



Engineering Research Center for
Collaborative Adaptive Sensing of the Atmosphere

*The Center for Collaborative Adaptive Sensing of the Atmosphere - **Student Work***

ERC Annual Meeting 2009



University of
Massachusetts Amherst



University of Oklahoma



Colorado State University

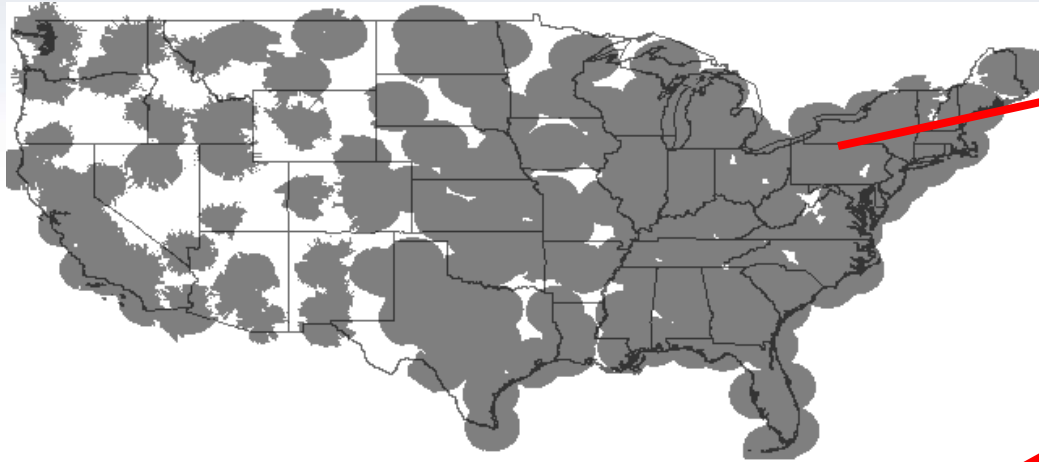


University of
Puerto Rico Mayaguez

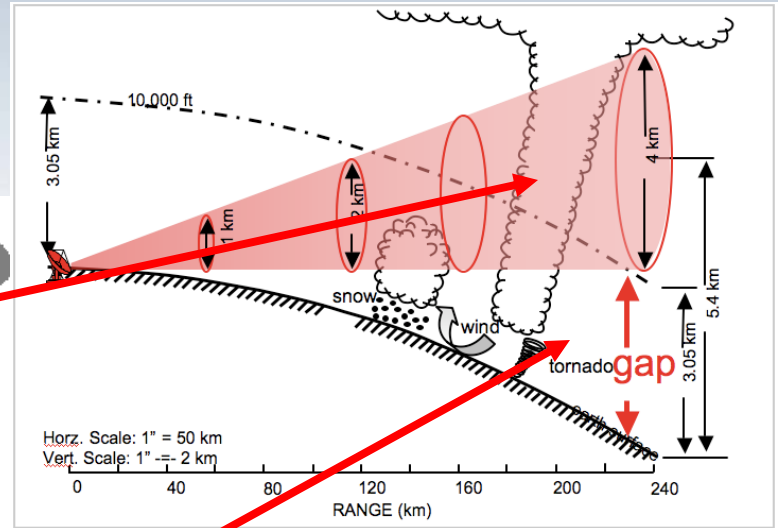
CASA is primarily supported by the Engineering Research Centers Program
of the National Science Foundation under NSF award number 0313747.



Motivation

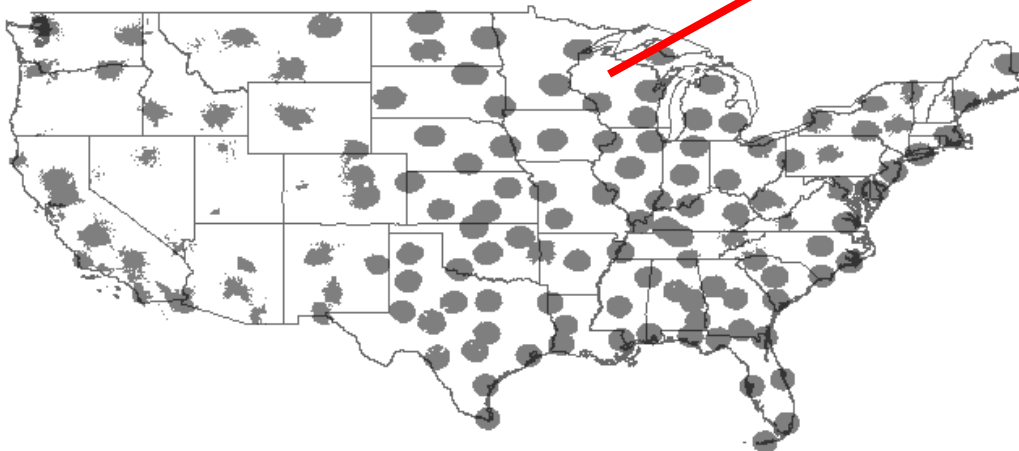


NEXRAD coverage at 3 km (~10k ft) AGL.



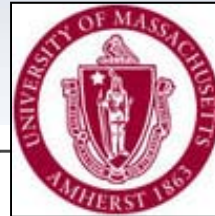
Today's systems provide:

- Inadequate coverage below 3km
- Insufficient spatial and temporal resolution; the space-time variability of phenomena such as tornadoes, downbursts, and urban flooding may exceed current capabilities



NEXRAD coverage at 1 km (~3200 ft) AGL.

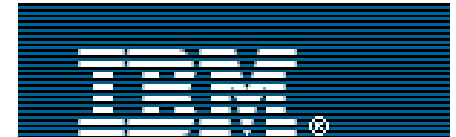
CASA's Team



Gilfillan



ITT Industries



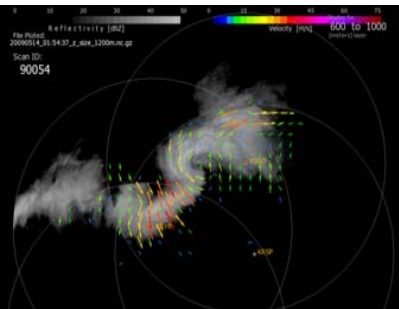
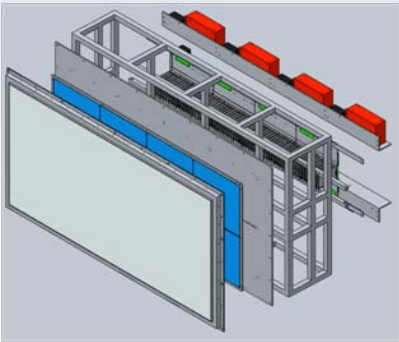
DeTect Inc.
detection technologies



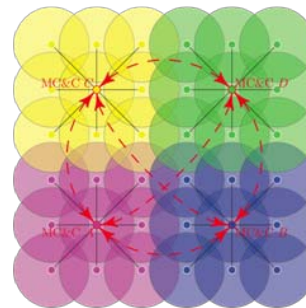
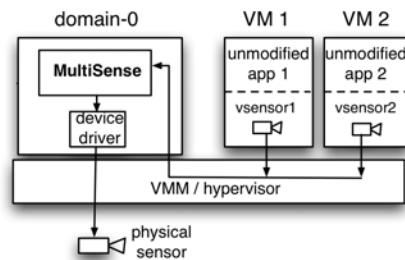
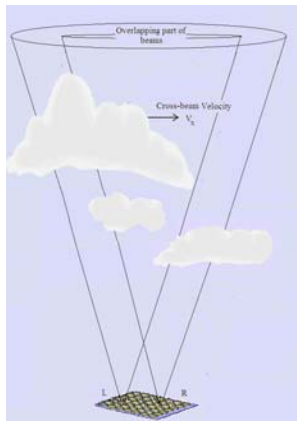
National Research Institute
for Earth Science
and Disaster Prevention.



University of Massachusetts Amherst – ECE and CS

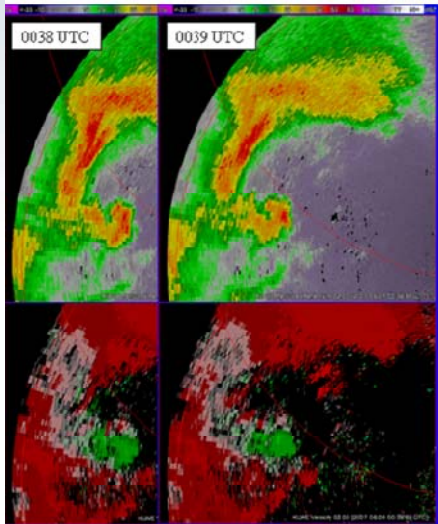


- Development of radar networks composed of small, low power, low cost phased array radar systems to improve lower atmosphere coverage and spatial-temporal resolution of weather phenomenon.
- Design of negotiation based distributed resource allocation mechanisms.
- Signal processing (maximum likelihood formulation) for real time estimates of vector velocities and related products in the overlapping Doppler radar network.
- Development of a pulse-compressed transceiver for mobile weather radars.
- Investigation of Phased-Array Spaced-Antenna implementations for remote sensing of cross-beam (tangential) winds.
- Development of MultiSense to enable fine-grained multiplexing of steerable sensors to satisfy requests.
- Evaluation of CASA IP1 radar network of X-Band radars for quantitative precipitation estimation



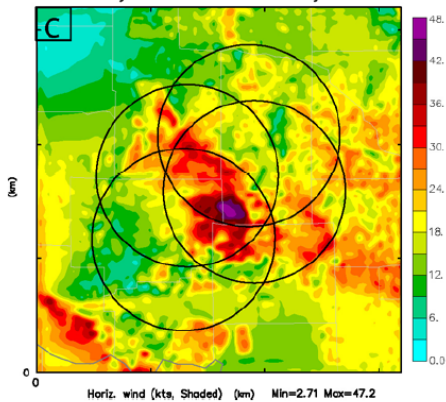
University of Oklahoma - Meteorological Applications & Analysis

- Storm dynamics are studied via the high temporal and spatial resolution of CASA data.
- CASA data are assimilated for High-resolution numerical weather prediction initialization. Case studies have shown the benefit of assimilating this data on the prediction of storms.
- Real-time wind analyses are produced by capitalizing on CASA's overlapping radar coverage areas.

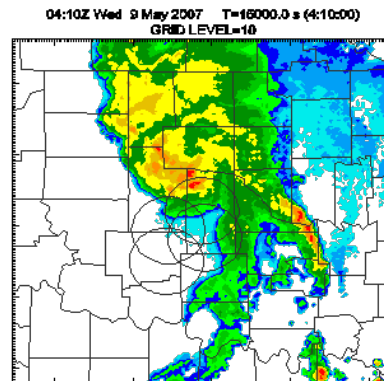


High-res storm data

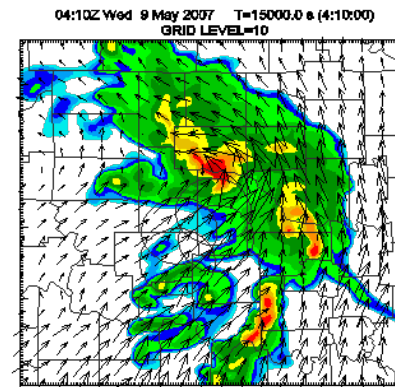
CASA 400m (400x400x6, dx=0.4 km)
Analysis for 21Z Wed 07 May 2008



Real-time analysis



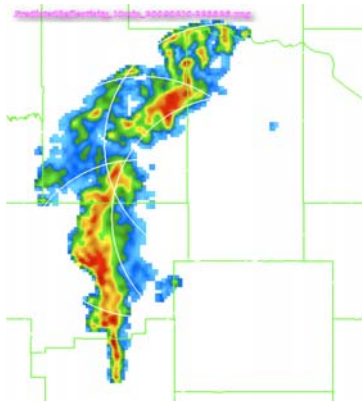
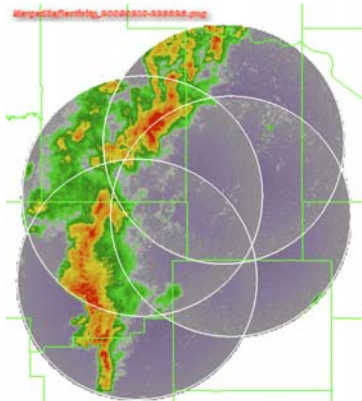
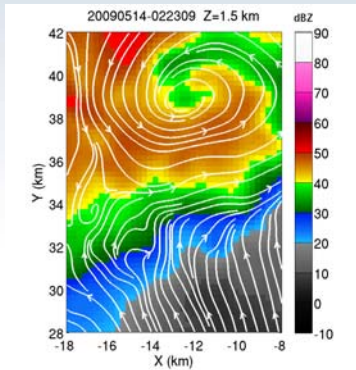
Observed



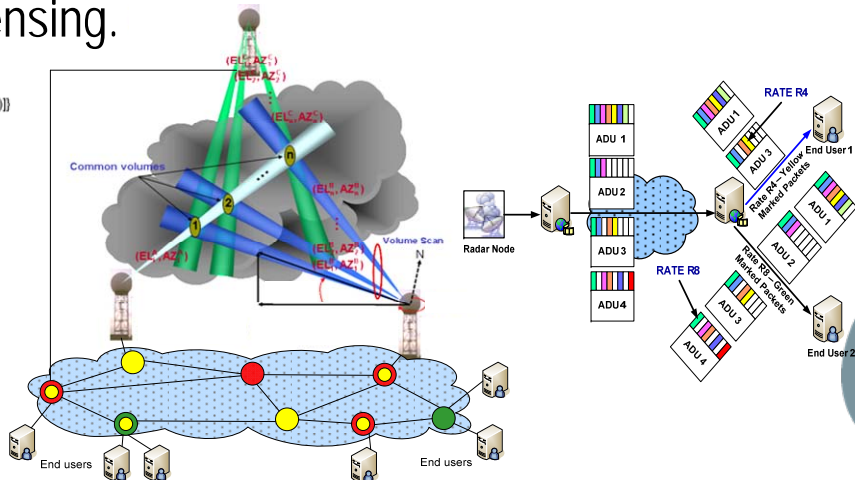
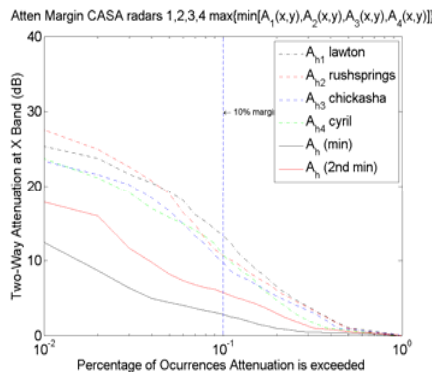
Simulated



Colorado State University – Radars, Signals, & Distribution

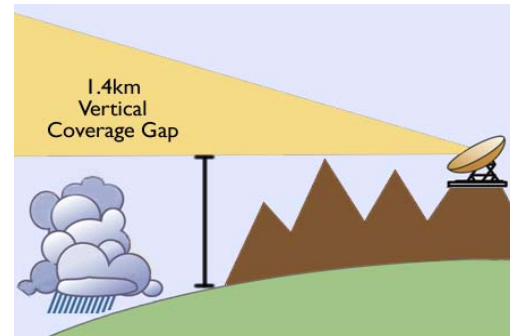
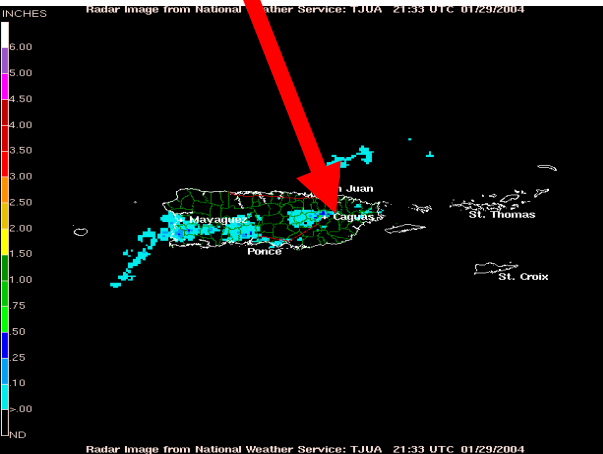


- Dual Doppler tornado wind retrieval.
- Real-time nowcasting system.
- Advanced waveform system for solid-state radar applications.
- Attenuation statistics for X-band radar networks.
- Quantitative precipitation estimation (QPE) from X-band radar networks.
- Fundamental models for Electronic Scanning of precipitation.
- Application-aware overlay networks for high-speed radar data dissemination.
- Real-time multi-sensor data fusion and data/resource location for collaborative sensing.



UPRM - Student Led Testbed

- Student led multi-institution team and research influencing overall CASA strategy.
- Improved precipitation measurements for western Puerto Rico and filling of the WSR-88D radar coverage gaps, focusing on precipitation measurements and mapping in the complex terrain of western PR.
- Advancements in low infrastructure sensor network design including development of a short range, limited node computation, Off-the-Grid radar network.
- Development of new tools for social vulnerability evaluation, site surveys and data visualization.
- Development of a DCAS strategy for tropical PM.

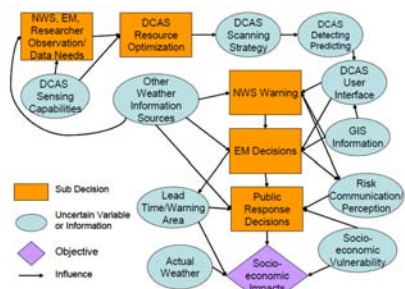
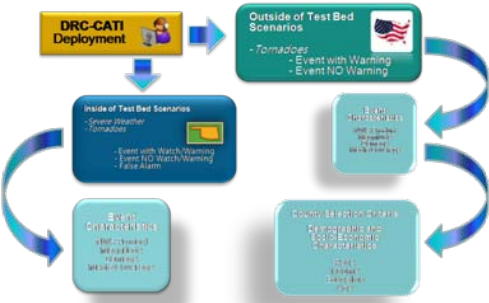




University of Delaware - Social Aspects of Disasters

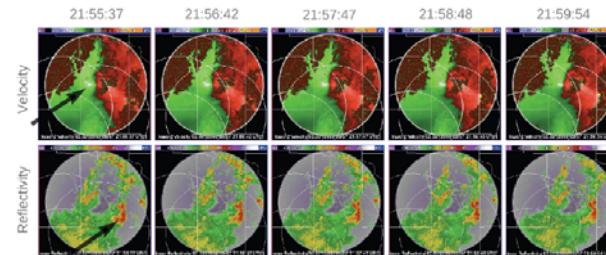
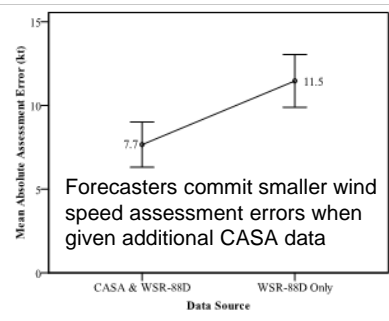
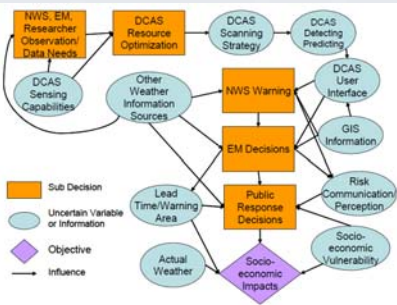


- Integrated decision model linking public response (radar observations, weather detection and prediction) to “upstream” influence factors (e.g. preferred sources of information, past experience, environmental cues).
- Conduction of phone survey after tornado warnings.
- Geospatial analysis of public response based on individual location in the warning area.
- Puerto Rico Disaster Decision Support Tool (DDST) – Geospatial Internet tool to assist decision making in Puerto Rico.



University of Virginia - Systems & Information Engineering

- Integrated end-to-end system decision model linking “upstream” technical capabilities to impacts on “downstream” responses (forecaster warning decisions, emergency management (EM) decisions, public response).
- Quantitative assessment of forecasting and EM decision making with inclusion of high resolution CASA data.
- Tailoring adaptive radar scanning and resulting weather data products to match forecaster and EM needs.
- Modeling system-level impacts from alternative radar and scanning technology as well as radar network topologies.



Analysis of radar scanning strategy to support reflectivity and/or velocity information

Finale

- CASA's research thrusts provide opportunities for student projects that are rigorous in core discipline areas.
- Our Integrated Projects "encourage" students to work on interdisciplinary teams to achieve shared goals, thus adding disciplinary breadth to student thesis work.
- CASA's Education, Outreach and Industrial Partner teams work to provide students with strong professional development opportunities; integrative, interdisciplinary curriculum and degree options; and cross-campus or international research exchange opportunities.



Student Leadership Council

