

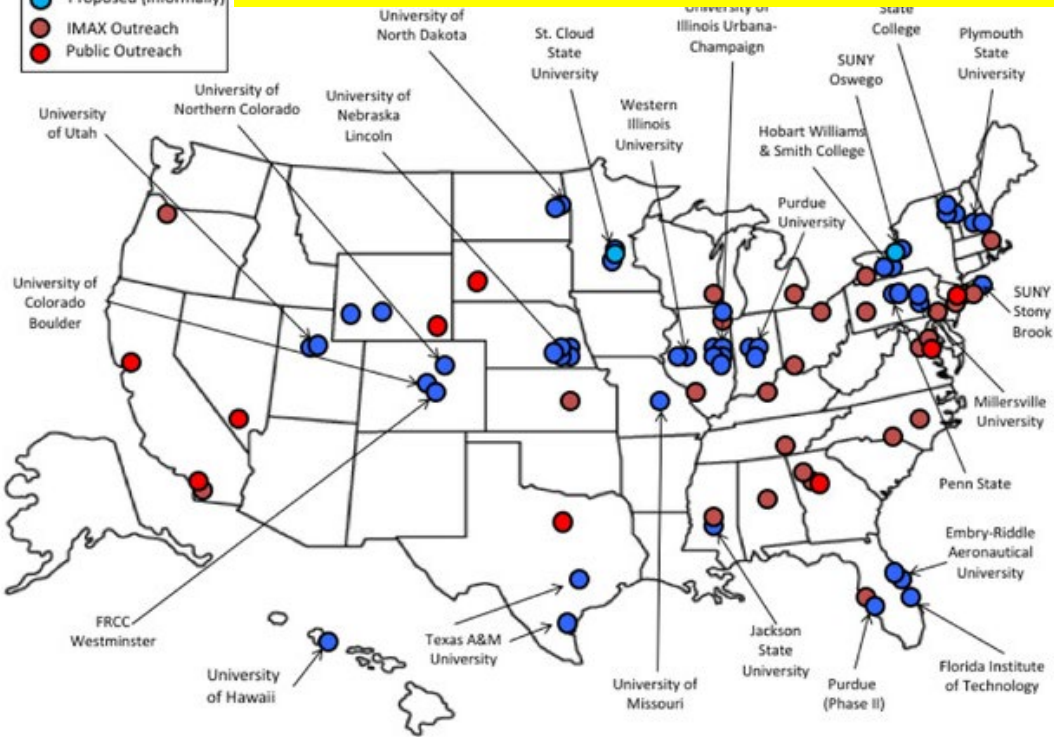
School of DOW



DOW Radar Facility for Education (and MMs/Pods/Soundings)

Education and Major Outreach Deployments

- Educational Projects
- Proposed (informally)
- IMAX Outreach
- Public Outreach



Year	Name	Location
1999	UWI	University of Wisconsin
2004	PAMREX	Pennsylvania State University
2008–2019	UNDEO 1,2,3,4,5,6	University of Nebraska at Lincoln
2009, 2012	DROPS 1,2	Purdue University
2010	NAPEP	St. Cloud State University
2010, 2012	Careers in Science 1, 2	Greater Chicago area
2010–2016	UIDOW 1,2,3	University of Illinois at Urbana–Champaign
2010	SNOWD-UNDER	University of North Dakota
2011–2015	DOWNNEWS 1,2,3	Lyndon State College
2011	"Tornado Alley" IMAX Tour	Nationwide
2011	CM3	Jackson State University
2012	TOM	University of Colorado at Boulder
2012	DOLE	State University of New York at Oswego
2012	PRESSES	University of Missouri
2012	SOLPLEX-REO	University of Utah
2013–2018	GEO-WIND-HWS 1,2,3	Hobart and Williams Smith Colleges
2013	DREAMS	State University of New York at Stony Brook
2013, 2015	WIUDOW 1,2	Western Illinois University
2013	HERO	University of Hawai'i Mānoa
2014	PSUMet-DOW	Plymouth State University
2014	PSU-DROPS	Pennsylvania State University
2014	FR DOW	University of Northern Colorado
2015	ERAU	Embry-Riddle Aeronautical University
2015	BASS	State University of New York at Oswego
2015	TAMU DOW	Texas A&M University
2015	F-DEWS	Florida Institute of Technology
2016	USA Science and Engineering Festival	Washington, DC
2016	MEDOW	Millersville University
2016	FRCC-DOW	Front Range Community College
2016	WWCC	Western Wyoming Community College
2016	MARVELOUS	Saint Cloud State University
2017	Earth Day Texas	Dallas, Texas
2017	Frontier Days	Cheyenne, Wyoming
2017	TAMU DOW	TAMU
2017	OREO	University of Utah
2017	Super Science Saturday	NCAR, Boulder, Colorado
2018	PuRAD	Purdue University
2018	C-BREESE 2	Embry Riddle Aeronautical University
2019	ChaserCon	Denver, Colorado
2019	Super Science Saturday	NCAR, Boulder, Colorado
2020	ChaserCon	Denver, Colorado
2020	BLOWN-UNDER	University of North Dakota

DOW Requests throughout the years

- ~60 NSF Education Requests (DOW and/or MMs/Pods/Soundings)
- ~13 Undergrad Only Programs; Providing access to major instrumentation to non-R1 schools
- ~10 Underrepresented Requestors/Institutions/Populations
- First-time DOW requesters: Betcha' can't request just once
 - 11 Multiple education requests from an institution
 - Part of the curriculum **EVEN** though school does not have a radar resource
- Gateway to field project requests for less-experienced PIs
- Provides a direct, hands-on and immersive (not virtual) experience
- Really get an opportunity to experience field work (flip a switch, level the truck, listen to the sound of the TX/Antenna)



What is an education request?

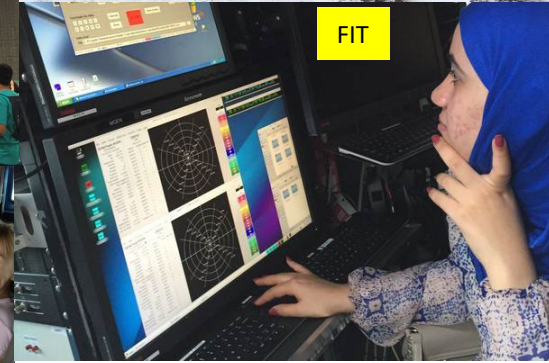
- A really awesome opportunity for students operate and learn about state-of-the-art instrumentation and the associated science!
- A really awesome opportunity to engage the general public and K-12 students in meteorology!

Track 1 (Education and Outreach):

Track 1 proposals are requests for limited field or laboratory activities that target education and outreach. Track 1 proposals must include *educational activities in formal and/or informal settings aimed at providing hands-on student training in field and/or laboratory based observational research, and/or provide significant public outreach through coordinated events.*



USA Science & Engineering Festival



What makes a good education request?

Engage Multiple Classes: Radar, Mesoscale, Forecasting, General Meteorology

- Undergraduate/Graduate
- Majors/Non-Majors

Engage Local Community Groups:

- K-12, Civic Groups, Museums
- University Open Houses, Local Conferences

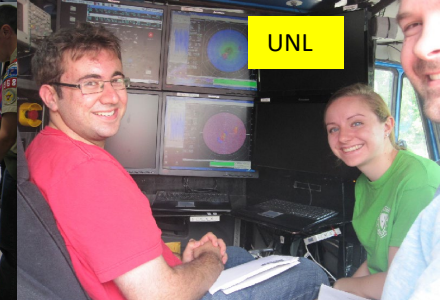
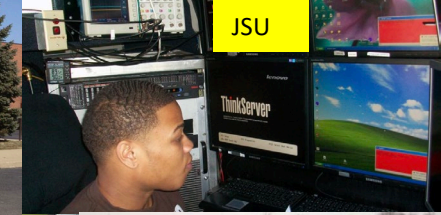
Engage Media:

Local radio/TV/print, social media

Engage Students

- Lead data collection and outreach

Engage Underrepresented Communities



F-DEWS: Florida Institute of Technology, Melbourne, FL

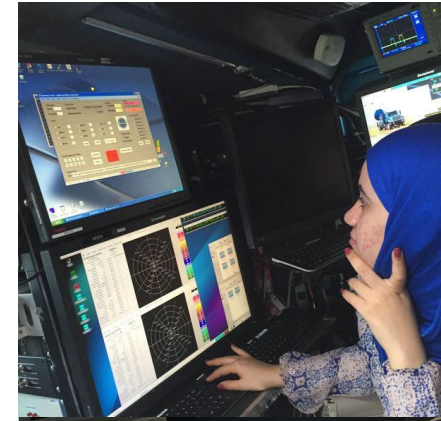
PI: Lazarus

Students:

- 32
- Special DOW course
- Integrated existing instruments (sounding, rain gauges, etc.)
- NWS Forecast Partnership
- Van rental to transport students to IOPs

Outreach: Campus open house, local K-12 schools, Campus seminar (Wurman/Kosiba)

Media: NWS, campus radio/news, local news, Twitter/Facebook



John Windsor and 2 others favorited
Camila Gomes Ramos @camilagmr · Sep 6
Radar got bugged at lake Okeechobee! #DOWFIT



MOBILE RADAR AS AN UNDERGRADUATE EDUCATIONAL AND RESEARCH TOOL

The ERAU C-BREESE Field Experience with the Doppler on Wheels

SHAWN M. MILRAD AND CHRISTOPHER G. HERBSTER

ERAU C-BREESE was an 18-day Doppler on Wheels educational deployment that investigated sea-breeze processes and convection across central Florida.



Student-led DOW RADAR OBSERVATIONS OF WIND FARMS

BY MALLIE TOTI, ERIN JONES, DUSTIN FITTMAN, AND DAVID SOLOMON

Mobile radar observations provide insight into the types of interference that can be expected in WSR-88D and local television radar operations as wind farms expand to locations closer to operational radars.

The growth of the alternative energy industry in the United States in recent years has led to an increasing number of wind farms nationwide. In 2005, the Department of Energy announced plans for the country to meet 20% of its energy needs through wind power by 2030 (U.S. Department of Energy 2005); to meet this quota an estimated 50,000 km² of land and ocean will have to be utilized. Although the bulk of the new turbines are expected to be placed offshore, continental based wind farms will occupy an area estimated to be about the size of Rhode Island. The expansion of wind farms has already proven to be problematic for the meteorological community—because turbines can interfere with Doppler weather radar observations. The nationwide Weather Surveillance Radar-1988 Doppler (WSR-88D) network provides coverage to nearly the entire continental United States at the level of ~1000 ft (~300 m) (Crum and Alberty 1995, which means that almost all land based wind farms will be within some range of a WSR-88D, though many WSR-88Ds may still overshoot wind farms. Wind turbines already built within close enough range of these radars however have resulted in ▶

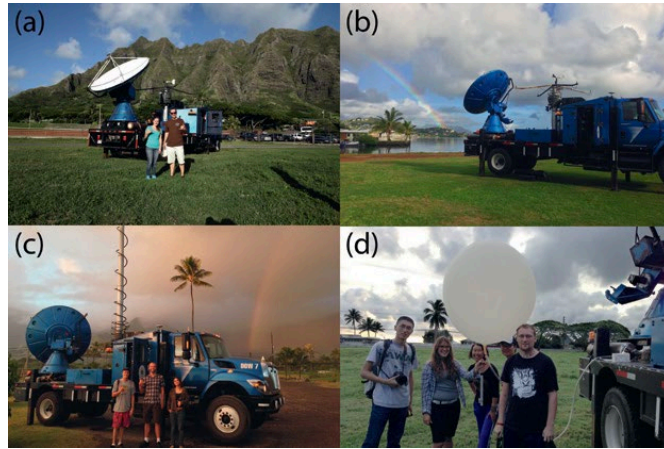
DOW7 at the Montezuma Wind Farm outside of Dodge City, KS during the 2010 season of the VORTEX2 project. Photo by Erin Jones.

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THE HAWAIIAN EDUCATIONAL RADAR OPPORTUNITY (HERO)

BY MICHAEL M. BELL, ROBERT A. BALLARD, MARK BAUMAN, ANNETTE M. FOERSTER, ANDREW FRAMBACH, KAREN A. KOSIBA, WEN-CHAU LEE, SHANNON L. REES, AND JOSHUA WURMAN

A Doppler on Wheels polarimetric radar was brought to Hawaii for the first time on a National Science Foundation educational deployment as part of a radar meteorology course at the University of Hawai'i at Mānoa.



INTEGRATING CLASSROOM LEARNING AND RESEARCH

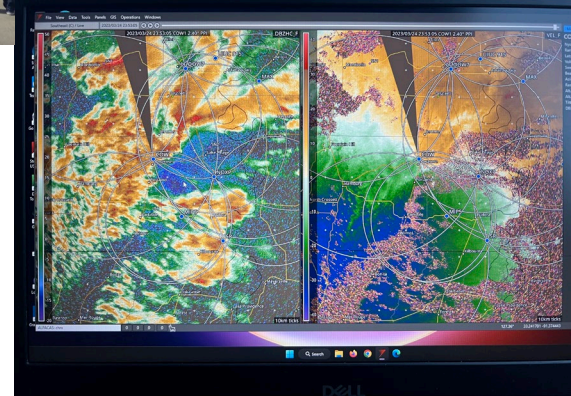
The Pennsylvania Area Mobile Radar Experiment (PAMREX)

BY YVETTE RICHARDSON, PAUL MARKOWSKI, JOHANNES VERLINDE, AND JOSHUA WURMAN



Customization

- Engage the facility in planning, needs, ideas, etc.
 - Deployments
 - Canned Vs. Student-designed
 - Radar "Laboratory" exercises
 - Community Outreach
 - Course Design
 - Undergrad/Grad
 - Radar Expertise
- Software
 - Can provide help installing/using analysis programs
 - Custom GURU software for visualization (easy to use in Windows!)
 - Can bring computers for your use



Don't take our word for it...

- *I've been waiting a long time for some serious field experience. I think it's awesome to introduce this into the department.*
- *I really enjoyed the TOM experiment, and I think it really gave me a much better perspective on how the processes work. I'm definitely a hands on learner, and it really gave me a much better understanding, rather than just sitting in a classroom learning it off of a powerpoint. I'd definitely recommend that it be used again if possible!*

Large Outreach Events

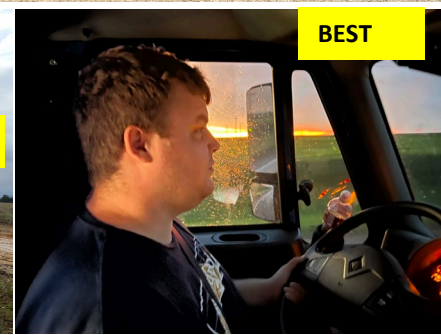
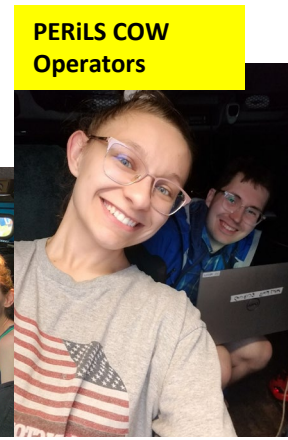
1000s of People

- IMAX Tour (USA)
- Earth Day (Dallas, TX)
- Frontier Days (Cheyenne, WY)
- Engadget (New York)
- CES (Las Vegas, NV)
- USA Science and Engineering Festival (Washington D.C.)



Student engagement in field projects...

- FARM facility instrumentation is designed to be student operable
- Requestors and their students can operate DOWs with ~2 hours of training
- Student operators play major roles in projects
 - E.g., VOTREX2, PECAN, OWLeS, RELAMPAGO, PERiLS, BEST
- No onsite student supervision of student operators
 - E.g., PERiLS, RELAMPAGO, WINTRE-MIX



Community engagement in field projects...

Impromptu



Local School Visits



Community Events & Media



PERILS



1st Annual Radar Institute...there will be a 2nd!

Provides an opportunity for undergraduate students to:

- Learn about radar theory, data, and analysis
- Learn about field projects and deployment
- Put together a radar!
- Operate radar and other instrumentation in their own field project
- Analyze and present results

