind assessment performance. The results reported herein clearly indicate that for wind speed assessments CASA radar data can simultaneously increase wind speed estimates, reduce assessment error, and increase confidence in assessment. This outcome is particularly promising given that data are from experimental radars, participants were given minimal training, the radar display and computer-interface were unfamiliar, and many participants said CASA data confirms their mental model.

CASA Student Autobiographies

University of Massachusetts

Edin Insanic

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Education:

Edin Insanic is a Ph.D. candidate in the Department of Electrical and Computer Engineering at the University of Massachusetts, Amherst. He joined UMASS in fall of 2003 to help design and develop the CASA IP1 radar hardware.

Research Projects:

His current research is in the area of vector velocity retrieval algorithms in networked radar environment.

Profesional Experience:

Edin worked in microwave and broadband telecommunications industry for four years as a circuit and systems designer.

Michael Krainin

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Education:

B.S. Computer Science. May 2009

Research projects:

Decentralization of the Meteorological Command and Control

Professional interests:

Artificial Intelligence, Machine Learning, Computer Vision, Multi-Agent Systems

Personal Interests:

Snowboarding, soccer, running

Victoria Manfredi

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Education:

Received her BA in Computer Science, magna cum laude with highest honors from Smith College in 2002, and her MSc in Computer Science from the University of Massachusetts at Amherst in 2005. She is currently a PhD student in the Department of Computer Science at the University of Massachusetts at Amherst.

Research Projects:

Computer networking, adaptive sensor networks, wireless and mobile ad-hoc networks, routing, resource allocation, stochastic processes, machine learning, Bayesian methods. She has published in the areas of sensor networks and machine learning.

Personal Interests:

She is a member of Phi Beta Kappa, and Sigma Xi. She received the Bert Mendelson Prize for Excellence in Computer Science in 2002.

Navin Sharma

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Education:

He has completed his undergraduate studies from "Indian Institute of Technology, Kharagpur". And he is a 2nd year graduate student in CS Department, University of Massachusetts, Amherst.

Research Projects:

His research interest includes sensor network, computer networks, virtualization and distributed systems. He is currently working on virtualization of devices involving actuations (such as radar sensor, network camera weather sensor etc.). Before that, he has also developed infrastructure for out-of-band management of power constrained sensor networks.

Professional Experience:

In the past, he has also worked over Bluetooth Networks and published many papers in various conferences and journals including "IEEE Transaction on Mobile Computing". Before joining UMASS, he has worked in software industry for 3 years.

Jorge L. Salazar-Cerreno

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Education:

He received his M.S. degree in Electrical Engineering from the University of Puerto Rico at Mayagüez in 2002. And he is a Ph.D. candidate in the Department of Electrical and Computer Engineering at the University of Massachusetts Amherst.

Research Projects:

He joined Dr. Rafael Rodriguez Solis and Dr Jose Colon Asturias to work on the CenSIS project to developed Log-Periodic Normal Mode Helical Antenna (LP-NMHA), as sensor for a Crosswell Radar Tomography system which makes it possible to identify natural contaminants under the soil's surface. His current research interests include phased-array antennas, solid state radars, and dense radar networks, application aware radar performance modeling for dense networks systems. And he is currently focused on development of low-cost phased-tilt solid state radar for CASA ERC

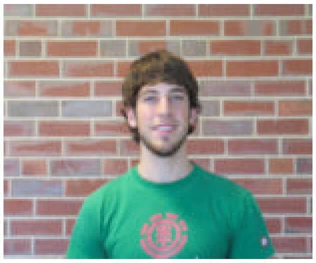
Professional Experience:

Previous to these studies, he got experience for 6 year in a wireless industry, where he performs the role of Project Manager to update the RF wireless network base on AMPS/TDMA system with CDMA technology for Telefonica Moviles Corporation in Peru.

Personal Interests:

He enjoys warmer weather to do camping, fishing and biking. He also enjoy cooking with his family friends and co-workers.

Ryan Baldwin



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Education:

Springfield Technical Community College
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Research projects:
Networking off-the-grid radar nodes using 802.11 Wireless Internet
Faculty Mentor: Michael Zink, Computer Science Dept., UMass

Rafael Medina-Sanchez

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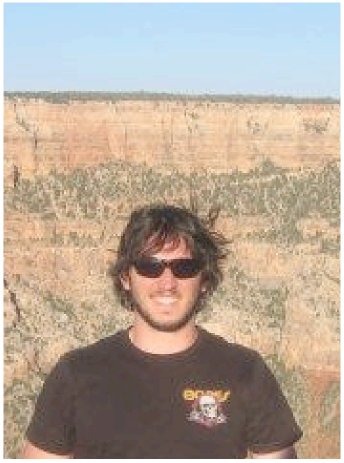
Education:

Rafael Medina is a PhD student in the ECE department in UMASS-Amherst. He received a BS degree in Electronic Engineering from the Bolivar Technological University in 1999, in Cartagena, Colombia, and the MS in Electrical Engineering in University of Puerto Rico at Mayaguez, Puerto Rico, at 2003.

Research Projects:

Currently, he is working on the IP5 project, designing T/R modules and local control hardware for the antenna of a Solid-State Radar. His research interest is in phased array antennas, microwave systems, software defined radar, radar signal processing, and digital signal processing with FPGAs.

Anthony Hopf



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Education:

Currently pursuing a PhD in Radar Systems Engineering in the MS/PhD program at the University of Massachusetts Amherst
B.S. in Electrical and Computer Engineering from the University of Massachusetts Amherst

Research projects:

My most recent projects have included collaboration with Brian Donovan on designing the first OTG radars for the Student Test Bed, and work with Dr. Steven Frasier on the MIRSL XPOL truck, mobile x-band tornado chasing radar. Currently I am working as the Systems Engineer for the Escan Radar System, which is the next generation radar being developed by CASA.

Professional interests:

My interests are in the application of phased arrays to network based meteorological sensing, and the architecture of the phased array radar that enables low cost, scalable networks, which will improve the temporal and spatial resolution of radar products without significant loss in sensitivity to the state of the art.

Personal Interests:

Since I am from the Northeast I enjoy every season differently. When it is snowing I am snowboarding and trying to find people to teach me to ice climb. When it is warm out I can be found dirt biking, motorcycle riding, cycling, running, hiking, and wakeboarding/waterskiing. When it is raining out I can be found walking the dog, movie watching, and waiting for the weather to change. But if I had to guess where most of my time is spent, it would be in the lab.

Jorge Trabal

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Education:

Received his BS (magna cum laude) and MS degrees in Electrical Engineering from the University of Puerto Rico at Mayagüez in 2002 and 2004, respectively. He is currently working toward the PhD in the Department of Electrical and Computer Engineering at the University of Massachusetts Amherst.

Research projects:

Mr. Trabal has conducted research and published conference papers in radar systems and radar data analysis. He is currently performing research in network based polarimetric quantitative precipitation estimation. As part of the CASA collaborative research, Mr. Trabal has performed research at the McGill University in Montreal, Canada and in Colorado State University in Fort Collins, Colorado under the supervision of Professor I. Zawadzki and Professor V. Chandrasekar, respectively. In addition, he has background in microwave circuits and antenna design and radar meteorology and imaging. He also possesses excellent communication skills in both English and Spanish. As part of the MS degree he performed research related to the CASA Puerto Rico Student Led Test Bed. Mr. Trabal performs the role of Project Technical Integration Leader for the CASA Puerto Rico Student Led Test Bed since 2006. In this role he also sits in CASA's Executive Committee and participates in all aspects of the management of the CASA ERC.

Professional interests:

Jorge has an agreement in place with the University of Puerto Rico at Mayagüez whereby he will take a position as Assistant Professor on the ECE faculty of that institution upon completion of his PhD degree.

Alexander P. Trefonas

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Education:

Current student at the University of Massachusetts Amherst pursuing a bachelor's degree in electrical engineering.

Research projects:

In Summer 2007, he joined CASA to work under Phd. Candidate Jorge Trabal on the graphical display of raw meteorological data, as well as the storing of raw data into NetCDF format for the CASA PR1 Stefani radar. He now works under Phd. Candidate Anthony Hopf and is creating plans for the fiberoptic interface for the CASA Phase-Tilt Escan Radar System. Last summer, Alexander interned for Cisco Systems and tested simulated Viking routers. In summer 2006, he interned for Invensys in Foxboro, wherehe tested fieldbus devices. Alexander's interests include network programming, optical character recognition, graphics rendering, website development, traveling, photography, dirt biking, and archery.

Professional interests:

He plans to work full-time as a software engineer at Cisco Systems in Boxborough, Massachusetts after graduation in May 2009.

Colorado State University

Dilum Bandara

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Education:

B.S. Computer Science and Engineering, University of Moratuwa, Sri Lanka (2004)
M.S. Electrical Engineering, Colorado State University (2008)

Research projects:

My main research theme is Sensor Networks and I am working under the guidance of Prof. Anura Jayasumana. Currently, I am exploring how high-speed and real-time sensor applications can benefit from the new paradigms of network aware applications and application aware networks. My Master's thesis was on self-organization of collaborative wireless sensor networks.

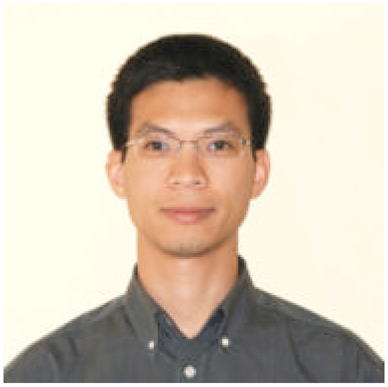
Professional interests:

I am eagerly waiting to go back to the academia, after completing the PhD. I was a junior faculty member at University of Moratuwa, Sri Lanka, prior to attending CSU in 2007. Currently, I am on study leave. I wish to start my own business some day. My overall research interest includes computer networks, wireless sensor networks, network security, and grid and high performance computing. I am an IEEE student member.

Personal Interests:

I like to travel and being outdoors. Compared to most, I love having snow around. I wish to travel to at least ten countries and have managed two so far. I love playing and watching cricket and a bit of softball. If I am crazy about one sport, it is cricket.

Cuong M. Nguyen



Contact info:

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Education:

M.S. Electrical and Computer Engineering, Colorado State University (2007)
B.S. Electronics and Telecommunications Engineering Department, Hanoi University of Technology, Vietnam (2001)

Research projects:

My research projects include clutter filtering methods for weather radars (Parametric Time Domain Method – PTDM; Dual-polarization parameters retrieval system – DPTDM; Gaussian Model Adaptive Processing in time domain – GMAP-TD) and sensitivity enhancement for pulse compression weather radar systems. I am now working on waveform design and signal processing for E-scan CASA radar systems. All my projects are advised by Dr. V. Chandrasekar.

Professional interests:

My interest is in developing signal processing algorithms for meteorological sensing systems which improve signal quality, sensitivity and scanning speed. These techniques can be applied to different systems at different frequency bands. It is good to have a small, low-cost system that performs as well as other bulkier and more expensive systems.

Personal interests:

I like snow and to see snow falling but sometimes it is not a pleasure to take snow off my car. I love and enjoy skiing; however I'm not quite good at it yet. Besides skiing in the winter, I like playing soccer with other students in the summer. Of course, I am a big fan of soccer; however, I am excited to watch American football too. My new hobby is photography and I just started it a year ago. I like to capture all the livable moments of the surrounding area. I guess that I still need more experience in this field. In my free time, you may see me walking around my place with a camera on my shoulder.

Kumar Vijay Mishra

Contact Info

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Education

B. Tech. (Hons.), Electronics and Communication Engineering, National Institute of Technology (NIT), Hamirpur, India (2003)

Work Experience

Electronics and Radar Development Establishment (LRDE)
Defence Research and Development Organisation (DRDO), Bangalore, India
Scientist 'C', Signal Processing Group, Jul 2006-Jun 2008.
Scientist 'B', Signal Processing Group, Aug 2003-Jun 2006.

Research projects:

In my last organization, I worked on the development of signal processors for ground-based surveillance radar for the Indian Army. At CSU, where I am working with Dr. V. Chandrasekar, my most recent project is designing an FPGA-based digital receiver for an X-Band weather radar system.

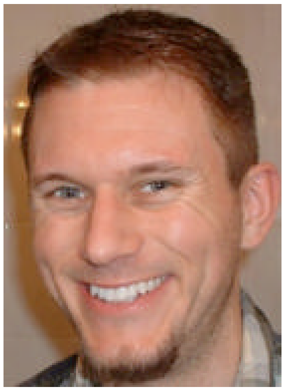
Professional interests:

Radar signal processing, FPGA-based hardware design, statistical signal processing.

Personal Interests:

I enjoy creative writing, reading contemporary as well as classical literature in English and Hindi, traveling, swimming and listening to music esp. Hindustani classical and retro Bollywood film music.

Evan Ruzanski



Contact info:

Evan Ruzanski
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Education:

B.S. Electrical and Computer Engineering, Colorado State University (2002)
M.S. Electrical and Computer Engineering, University of California at Santa Barbara (2004)
Ph.D. Electrical and Computer Engineering, Colorado State University, expected graduation May 2010

Research projects:

I worked on a range-velocity ambiguity project with NCAR in 2006. I currently develop and maintain the operational nowcasting software for the CASA network. My current research interest is linear modeling and spatiotemporal characterization of weather for nowcasting.

Professional interests:

I am employed by Vaisala, Inc. where I work on radar and precipitation gauge applications including nowcasting and data quality control.

Personal Interests:

I have been racing road and mountain bikes at an elite level for 17 years. I also enjoy scuba diving as it allows me to visit many tropical locations around the world.

Leonid Tolstoy

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Engineering Building, C-109
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leontol@gmail.com

Education:

B.S. Computer Engineering, University of Puerto Rico, Mayaguez
Currently pursuing a PhD in Electrical Engineering in the Inter-Institutional Collaborative PhD Program at the Colorado State University, Fort Collins.

Research Projects:

My current research projects have included development of algorithms for CASA radars data merging, correction of radar reflectivity, and adaptation of variational scheme approach to the CASA X-band radars.

Professional interests:

My interests are in the area of developing algorithms in C++, Perl and Matlab, for Linux and Windows, for CASA radars network data processing and analysis.

Personal Interests:

My personal interests include skiing, skating, hiking and mountain climbing, biking, windsurfing, swimming and snorkeling. Also I enjoy taking pictures with my camera, watching movies and programming.

Delbert Willie

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Education:

I'm a Ph.D. student in electrical engineering at Colorado State University. I completed both my Bachelors and Master degrees also at CSU.

Research Projects:

My area of research interest involves weather sensing using dual polarimetric radars

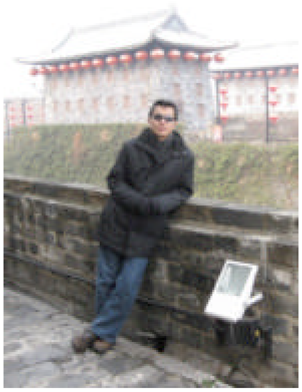
Personal Interests:

I am a member of the Navajo Nation.

Experience:

I was employed by IBM for 8 years prior to graduate school.

Sean Zhang



Contact Info:

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Education:

B.S. Electrical and Computer Engineering, Colorado State University (2006)

Currently pursuing Master's degree at Colorado State University, topic for Master's Thesis is real-time algorithms for multi-Doppler wind synthesis.

Research Projects:

My current work lies in implementing a real-time algorithm for multi-Doppler wind retrieval in the IP1 network. Its purpose is to replace the outdated CEDRIC implementation to allow for better real-time performance. The contents of the work going in to this will serve as the topic for my Master's Thesis.

Professional Interests:

I aim to develop and implement new algorithms for network-based wind modeling that are faster, more accurate, and easier to use. The emphasis is on implementation that is optimized for real-time robustness.

Personal Interests:

I like to do anything that is outdoors, but most of all, I like climbing. On the indoor side I like to indulge in fancy home theatre systems and having friends over. I like my music loud and my movies louder.

Jason Fritz (updated spring 2007)

Contact Info:

CSU CASA PhD Candidate
Colorado State University
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Fort Collins, Colorado 80523 USA
jpfritz@ieee.org

Education:

Jason Fritz is an Electrical Engineering PhD student at Colorado State University. Jason received his Bachelor of EE in 1994 from the University of Dayton, and a Master of EE from the University of Delaware in 1996.

Research Projects:

His Master's thesis was entitled "Haptic Rendering Techniques for Scientific Visualization". Haptic refers to the sense of touch, and this research revolved around using a high fidelity force feedback device to render scientific data in a form that could be felt, and it was geared towards people with visual impairments. From 1997 to 1999, Jason worked for a small marine technology company called Imetrix on Cape Cod, MA. The focus of the technology was underwater Remotely Operated Vehicles and a method to inspect ship hulls without dry docking. After Imetrix, Jason worked for Raytheon Co. at the Marlboro, MA plant. Here he gained experience programming Field Programmable Gate Arrays (FPGAs are programmable logic chips), and worked on the Digital Airport Surveillance Radar program. It was this exposure to radar that led Jason to return to pursue his PhD, focusing on radar signal processing. Recently, Jason has changed his research topic from refractivity estimation to Synthetic Aperture Radar (SAR) processing, and is working as a contractor for Vexcel – a Microsoft Company, located in Boulder, CO. SAR is an imaging radar, so the processing of SAR data merges radar and imaging processing techniques.

Professional Interests:

He is especially interested in the use of multiple polarizations for change detection.

Personal Interests:

Jason lives in Thornton, CO with his wife, Sandy, which is near Denver. His personal interests include outdoor activities (hiking/backpacking, camping, skiing, snow shoeing, etc.) in the Rocky Mountains, motorcycling, and Chinese martial arts (kung fu and taiji chuan).

Leyda León (updated spring 2007)

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Education:

Leyda V León-Colón obtained her BS and MS degrees in Electrical Engineering from the University of Puerto Rico, Mayaguez Campus (UPRM). On 1999, she started as an undergraduate, researching with Dr. Sandra Cruz-Pol on the "Effect of the Air/Sea stability on the Satellite Radiometric Parameter Retrieval". After completing her BS in Electrical Engineering, she continued graduate studies on the same EE field working on "Active Rain Gauge Concept For Moderate To Heavy Precipitation Using W-Band And S-Band Doppler Radars" in collaboration with Dr. Sandra Cruz-Pol from UPRM and Dr. Steve Sekelsky from the University of Massachusetts (UMASS). She started this research in a summer visit on 2001 to the UMASS Microwave Remote Sensing Laboratory (MiRSL). Later on that Fall, she returned to UPRM to work on the Cloud Microwave Measurements of Atmospheric Events (CliMMATE) Laboratory to continue the research until graduated on May 2004. She is currently pursuing doctoral studies in Colorado State University (CSU), where she is researching on X-band radar data attenuation correction as part of the Collaborative and Adaptive Sensing of the Atmosphere (CASA) group

Research Projects:

She is researching on X-band radar data attenuation correction as part of the Collaborative and Adaptive Sensing of the Atmosphere (CASA) group, under the supervision of Dr. Bringi and Dr. Chandrasekar. As part of her research, she is working on microphysics outputs from a Regional Atmospheric Modeling System (RAMS) 2-moment scheme supercell simulation to simulate the CASA and WSR-88D radar signals. A preliminary technique is developed to separately estimate the X-band specific attenuation due to rain and wet ice along the path of the dual-polarized CASA radars and the mono-polarized NEXRAD WSR-88D radar. A paper titled “Rain and Wet Hail Specific Attenuation Estimation for a 3D supercell case using RAMS model to simulate CASA X-band and WSR-88D S-band radar signals” will be presented on this matter in the 33th AMS Conference on Radar Meteorology in Australia this August.

Professional Experience:

She worked from 2003-2005, as a Part-Time Professor in the Polytechnic University (PUPR) of Puerto Rico Electrical and Computer Engineering Department where she teach courses on the Electromagnetic, Microwave, Computer and Electronic fields. At

PUPR, she collaborates on the Computational Electromagnetic Laboratory (CEL) with Dr. Nader Farahat.

University of Oklahoma

Rachel Butterworth

Contact info:
Rachel Butterworth
M.S. Candidate
School of Meteorology and Department of Communication
University of Oklahoma
rbutter@ou.edu

Education:

B.S. Meteorology, Iowa State University (May 2008)

Research Projects:

I am pursuing an interdisciplinary degree and taking courses in meteorology, communication, and journalism. My research focus is on the social science side of CASA; specifically the understanding the layperson has about weather information and how we (meteorologists) can portray information to them more effectively. I am concentrating on the role the media has in disseminating severe and hazardous weather information, as it is a major information source for people. I may also look at how uncertainty is portrayed in weather forecasts and whether people are able to make more or less informed decisions based on the uncertainty information.

Professional Interests:

My overall professional interests lie with the communication and social science aspects of meteorology, so I am thrilled to be able to engage in such research.

Personal Interests:

I grew up in Apple Valley, MN. Oklahoma has many things to offer meteorologically speaking, but I miss the snow quite a bit! There is nothing like the calm after a winter storm where the freshly fallen snow sparkles in the sunshine. Outside of meteorology I enjoy playing tennis, skiing (can’t do much of that in Oklahoma!), hiking, baking, and listening to music.

Jing Cheng

Contact info:

Jing Cheng
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School of Meteorology
University of Oklahoma
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Norman, OK 73072
office: 405.325.1077
jcheng@ou.edu

Education:

Currently pursuing a PhD in Meteorology in the PhD program at the University of Oklahoma
B.S. in Meteorology from the Nanjing University, P.R.China

Research projects:

My current project explores the usefulness of adaptive sensing techniques on NWP using a new radar network recently installed in central Oklahoma. I'm looking into the impacts and scanning strategies of CASA radars on the assimilation and prediction of different types of storms.

Professional interests:

My interests are in the mechanisms of cell regeneration, development, and propagation within three dimensional multi-cell storms, which are investigated using a numerical model. Understanding these will help us to improve the prediction of storm genesis.

Personal Interests:

Though I spend most of my time in the lab, I like to go out walking, cycling, fishing or simply driving around the neighborhood.

Corey Potvin

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Education:

M.S. Meteorology, University of Oklahoma (2006)
B.S. Meteorology, Lyndon State College (2004)
B.A. Mathematics, Lyndon State College (2004)
A.S. Computer Science, Lyndon State College (2004)

Research Projects:

I'm developing a tornado detection/characterization algorithm for CASA-like radar networks which will hopefully provide useful real-time estimates of tornado size, intensity and motion. I'm also helping develop a new dual-Doppler retrieval technique which will likely be tested using IP1 observations (this work is not CASA-funded). Finally, I'm investigating the sensitivity of sounding-based severe thunderstorm climatologies to the proximity criteria employed (unfunded).

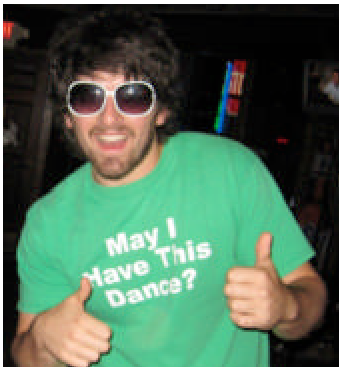
Professional Interests:

Beyond my current research projects, I'm also interested in storm- and mesoscale modeling.

Personal Interests:

I enjoy stormchasing, reading fantasy series, and studying the modern sciences (e.g. quantum physics, relativity, mind/consciousness) and theology. The two things I miss most from the Northeast are the ocean and snowstorms.

Alex Schenkman



Contact info:

alex3238@ou.edu
405-325-1077

Education:

BS (2005) and MS (2008) in meteorology at the University of Oklahoma

Research projects:

I am currently working on a detailed analysis of an ARPS simulation of a tornadic convective system in central Oklahoma.

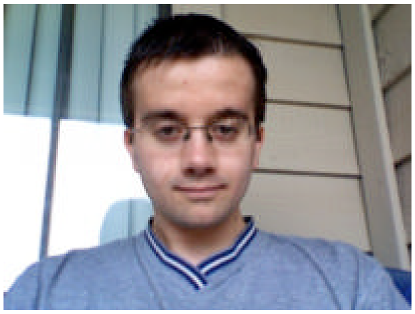
Professional interests:

I am a very interested in severe weather of all kinds. My research is in radar data assimilation and modeling of severe convective storms. I also enjoy researching interesting and unusual weather events. As a side (non-CASA) project I am currently working with a group of OU graduate students on researching an unusually heavy period of a rain in Oklahoma in summer 2007.

Personal Interests:

I enjoy traveling, playing guitar, and eating all sorts of wonderfully different foods. I love to visit places and sample the local cuisine. I am also quite fond of spicy food… the hotter the better!

Nate Snook



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Nate Snook
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School of Meteorology
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Norman, OK 73072
Email: nsnook@ou.edu

Education:

Currently pursuing a PhD in Meteorology in the MS/PhD program at the University of Oklahoma
B.S. in Meteorology from Iowa State University

Research projects:

During my masters research, I investigated the connection between rain and hail drop size distribution and tornado potential in tornadic supercells. I am working on a project to assimilate CASA and WSR-88D radar data into the ARPS model to improve analyses and for use in short-term probabilistic ensemble convective forecasts.

Professional interests:

My interests are in the areas of severe convective storms, ensemble data assimilation and forecasting techniques, and development of short-term probabilistic forecast methods for numerical convective prediction.

Personal Interests:

Though I grew up in the midwest, I enjoy the warmer weather (and relative lack of winter) in Oklahoma. When the weather permits, I enjoy biking and swimming. In my free time I also enjoy computers and the internet, movies, and talking politics with my friends and co-workers. I am active in the college-age group at my church, and serve as a tutor for the School of Meteorology's “Help Desk” service. Perhaps my most eccentric interest is Dance Dance Revolution, which I was introduced to by people I met at OU – I've introduced it within the SoM grad student community, and several of us play on a regular basis.

University of Puerto Rico Mayagüez

Abel Labour Castro

Contact info:

Abel Labour Castro
M.S. Candidate
University of Puerto Rico, Mayagüez, PR

Education:

B.S. Electrical Engineering, University of Puerto Rico, Mayagüez (Dec 2006)

Research Projects:

Currently working for CASA to implement a new method of tracking the maximum power point in photovoltaic panels. This project will contribute to the development of radar "Off The Grid."

Professional Interests:

His area of specialty is Power Systems but also has interest in the area of Power Electronics and Control Systems.

María Fernanda Córdoba-Erazo

Contact info:

María Fernanda Córdoba-Erazo
M.S. Candidate
Electrical Engineering
University of Puerto Rico, Mayaguez
Maria.Cordoba@ece.uprm.edu

Education:

B.S. Physical Engineering, Universidad del Cauca, Colombia (2005)

Research Projects:

In Universidad del Cauca she worked in the design and fabrication of smart windows using vanadium dioxide thin films. Her M.S research is focused on the characterization of a cavity-backed folded slot antenna at 1 GHz and 10 GHz. Her research includes simulation, fabrication and testing of the antennas. Additional research in University of Puerto Rico includes the design, simulation and fabrication of microwave switches using silicon and GaAs substrates and thin films fabrication techniques.

Benjamin De Jesus

Contact info:

Benjamin De Jesus
B.S. Candidate
University of Puerto Rico, Mayaguez
djesus.benjamin@gmail.com

Research Projects:

Installation and validation of PARSIVEL disdrometers and Vaisala Weather Stations. These will be used to validate the CASA radars.

Personal Interests:

Participate at church actually a Gospel guitar and bass player. And like to play baseball and volleyball.

Background:

Born in Brooklyn, NY. Moved to Moca, Puerto Rico at young age.

Alexandra Litchfield-Santana

Contact info:

Alexandra Litchfield-Santana
M.S. Candidate
Electrical Engineering
University of Puerto Rico, Mayaguez
alexandra.litchfield@gmail.com

Education:

B.S. Electrical Engineering, University of Puerto Rico, Mayaguez (May 2005)

Research Projects:

Alexandra is currently working on the development and implementation of a Transmit Receive Module for a dual-polarized solid state Doppler radar for the CASA student test bed. She has worked for Raytheon with the Surveillance Radar Program (SRP), THAAD, BMEWS and UEWR projects.

Carla J. Carrasquillo Luna

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M.S. Candidate
Engineering
University of Puerto Rico, Mayagüez, PR
carla_carrasquillo@yahoo.com

Education:

B.S. Chemical Engineering, UPRM

Research Projects:

Currently Carla is working in a Master's Degree in Engineering with concentration in Industrial Engineering - Manufacturing Systems, working most of the time, with her research in drug stability and regression techniques for her thesis. Carla is a member of CASA (Collaborative Adaptive and Sensing of the Atmosphere) project in which she works with the NEXRAD, disdrometer and rain gauges continuous and discrete validation.

Omar X. Rivera

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University of Puerto Rico, Mayaguez, PR
omarxrivera@gmail.com

Education:

B.S. Computer Science, University of Puerto Rico, Bayamón

Research Projects:

Master's Thesis: "A Visualization Interface for Climate Monitoring Using a Radar In a Grid Environment"

Research Interests:

His research interests include Weather Visualization, Distributed Systems, High Performance Computing, Human Computer Interaction, and Bioinformatics. Omar have been 5 years in the industry gaining software development, networking, web development and system administration experience.

Personal Interest:

Omar have plans to pursue a PhD degree focused in computer science in with a mayor in bioinformatics.

Yahira M. Quiles Perez

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yahira.quiles@upr.edu

Research Projects:

She worked with the graduate student Ricardo Rios Olmo, in the source code of the EWR radar that will be installed in Aguadilla, Puerto Rico. Also works processing the data of the National Weather Service radar (Nexrad) to make the validation and comparison of the radars, weather stations, and disdrometers network of CASA UPRM. She has been working in CASA since 2008.

Personal Interests:

She likes to practice martial arts and extreme sports. Also, she rides motorcycles.

Ricardo Ríos-Olmo

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M.S. Candidate
Electrical Engineering
University of Puerto Rico, Mayaguez
ricky.rios@gmail.com

Education:

B.S. Electrical Engineering, UPRM (Dec 2006).
M.S Student Electrical Engineering, UPRM.

Research projects:

On November 2004 he joined the CASA project with Dr. Sandra Cruz-Pol as his advisor. Continued to participate in CASA related undergraduate research, collaborating with various graduate students. He graduated from his bachelor's degree on December 2006. On January 2007 he started pursuing his master's degree at UPRM under the CASA project with Dr. José Colom as his advisor and has participated in two different summer internships during his graduate studies. He is currently in the process of culminating this last task expected to graduate this coming May 2009.

Alix Rivera-Albino

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Alix Rivera-Albino
M.S. Candidate
University of Puerto Rico, Mayaguez
alixrivera@yahoo.com

Education:

B.S. Electrical Engineering, University of Puerto Rico, Mayaguez (2007)

Research Projects:

Alix's current research involves the development of a space distributed power amplifier at 10 GHz to be used in one of the CASA X- Band radars. Part of her work has been published in the papers "Mentoring interdisciplinary service learning projects" (FIE 2007), "Design of Coplanar Waveguide Fed Tapered Slot Antenna Arrays for High-Power Space Distributed Amplifier Applications" (Antennas Applications Symposium 2008), and "Design of Tapered Slot Antenna Array for Space Distributed Class E Power Amplifier" (Submitted APS 2009).

She was awarded with the 2008 William Zierenberg and the 2008 Xerox Technical Minority fellowships.

Carlos A. Rodríguez-Rivera

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M.S. Candidate
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carberto2001@gmail.com

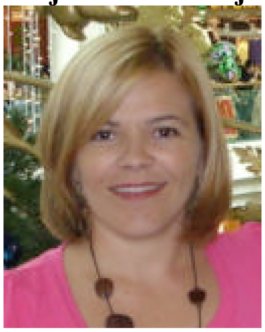
Education:

B.S. Electrical Engineering, UPRM (Dec 2006)
- Specialization: Applied Electromagnetics

Research Projects:

During his bachelor he had the opportunity of working in the CASA project since 2004, worked in different summer internship and published one article named "Is Spectral Processing important for the future of the WSR-88D?". He is currently working in the calibration and validation of the PR1 Radar to obtain his Master Degree from UPRM under supervision of Dr José Colom. During his graduate studies, he participated of two summer internship with two different companies. His expecting graduated date is May 2009.

Alejandra M. Rojas González



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Education:

B.S. Agricultural Engineering, University of Costa Rica (2000)
M.S. Civil Engineering, University of Puerto Rico, Mayaguez (2004)

Research Projects:

Alejandra's M.S. project was funded by FEMA through the Puerto Rico Water Resources and Environmental Research Institute and consisted of using two- and one-dimensional hydraulic models to analyze flood patterns in alluvial fans for flood hazard mitigation for the "Grande de Añasco" River in Puerto Rico. She joined the P17 project in August 2006 and is now studying watershed models and flash flood prediction for the mountainous terrain of Puerto Rico.

Professional Interests:

Geographical Information Systems, Distributed Hydrologic Models and hydrologic error quantification from rainfall and terrain grid size resolution.

For her graduation project she realized a Hydrologic Modeling for Flood Control in Turrialba Watershed, located in Costa Rica. From this moment, she will be interested and related to Water Resources. She was Instructor of Fluid Mechanics Laboratory by 3 years, so helped in courses like River Hydraulic and Hydrologic Modeling using HEC-RAS, Fluvial Geomorphology and Erosion Control, Geographic Information Systems (GIS) applications in Hydrologic-Hydrologic Studies in Puerto Rico; GEO-HMS, Arc-Hydro Tools and GEO-HECRAS; offered by Puerto Rico Water Resources and Environmental Research Institute.

Gianni A. Pablos Vega

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Education:

B.S. Electrical Engineering, UPRM (2008)
He is currently enrolled in UPRM doing MS in Electrical Engineering focused on Applied Electromagnetics. Advisor: Dr. José G. Colom Ustáriz

Research Projects:

CASA research: Currently developing Off The Grid Radars using X-band Furuno marine radars using photovoltaic systems in the west coast of Puerto Rico under the IP3 testbed of CASA UPRM. Two marine radars were modified for meteorological applications, specifically measurements of rain cells; each with a different peak power, one has 4kW and the other one has 12 kW. OTG radars should be easier to handle and deliver for remote places with poor access where better knowledge of the weather is needed.

Professional interests:

Applied Electromagnetics, Electronics, Renewable Energy

Personal interests:

Swimming, powerlifting, videogames

Cristina T. Vigil

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University of Puerto Rico, Mayaguez
ct.vigil@gmail.com

Education:

B.S. Candidate at Electrical Engineering, University of Puerto Rico, Mayaguez

Research Projects:

As a CASA member she is currently working with finishing the implementation of two Weather Stations at specified locations for the collection of data. The collected data will also be validated with the collaboration of another undergraduate student comparing the data collected from all the weather stations. Also she will be working on adapting the marine radars Furuno in collaboration with the graduate students. The Furuno radar will be completely off the grid, mobile and compact to meet with the CASA objectives.

She specialized her bachelors degree in Applied Electromagnetic and has been working at CASA since 2007, after she took the Electromagnetic II course and was really motivated by it. After she finishes her undergrad in May she plans to continue graduate studies.

<u>University of Delaware</u>

Claudia Flores

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Newark, DE 19711
Cell: 609-410-4698
E-mail: clauflo@udel.edu

Education:

Claudia Flores is from Medford, New Jersey and is senior undergraduate student in the Department of Economics at the Alfred Lerner School of Business of the University of Delaware. Flores is completing a bachelor's degree in Economics and International Relations with a concentration in Development in Latin America.

Research projects:

For the past three years, Claudia has served as an undergraduate research assistant for CASA at the Disaster Research Center and has taken an active role in a number of end-user research activities.

Professional interests:

Her interests include: development economics, political economy, macroeconomic approaches, econometrics theory, business continuity, and environmental economics.

Personal Interests:
Her personal interests include: traveling, fine arts, tennis, and dancing.

Spencer Schargorodski


Contact info:

Spencer Schargorodski
6208 Sudley Church Court,
Fairfax Station, Virginia 22039
Email sski@udel.edu

Education:

Spencer Schargorodski is a sophomore at the University of Delaware majoring in Sociology with a concentration in Emergency and Environmental Management. Spencer joined the CASA project in February 2009.

Professional interests:

His interests include: emergency management, disaster mythology risk communication, warnings and evacuations.

Personal Interests:

On his free time Spencer likes to read, enjoy the outdoors, listen to music, go biking, and spend time with friends and family.

Stephen Shinn

Contact info:

Stephen Shinn
103 Sunny Dell Road
Landenberg PA 19711
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Cell: (302) 388 7811

Education:

Stephen Shinn is from Landenberg, PA and a senior in the Department of Sociology and Criminal Justice at the University of Delaware.

Research projects:

Stephen joined the CASA project as an interviewer at the Disaster Research Center in the summer of 2008. In September of that same year he became an undergraduate research assistant. Shinn's academic interests include risk communication, research methods and data management.

Personal Interests:

On his free time he enjoys biking, hiking, and playing chess.

Jasmine Wynn

Contact info:

Jasmine Wynn
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(302)323-0481
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Education:

Jasmine Wynn is a sophomore double majoring in sociology and criminal justice at the University of Delaware. Wynn is also pursuing a minor in legal studies and another minor in black American studies.

Research projects:

Wynn started working as an interviewer for the CASA project at the Disaster Research Center in the summer of 2009. She became a research assistant in September of that same year. Jasmine is interested in the decision making process following a severe weather or tornado warning.

Personal Interests:

Her personal interests include shopping, music, reality television shows, and cooking.

Melody Simcha Cotterill

Contact info:

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University of Delaware
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Education:

Melody Simcha Cotterill is a master's student in sociology in the Department of Sociology and Criminal Justice at the University of Delaware. She joined the Disaster Research Center in 2008 after completing a bachelor's in sociology at the North Georgia College & State University.

Professional interests:

Her interests include: collective Behavior and social Movements, disaster studies, research methods, statistics, and visual sociology.

Personal Interests:

A personal interest of Melody is documentary films.

Jenniffer Marie Santos-Hernández

Contact info:

On-campus address:
Disaster Research Center
166 Graham Hall
Newark, DE 19716
jsantos@udel.edu

Education:

Jenniffer Santos-Hernández is a doctoral student in the Department of Sociology and Criminal Justice at the University of Delaware. She entered the program after receiving a B.A. in Sociology at the University of Puerto Rico-Mayagüez (UPRM). As an undergraduate, she completed a certification in International Population and Development from the University of Michigan-Population Fellows Program that took her to Petén, Guatemala to work with a local NGO in the Mayan Biosphere Reserve. She also completed a certification in Applied Social Research from the University of Puerto Rico-Center for Applied Social Research (CISA); where she also worked for three years as a research assistant for several projects. Jenniffer joined the DRC on August, 2004. In 2007, Santos-Hernández completed her Master's degree.

Research projects and professional interests:

Her academic interests include: development, inequality, demography, disasters, collective action, social change, sociological theory, research methods and geographic information systems. As part of her work at DRC, she serves as graduate research assistant on the DRC-End-User Integration project and the Puerto Rico Student Led Test Bed, which are part of the Engineering Research Center for Collaborative Adaptive Sensing of the Atmosphere project (CASA) and funded by the National Science Foundation (NSF).

University of Virginia

Brendan Hogan

Contact info:

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Department of Systems and Information Engineering
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Education:

B.S. Mathematics and Physics, St. Lawrence University, 2000.
M.S. Computational Operations Research, William & Mary, 2002.
Ph.D. (in progress) Systems and Information Engineering, University of Virginia.

Research projects:

Working on a simulation study of alternative End User modes of interaction with the CASA system.

Professional interests:

Modeling and simulation, statistics, data visualization, teaching.

Personal Interests:

Running, cycling, nordic/alpine skiing, live music.

Don Rude

Contact info:

Don Rude
Department of Systems and
Information Engineering
University of Virginia
Charlottesville, VA 22904
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http://people.virginia.edu/~djr7m/

Education:

Masters of Science, Systems engineering, University of Virginia, Charlottesville, VA expected Spring 2009. Masters course work completed fall 2007. PhD expected 2011.

Graduated May 1998 with a Bachelor's of Science degree. Computer Science Major (3.86 GPA in major) with a Math minor. Frostburg State University, Frostburg, MD. Delivered multiple entry level computer science class lectures and general math tutoring.

Research projects:

He is currently conducting research as part of the End User team within CASA focusing on weather displays and decision making in regards to severe weather warnings.

Professional experience:

He has over eight years of professional industry experience in software engineering and network management. Don earned a BS in Computer Science from Frostburg State University in 1998.

SLC Activities

Site Visit 08

Delaware Retreat, November 2008

WNS Climate Conference 09

University of Delaware BBQ 09

casa Engineering Research Center for
Collaborative Adaptive Sensing of the Atmosphere