

The DOW Radar Observations at Purdue study (DROPs)

submitted by

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1. INTRODUCTION

We propose use of a Doppler on Wheels radar (DOW), an NSF Facility managed by the Center for Severe Weather Research (CSWR), for the period 21 October - 18 November 2009. The usage period will run concurrently with the offering of EAS 523 *Radar Meteorology*, which has an expected enrollment of 20-25 graduate and senior undergraduate students.

During the DOW Radar Observations at Purdue study (DROPs) we will: (1) introduce undergraduate and graduate students to the components and operation of a research radar; (2) allow the students the opportunity to plan and lead multiple data-collection missions; and (3) analyze the data as part of small group projects that will be presented at the end of the semester, and potentially during the Student Conference of the American Meteorological Society's Annual Meeting. Additionally, the DOW will be used as a focal point for K-12 outreach activities with area schools (see Section 3).

2. PROPOSED USE OF THE FACILITY

During the student-facilitated missions, the DOW will be used to collect radar data on a variety of precipitating weather systems, in different data acquisition modes. Our deployments will be opportunistic: The proposed period represents a transition season, and hence offers the possible occurrence of isolated severe and non-severe thunderstorms, mesoscale convective systems, frontal rainbands, and

even lake-effect snowfall, all within a ~100 km range of Purdue University, in West Lafayette, Indiana.

Sampling in each of these event types will benefit from different sets of radar parameters such as pulse repetition frequency (PRF), antenna rotation rate, volume-scale angles, etc. In preparation for DROPS, lab exercises will be devoted to devising radar deployment and sampling strategies, which will also serve to reinforce lecture material.

During DROPS, individual students groups will have the responsibility of forecasting target areas, planning the mission, and deciding upon—and modifying as needed—the sampling strategy. Other student groups will provide nowcasting and other support. Consultation and collaboration with students enrolled in *EAS 397 Team Weather Forecasting* will be encouraged.

Post-event data analysis will be accomplished using software such as SOLOii. The PI has considerable experience in DOW-data analysis, and all necessary software is currently available and maintained on Purdue computers.

From the perspective of student learning, a particularly exciting aspect of DROPS – and the dedicated use of a research radar – will be the ability to collect data in ways not afforded by operational radars such as the WSR-88D and TDWR. So, for example, RHI scans through stratiform precipitation will be used to help illustrate the existence and structure of bright bands and associated melting layers. Real-time adjustment of the PRF will be used to show the dependence of range and velocity ambiguities on this parameter. Close-range collection, in conjunction with an application of the “filter-paper” technique, will be used during one mission to construct a local *Z-R* relation.

The PI has spent more than 100 hours operating DOWs, served as the DOW coordinator during the Intermountain Precipitation EXperiment (IPEX)ⁱ, and has even made minor repairs to the radar system. Additionally, Purdue graduate students will be participating in VORTEX2 as part of the DOW crew, and will receive some limited training on DOW operations. Therefore, the level of on-site technical support for DROPS will be much less than in other similar programs, thus allowing for a longer duration in DROPS for a comparable budget.

3. OUTREACH PLAN

The K-12 outreach will be in two modules. The first will be activities for students. The EAS departmental outreach will use DOW demonstrations by the PI as a focal point for student activities during the 2009-2010 school year. In 2008 the department hosted activities with an excess of 1700 K-12 students through campus visits and classroom visitation. The second module will be carried out by means of teacher kits. The outreach coordinator will develop activities, teach them with students visiting campus, modify them for classroom use, and turn the activities into a Radar Education Kit for classroom teachers. The kits will include activities and equipment necessary to perform the activities. This kit will be added to the Kits for Earth and Atmospheric Sciences (KEAS) program. This program allows K-12 teachers to check out kits for classroom instruction at no cost to the teacher or participating school. In the 2008-2009 school year over 40 in-service and pre-service teachers used the kits with an excess of 2000 students. Once the Radar Education Kit is developed, it will be available to thousands of educators.

Appendix I – Facility Request Form for Educational Activities

Part I: General Information

Requestor Name	Robert J. Trapp
Institution and Address	Purdue University, West Lafayette, IN
Phone and Email	765-496-6661; jtrapp@purdue.edu
Faculty Advisor Name (if student requestor)	
Institution and Address	

Part II: Project Description

Project Title	The DOW Radar Observations at Purdue study (DROPs)
Project Location	West Lafayette, Indiana
Start and End Dates of Field Deployment	21 October - 18 November 2009
NSF Facilities requested (type and # of systems)	one (1) DOW radar

Part III: Educational Activities Description

Number of students involved	Graduate: 10 Undergraduate: 20
Desired training activities conducted by Facility Staff incl. time in the field	
Desired teaching activities conducted by Facility Staff incl. time in the field	
Additional special requirements that pertain to Facility support	
Ancillary/Oppportunistic K-12 Outreach Activities	DOW demonstrations during K-12 student/teacher visits; development of a Radar Education Kit for K-12 teachers

Part IV: Operational Requirements

Please specify data access needs (e.g. real time)	
Please specify data analysis needs	
Please specify communications needs	

ⁱ Schultz, D. M., W. J. Steenburgh, **R. J. Trapp**, and co-authors, 2002: The Intermountain Precipitation Experiment, *Bulletin of the American Meteorological Society*, **83**, 189-210.