Student Nowcasting and Observations with the DOW at UND: Education through Research

MATT GILMORE, LEON OSBORNE, DAVID DELENE, LAURA MUNSKI, MARK ASKELSON,
CHRIS THEISEN, FRED REMER,
AARON KENNEDY, ANDREA NEUMANN, JASON NAYLOR, DAN KOLLER,
MATTHEW CLEGG, YINGXI SHI, COREY AMIOT, HOLLY ROBAK, MATTHEW COKER

University of North Dakota, Department of Atmospheric Sciences, Grand Forks, ND

What was it?

Student-designed / faculty-mentored field project
(15 Nov - 6 Dec 2010)

Instrument Platforms

Radars
- DOW 7 (polarimetric 3 cm)
- UND Polarimetric Radar (5 cm)
- WSR88D at Mayville (10 cm)

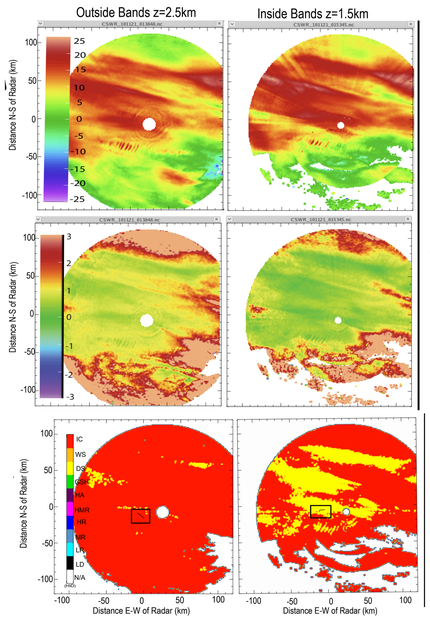
Aircraft
- UND Cessna Citation Research Aircraft (1 h per event)

Surface
- ASOS
- Snowboard network (9 AM & 3 PM)
- Road Weather Field Site @ Buxton

Luke and Ben Hartman, home-schooled students, measure the day's accumulation for SNOwD UNDER on 5 December 2010. *Photo courtesy Sara Hartman.*

DOW Example, 20-21 NOV 2010 Case (First of 4)

HCA Bulk crystal types determined for the DOW 7, inside and outside snow bands



Reflectivity is
- Larger within bands
- Smaller outside

ZDR values are near:
- zero within bands
- one outside

HCA detects
- "Dry snow" within bands
- "Ice Crystals" outside

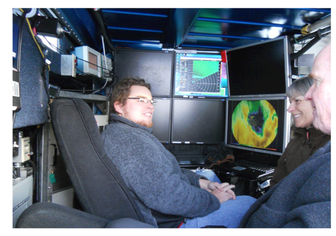
(Boxed region: track of Citation II Aircraft)
HCA algorithm from Marzano et al (2007)

Professor Dave Delene and student volunteers stand next to the UND Cessna Citation II Research Aircraft. *Photo courtesy Aaron Kennedy.*

Analysis of Data (so far)

Polarimetric variables versus *in situ* obs (see left)
AURA (Ms. Robak; summer 2012)

Multi-radar Z-S relationships (not shown)
Senior Thesis (Mr. Coker; Fall 2011)



Graduate student Field Coordinator, Aaron Kennedy demonstrates the DOW 7 to UND's President Kelley and First Lady, Marcia Kelley. *Photo courtesy Corey Amiot*

Graduate Student volunteer, David Keith, checking readings on the Citation II prior to takeoff. *Photo courtesy Zhe Feng.*

Who? Roles?

UND ATSC Faculty – Mentoring; classroom activities

Kennedy & Neumann – Student Field Coordinators

15 UND Grad Students – Leadership; Design of Field Plan; coordinating surface, aircraft, satellite, and radar obs

28 Undergraduates - Photography; Press Releases
snowboard measurements;
DOW deployments;
video training of K-12 students

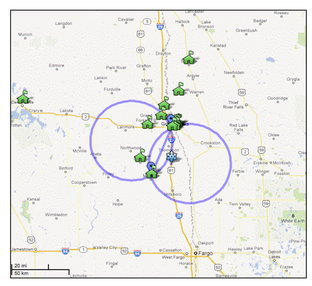
200 K-12 Children – Snowboard Measurements
(9 classrooms)

Research Goals

For the Red River Valley, a better…
- understanding of air motions in snow events;
- estimation of snowfall using radar;
- understanding of snow microphysics.

Learning Goals

how to…
- plan and conduct a field campaign
- forecast snow events
- how to collect data



Google Map showing locations of the 11 K-12 schools (green schoolhouses), 40° dual-Doppler lobes between the UND polarimetric & Mayville WSR88D radars, and the Buxton Field Site (snowflake symbol).

UND Courses Involved

DOW Deployment Strategies
Matt Gilmore's *Radar Meteorology*

Snow Forecasting
Leon Osborn's *Synoptic Meteorology*

K-12 Video Training
Fred Remer's *Broadcast Meteorology*

Aircraft Instrument Training
Dave Delene's *Measurement Systems*

SNOwD UNDER student volunteers and faculty mentors standing next to the DOW7 *Photo courtesy: Zhe Feng.*

References

Marzano F.S., D.Scaranari, and G.Vulpiani, 2007: Supervised Fuzzy-Logic Classification of Hydrometeors Using C-Band Weather Radars. *IEEE Trans. on GeoScience and Remote Sensing.* **45,** 3784 – 3799

Future Work

- Polarimetric vs Aircraft Observations
- Triple-Doppler analysis of snowbands
- SNOwD UNDER II

Acknowledgements

Dr. Josh Wurman & CSWR Staff – DOW 7 training & support
NSF via CSWR (ATM-0734001) – DOW 7 deployment
ND EPSCoR – Analysis of data
Goodrich Corp. – Aircraft flights
ECO LAB – Snowboards
UND AtSc Dept. – Miscellaneous