P4.11 WET MICROBURST – BIBLIOGRAPHY, ANNOTATION, DATA

Paul J. Croft* and Alan E. Gerard
University of Louisiana at Monroe, Monroe, Louisiana
National Weather Service, Jackson, Mississippi

1. INTRODUCTION

Despite their prevalence, and their ability to cause damage on par with other types of severe weather, microbursts in the United States have received little dedicated study or attention. Microburst occurrences are often reported as thunderstorm wind damage – and thunderstorm wind damage reports to the Storm Prediction Center now total nearly 10,000 per year.

Although the general nature of microburst occurrence and properties may be predicted through dynamic reasoning, the particular characteristics of their occurrence, and their metrics, is not well-known or predicted. In fact the conceptual models used in explaining their occurrence and behavior are unreliable. This is partly due to microphysical contributions and a lack of complete understanding of the thermodynamic environment that leads to their occurrence rather than tornadoes, straight line winds, or large hail.

In an effort to ameliorate this lack of knowledge and forecast ability, an examination of observed "microburst family" characteristics was prepared based on available resources in the meteorology community. These include web-based information and products, literature, and real-time observational data from events. The events were provided to the University of Louisiana at Monroe Atmospheric Science Program by NWS Partners (BMX, JAN, LIT, MEM, MOB, SHV) and SPC. The Project Director and two undergraduate meteorology majors (Patrick C. Pyle and Scott F. Blair) were responsible for the development of the collected resources.

The intent is to provide better qualitative and quantitative information on the phenomenon and to determine appropriate tools to aid in predicting the occurrence of microburst events. The objectives of the study were to (1) Determine the base characteristics and properties of observed microbursts; (2) Develop a prototype conceptual model; (3) Provide an annotated bibliographic database for operations, research, and education; and (4) Disseminate and coordinate informational exchange within the scientific community.

Qualitative and quantitative information were of interest as they are essential in an operational environment tasked with the prediction of pulse severe weather under weak shear conditions (i.e., duration, intensity, scale/size, and storm scale features). As such the outcomes must include: the observed characteristics of the family of microbursts that occur; forecast checklists; and a subset of occurrences for direct examination.

The project has seen the preliminary development of both a bibliographic and event database to aid in operational microburst forecasting and detection. The body of literature and the event data have assisted in establishing the population characteristics of Southern Region wet microbursts within the parent distribution (or family) of wet microbursts. Such characteristics include observed and theoretical attributes of the microbursts, their physical basis, and the physical processes preceding their occurrence. These are expected to provide a basis for improved understanding, prediction, and detection of wet microbursts operationally.

2. DEVELOPMENT

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

* *Corresponding Author Address*: Dr. Paul J. Croft – Associate Professor of Meteorology, University of Louisiana at Monroe, Department of Geosciences, 700 University Drive, Monroe, LA 71201; email <croft@ulm.edu>.

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).

Within this file system, NWS partners provided forecast checklists used operationally, local studies, and specific event information (including radar analyses). This information was incorporated with the parameter spreadsheets and integrated with various simulations and modeling efforts as gleaned from the literature. In this manner, a conceptual framework and working model of microburst initiation, development, and occurrence have been developed from an operational perspective. In addition, differentiation between isolated and widespread events on a given day, were considered.

The event database is comprised of synoptic and mesoscale settings in the pre-storm environment, appropriate thermodynamic and kinematic analyses, and operational forecast tools used, and storm scale features as derived from WSR-88D investigations (as available from NWS partners). These provide the broader conditions conducive to the occurrence of microbursts as well as the actual morphology of the microburst family. These also provide bases for the conceptual model that illustrates the pre-storm environment, the initiation and development of pulse severe cells (or lines), and their characteristics as observed in operations by radar.

3. OUTCOMES

The empirically-based conceptual model was generated by synthesis of the bibliographic and event bases and coordination with the NWS partners. This resulted in an empirical model of the wet microburst family and an empirical model based on event radar imagery. In combination, these are intended to assist operational forecasters in the interpretation of risk and the nature of events (widespread versus isolated).

The complete set of resources are contained in a hardcopy version (including all journal articles referenced) available for review at the University of Louisiana at Monroe. Electronic copies (excluding the journals but not their reference citations) will be made available to the NWS partners. It is anticipated that a partner, or another interest, will host an electronic version on-line to enhance distribution and accessibility to the broader community.

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