Final Report:
DEVELOPMENT OF AN IMPROVED FORECASTING TECHNIQUE FOR STRONG NORTHEASTERLY WINDS IN THE WESTERN GULF OF MAINE

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Type of Project (Partners or Cooperative): Partners

Project Title: DEVELOPMENT OF AN IMPROVED FORECASTING TECNIQUE FOR STRONG NORTHEASTERLY WINDS IN THE WESTERN GULF OF MAINE

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Section 1: Summary of Project Objectives

(a) Identify synoptic-scale conditions at time of onset, and at points 12, 24, and 48 hrs prior to onset, corresponding to the four dominant Moker (2006) classes associated with strong northeast winds in the western Gulf of Maine; (b) study the time-evolution of events *after* onset, and determine the sequence of Moker (2006) classes during events; (c) study occurrences of low-level wind shear during northeast wind events, and determine location and evolution of low-level wind maximum under different synoptic conditions.

Section 2: Project Accomplishments and Findings

(a) PSU student Daniel Michaud, under supervision of PSU professor Dr. Miller and Mr. St. Jean (NWS) used a 5-yr dataset to create composite surface and upper-air analyses for the time of onset of strong northeast winds, as well as points in time 12, 24 and 48 hrs prior to onset. The Moker (2006) classes identified in previous work were found to be associated with distinct pre-onset conditions, recognizable up to two days in advance. Michaud and Miller also examined the time-evolution of synoptic-scale conditions during events, the mean duration of events under different Moker classes, and the sequence of large-scale conditions leading to the termination of wind events. Mr. Michaud's results are summarized in the attached paper Michaud_2007.pdf.

(b) During the Summer of 2007, Mr. Michaud, under the guidance of KGYX Science Officer Dan St. Jean, completed the final objective of the study. NARR high-resolution constant pressure analyses were the dominant form of data used, rather than archived RUC model runs as originally proposed. These results are summarized in the attached paper Michaud_Summer2007.pdf.

Section 3: Benefits and Lessons Learned: Operational Partner Perspective

Benefits: The National Weather Service in Gray benefitted from this research by the development of a conceptual model for these wind events. This conceptual model was delivered to the WFO Gray staff during a seminar given by Mr. Michaud during the summer of 2007. This conceptual model increased forecasters' situational awareness of these wind events by showing them the weather regimes in which this phenomenon occurs – thereby aiding the recognition and subsequent prediction of these events.

Lessons Learned: WFO Gray has benefitted from the opportunity to work closely with Dr. Miller and the meteorology students from Plymouth State. Applied meteorological research not only benefits the NWS by helping get at solutions to difficult forecast problems, but also benefits the students by their learning about NWS operational forecasting and the challenges a WFO deals with. WFO Gray's growing relationship with the PSU meteorology department keeps the science fresh for the WFO forecasters, and this research experience has laid the groundwork for additional research interactions between WFO Gray and PSU students and faculty.

Section 4: Benefits and Lessons Learned: University Partner Perspective

Benefits: Our students benefited from the direct relationship with a nearby WFO. Mr. St. Jean's practical, operational insight and access to data resources at the Gray WFO made it possible for Mr. Michaud to complete the basic research into physical causes. Mr. Michaud also benefited from the interactions he had with the rest of the operational staff at Gray. All PSU meteorology undergraduates and graduate students benefited from the relationship, as Mr. St. Jean has become a regular guest speaker in several of our courses. The PSU faculty has benefited from the insight Mr. St. Jean and his associates at the WFO have been able to share on current NWS practices and trends, both at the WFO and regional levels.

Lessons learned: These small projects are incredibly beneficial to our undergraduates for several reasons. They not only provide opportunities to apply concepts that may have previously only been understood by them at an abstract level, but they give the student practice in practical management of large amounts of digital data, from collecting, through processing, presenting, and, ultimately, the derivation of new knowledge. These projects have also been useful as a tool for strengthening the relationship between the Gray WFO and the meteorology faculty at PSU.

Section 5: Publications and Presentations

There are currently four manuscripts under development. These are derived from the results of this research, and related research that took place both before and after this portion of the project. Mr. St. Jean is leading the development of two of them, and Dr. Miller is leading the development of the other two. We expect to have these ready for submission to professional journals in the late Summer or early Fall of 2008.

For now, I attach two student papers covering the results of this year's work. Both were authored by Mr. Michaud.

Section 6: Summary of University/Operational Partner Interactions and Roles

Mr. St. Jean travelled to Plymouth State University several times during the course of the 2006-2007 academic year for face-to-face conferences involving the project participants. There were also frequent telephone and e-mail exchanges to coordinate our work.