University of Louisiana at Monroe

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NWS/AFWA/Navy Office: *JAN NWS (primary) and other NWS (see report)*

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Partners Project UCAR Award No.: *_S03-41098__*

1 April 2004

SECTION 1: PROJECT OBJECTIVES AND ACCOMPLISHMENTS

1.1 The project objectives (below) were completed in partnership with several NWS offices (JAN, SHV, LZK, MOB, BMX, and MEM) and with shared responsibility. The lead investigator directed this process and coordinated the development process with two student hires (undergraduate atmospheric science majors) at the University of Louisiana at Monroe.

- Determine the base characteristics and properties of observed microbursts
- Provide annotated bibliographic database for operations, research, and education
- Disseminate and coordinate informational exchange within scientific community
- Abstract, preprint, presentation at NWA Conference
- Student participation

Project accomplishments – the project resulted in the development of both a bibliographic and event database to aid in operational microburst forecasting and detection. The body of literature (including web-based resources) and the events data established with NWS partners provided a glimpse at the observed population characteristics of southern region wet microbursts within the parent distribution of microburst events, and their various modes of occurrence. Such characteristics include observed and theoretical attributes of the microbursts, their physical basis, and the physical processes preceding their occurrence. Summary statistics were developed to indicate the range of various parameters associated with microbursts and their mean values as appropriate. In addition, the initiation types included isolated events, outflow boundary spawned events, and cluster events. These were used to develop a basis for conceptual model development (both regional and storm scale) that may be refined in the future.

The improved understanding, prediction, and detection of wet microbursts are considered in a holistic and comprehensive sense using this information. The two students, under the direction of the lead investigator, derived common features and attribute information for use as a reference by operational forecasters. These results are contained within a technical report (composed of multiple documents) that has been disseminated to the NWS partners on cd-rom and that will be hosted on the web by the JAN office. The bibliographic database was constructed based upon existing literature through exhaustive

searches on-line including: AMS journals archive, geo-astrophysical abstracts (vendor), and various electronic resources. The searches were based primarily upon the following keywords (or variants thereof) – microburst, downburst, downdraft.

From these searches, a multiple file system was developed to contain select information for annotated listings. The intent was to provide a wide ranging collection of resources and summary information that would allow different user communities to access those aspects of the microburst literature of most interest to them and to allow for cross-referencing of the materials. Each resource was reviewed for inclusion or removal and was used to not only construct a bibliographic base, but also to provide information for the development of a scientific base to depict the characteristics of the microburst population (or family). This was then compared to several events collected from NWS partners in order to draft an initial conceptual model and to provide real-time analysis of events from their origin to their demise using data from 2002 and 2003. The combination was intended to provide forecasters with a better understanding of the distribution of parameters that lead to the likelihood of microbursts; and, given their occurrence, the characteristics expected on the storm scale based on radar information.

The dissemination and informational exchange within scientific community of the project was accomplished through presentations (oral and poster) at the National Weather Association Meeting (October 2003) and AMS preprints (two). The two students also participated in the oral presentation at the NWA conference. The final dissemination was through mailing of the cd-rom technical report to the NWS partners and the hosting of the cd-rom files online by the JAN office. As part of these efforts, several visits were made to some of the NWS partner offices (SHV, JAN, LZK, MEM) by the students and/or the lead investigator.

In addition to project accomplishments, leveraging of resources were made with a two week teacher workshop held by Delta RSI Office at ULM and with the GEARUP Program funded by the state for a one-week on-campus weather exploration for 7th graders. The student hires were able to expand their interaction by spending some time with varied public audiences and presenting their work. Students also provided a Geosciences Department seminar for faculty and students.

JAN – There was regular interaction and activity between this office and the lead investigator for all aspects of the project. Frequent e-mail updates were provided and office visits (and phone calls) were made by both the students and the lead investigator.

SHV – Contributions were made to the bibliographical list of references as well as the events database. Several microburst producing storms were examined on the Weather Event Simulator and discussion of the microburst family and conceptual model of a microburst producing storm was provided.

MEM – The involvement consisted of two major parts: the implementation of a decision tree worksheet and identification of events for the database. The worksheet used parameters from surrounding upper air soundings that have been found to help identify

days when wet microbursts may be prevalent. This worksheet was completed every day from May 15th through Sept 15th and increased situational awareness with regard to microburst potential. The worksheet also assisted in the analysis of past events within the CWA. The identification of two events for inclusion in the project's "family of microbursts" cases included data from August 4, 2003 and July 22, 2003. Summaries of these events were provided for incorporation.

SECTION 2: SUMMARY OF UNIVERSITY/ NWS/AFWA/NAVY EXCHANGES

2.1 Joint presentations made for the project were *"Wet microburst – bibliography, annotation, data (BAD)"* and *"Wet microburst – student training and role in on-line bibliography and event selection (STROBE)"* at the NWA Annual Meeting. Although also accepted for presentation at the AMS Annual Meeting, travel funds were not available for attendance. The joint preprints were *"Croft, P. J., and A. E. Gerard. Wet microburst – bibliography, annotation, data. Preprint for AMS Annual Meeting, Seattle, Washington, 12-16 January 2004"* and *"Croft, P. J., P. Pyle, and S. Blair. Wet microburst – student training and role in on-line bibliography and event selection. Preprint for AMS Annual Meeting, Seattle, Washington, 12-16 January 2004"*. All of the presentations and preprints are contained within the cd-rom technical reporting (Croft, P. J., P. Pyle and S. Blair, 2004. Technical Report: Preliminary Investigation of Observed Microburst Characteristics and Forecast Methods. University of Louisiana at Monroe, Department of Geosciences).

JAN – There were meetings (in person, phone, email) regarding the development of a conceptual model. We also shared certain case study dates and some of the work done at NWS Jackson with our Wet Microburst Checklist.

MEM – The main exchange involved a visit by the students to discuss the two event cases used in the database. We also attended the NWA conference where the findings from this COMET project were presented. Many other exchanges have occurred through email during the past year concerning the project.

SHV – Visits to the office to view archived radar data on the WES and to gather bibliographic references.

SECTION 3: PRESENTATIONS AND PUBLICATIONS

3.1 Two abstracts were submitted and accepted for oral/poster presentation consideration by the NWA and AMS Annual Meetings (*Wet Microburst – Bibliography, Annotation, Data [Wet Microburst – BAD] – Paul J. Croft and Alan E. Gerard & Wet Microburst – Student Training and Role in On-line Bibliography and Event Selection [Wet Microburst – STROBES] – Paul J. Croft, Patrick Pyle, Scott Blair*). It is anticipated that the PI and potentially the students involved in the project will attend at least one of the meetings listed. During the course of the investigation a variety of issues that may be worthy of further investigation have been raised. These include field investigation, other partners, and a videoconference.

The student hires were able to expand their interaction by spending some time with varied public audiences and presenting their work. Students also provided a Geosciences Department seminar for faculty and students.

SECTION 4: SUMMARY OF BENEFITS AND PROBLEMS ENCOUNTERED
4.1 Students were provided extensive opportunity for end-to-end research project (including aspects of presentation and publication) as well as direct interaction with NWS personnel. Skills learned are useful to research, their career, and professional development.

STUDENTS - The project offered some personal benefits. The poster and presentation at the NWA conference has given me confidence in anything. We felt very privileged to be able to present our work to such a prestigious crowd. The communication skills gained throughout the project (NWS visits, NWA conference) will be something that can be used for a lifetime. For just attending the conference, we were able to track down a scientist that wrote one of the papers we read this summer. We approached him and shared some words about his work. We were able to discuss microburst topics just about every time we saw each other. We were also able to make a variety of contacts (not just our NWS partners) with other scientists in our field. We have their contact information and feel very comfortable emailing or calling them if we need anything concerning our work. Through this experience we were also been given the opportunity to present to other groups. We presented severe weather information to 7th graders and their teachers in the summer which resulted in a planned visit to a school in southern Louisiana. We were also able to share our work with students in atmospheric science classes during the fall term.

4.2 MEM – There were no problems. The benefits from this project are numerous. Forecasters now look at a variety of upper air soundings while completing the decision tree worksheet each morning during the warm season. This is undoubtedly leading to better situational awareness and better forecasts. This COMET project has also helped to jump-start other local research projects.

SHV – The participation in this project by NWFO Shreveport helped to strengthen ties between the NWFO and ULM. The extensive bibliographical reference list developed by the students will assist NWFO Shreveport in further research on microburst producing storms.

MOB – Project is clarifying what variables (in the vertical eqn of motion) that we are able to represent (and how to represent them) as they pertain to supporting and predicting the potential for wet microbursts given cursory knowledge of the pre-storm environment and lack of in-situ cloud measurements.

JAN – The development of the conceptual model of the Microburst was unique and will be an exceptional training tool for National Weather Service Science and Operation Officers in the coming years. One of our Lead Forecasters continues to work hard in producing operationally relevant forecast techniques for weak shear severe in the warm

season. He has already harnessed some of the work done by ULM to increase the accuracy of our local Wet Microburst checklist. The caliber of the work done by these students and the continuing leadership of Dr. Paul Croft in producing high quality meteorology graduates makes the University of Louisiana at Monroe an attractive source of Meteorologist Intern candidates for the National Weather Service.