P4.1 WET MICROBURST – STUDENT TRAINING AND ROLE IN ON-LINE BIBLIOGRAPHY AND EVENT SELECTION

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## 1. INTRODUCTION

As part of a wet microburst study, a preliminary bibliographic base and reference data set for the Southern Region has been developed. Two undergraduate atmospheric science majors (second and third authors of this paper) collected, reviewed, organized, and summarized all of these materials. In the process, a variety of professional and skills development opportunities have been possible for them ranging from keyword selection used in searching of resource contents to the identification of reference and resource types available.

In addition, students necessarily had to consider the material from a scientific viewpoint, be prepared to discuss the materials with peers in the field, and formulate conceptual models and diagrams needed to organize the information into a coherent and operationally-oriented framework. This included visits to partnering NWS Forecast Offices involved in the project and the examination of specific events and radar imagery. Production of the end products also required them to develop their communication skills.

There was great potential for personal and professional development as both students acted in their capacities as meteorologists. This demanded attention to details, succinctness, and specificity not typical of mid-level or senior undergraduate meteorology majors. The project also permitted them to gain experience working on funded research and thus to gain an appreciation of operational research and the skills necessary in graduate work.

## 2. PROJECT GOALS

Project goals for students were based on full immersion into the process of research from initial literature review and understanding to synthesis, analyzing relationships, interpretation of conflicting information, portrayal, physical understanding, and the development of conceptual models and their applications. Upon completion, the students were also afforded opportunity for professional growth through seminar presentations, preprint preparations, and poster/oral discussions.

As part of the process, the students accessed a variety of sources (web-based, professional literature, office documents, and others). They were often left to "think-on-their-own" and to offer alternative solutions or approaches to questions arising during their investigations. In some cases they were able to take advantage of situations or information that presented itself during the project. These pragmatic opportunities were an important component in the students' search for answers as to the development, morphology, and prediction of wet microbursts.

## 3. ACTIVITIES & OUTCOMES

The students began project work in early summer of 2003 and continued into the fall semester. Beginning with collection of literature and resources on the microburst phenomenon, they accessed websites and libraries. Using keywords (e.g., downburst, microburst) and organizing resources by type challenged them to develop a manageable system for archival and manipulation of the information base.

Websites offered a plethora of possibilities and included information on microburst events, descriptions, pictures, and general education or training materials. Decision-making was essential when considering that sources ranged from pseudo-scientific (or not at all) to informational, visual, or theoretical. Understanding how best to separate and represent these for the public or the professional community was a learning process.

Information from scientific journals and other periodicals provided a basis for the students to relate their coursework to operational applications and forced them to understand extensions of their basic knowledge to new situations. The operational aspects were of particular interest and a driving force for the project in order to improve real-time

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recognition and prediction of wet microbursts. The contrasts between the realities of the atmosphere, forecast models, theory-based principles of atmospheric behavior, and how these may complement one another provided important lessons.

For example, a goal of the overall project was the development of an initial conceptual model of the "microburst family" to improve operational recognition and prediction. The model would provide information on the characteristics of members of the overall family of microbursts. This required the collection of a broad set of population characteristics and parameters used in microburst observation, analysis, and prediction. In other words, the ability to identify from which "clan" a particular form of wet microburst originates within is useful to forecasters. This is comparable to the "sea breeze family" (or spectrum) when predicting the nature of interactions and convective activity for the day.

Visits to some of the partnering NWS Forecast Offices (JAN, LIT, MEM, SHV) were also of significance as it gave them a clear operational view and approach to the microburst issue and perspective with which to consider the purely theoretical applications and model simulations found in the literature. In addition, they were able to receive some real-time experience in radar interpretation and reanalysis by working with NWS staff. For those offices not visited, they relied on phone calls and/or emails for scientific exchange and also dealt with issues of file transfer and portability.

## 4. RESULTS

As part of the overall project, the completion and dissemination of bibliographic and event data sets were intended to provide a summary of what is known and unknown about wet microbursts, describe the basic microburst family and its associated parameters, identify the most appropriate operational tools for prediction and detection, and begin to discern the storm scale cues (from radar) that can increase lead-time and provide evidence of the forces leading to isolated versus widespread microbursts.

The summary information and associated documentation is composed of several reports and arranged/organized according to the following categories: web, journal, parameter, imagery, image summary, checklist, and model development. The web portion was developed to be a part of the bibliographic base to identify research and educational resources on-line. Each of these was summarized from an operational forecast perspective and according to natural groupings (e.g., AMS, Educational, and Vendor). This allows a user to quickly access a desired focus and easily interpret information.

The journal base contains a listing of peer reviewed articles that pertain to many members of the microburst family (e.g., bow-echo, isolated, cell interactions, widespread) and their characteristics. This information is primarily associated with physical understanding of the ingredients and processes at work in microburst production and thus is of educational and research value. Together, they provide a basis for development of an empirical conceptual model of the microburst family.

Related to conceptual model development are the parameter and imagery bases, derived from the journal and web resources, which provide the morphological characteristics and other relevant information for the depiction of the microburst family. The parameter base provided a physical understanding of the microburst process and was organized in a spreadsheet format for comparison and reference. Three distinct areas of focus were identified and include thermodynamic, kinematic, and radar/miscellaneous.

The imagery base provided the ability to depict a variety of complex parameters, and their associations, in an operational framework that could be readily applied in a forecast or nowcast situation. The imagery base consists of thermodynamic profiles, radar and satellite imagery, surface and upper air maps, and time series or cross-section plots of thermodynamic and/or kinematic variables. This resource also provides an operational forecaster with a clear depiction of the tools to use that are available, and other tools that could be made available.

A composite checklist was also possible given input from the NWS Partners in combination with the aforementioned resource bases. The composite listing is intended to provide guidance in the discrimination of severe versus non-severe cases in a weak shear environment and to allow real-time assessment of parameters for a given day's forecast. Of the parameters included, selection was made of those that were most commonly cited or used by the NWS Partners to provide some consistency when anticipating microburst events. They also provided an opportunity for direct comparison and contrast between operational practice and theoretical approaches.

When combined, the above resource bases provide for the development of an empirical (and somewhat theoretical) conceptual model. In this work, two models were developed – one for the storm structure within its environment, and another according to radar information to provide a model of storm structure and characteristics during and before the formation of the microburst event. In essence, these models provide a physical and dynamic model (over time, or stage of development) that may assist the forecast process in identifying the chance of microburst events, their coverage, and help to distinguish between days with events versus those without – particularly in those situations in which no obvious differences exist in the synoptic or mesoscale settings from day-to-day.

## 5. COMMENTS

During the course of the project the students developed an improved understanding of both the phenomenon of interest and the nature of the research process. In particular, the assembly of diverse data and information resources allowed them to put the puzzle together using an operational perspective.

While the driving force or motivation for the project was to gain a better understanding in order to develop a conceptual model, the motivation for the students to pursue the project varied. The research opportunity provided a chance to use and develop skills in their field while also experiencing first-hand the nature of research, its obstacles, and the rewards.

For each student the project provided a time to experiment with research and other interests and involved their immersion into the field's literature and other resources. It gave them reason to work with professionals in the discipline and an appreciation for the planning and communications necessary to achieve project goals.

The relationship between project work and the students' degree work included tie-in of their course materials with scientific study. The collection and organization of materials, and their proper display or representation, were critical skills helpful for career preparation.

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