

Final Report:
**FORECASTING AND CAUSES OF STRONG NORTHEASTERLY WINDS IN THE WESTERN GULF
OF MAINE**

University: Plymouth State University

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Type of Project (Partners or Cooperative): Partners

Project Title: FORECASTING AND CAUSES OF STRONG NORTHEASTERLY WINDS IN THE
WESTERN GULF OF MAINE

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Section 1: Summary of Project Objectives

(a) Identify the key physical mechanisms giving rise to strong northeasterly winds in the Gulf, associated with the four dominant Moker (2006) classes; (b) improve the accuracy of the mesoscale prediction method originally developed by Giard (2006), and clarify the role of the New England Coastal Front during events occurring with the different Moker classes; (c) determine the prevalence of low-level wind shear (LLWS) at coastal airports during northeast wind events; (d) develop a dynamically-updating webpage that automatically calculates the current values of mesoscale gradients using current weather observations, and alerts the NWS forecasters of the impending onset of a northeast wind event at the three offshore sites; (e) create a separate but related webpage that presents the results of the entire research project.

Section 2: Project Accomplishments and Findings

(a) Key physical mechanisms: Mr. Michaud (Plymouth State) and Mr. St. Jean (NWS Gray) accomplished this goal during the Summer of 2007. Their results are detailed in the attached paper Michaud_Summer2007.pdf.

(b) Improve accuracy of mesoscale prediction method: Mr. Michaud and Dr. Miller (Plymouth State) accomplished this goal during the Fall of 2007 and Spring of 2008. The results are detailed in the attached paper Michaud_Spring2008.pdf.

(c) Determine prevalence of LLWS: Mr. Bedard (Plymouth State) performed this research during the Spring of 2008. His results are detailed in the attached paper Bedard_Spring2008.pdf.

(d) Develop dynamically updating webpage: This goal has not yet been achieved. Mr. Bedard and Dr. Miller will accomplish this over the Summer of 2008.

(e) Post results to webpage: At the moment, most of the relevant documentation (proposals, results, etc.) can be found on-line at http://vortex.plymouth.edu/~stmiller/stmiller_content/Research/KGYX/KGYX.html. This still needs some additional updating; we will accomplish this over the Summer of 2008.

Section 3: Benefits and Lessons Learned: Operational Partner Perspective

Benefits: NWS Gray forecasters now have a working conceptual model of and operational familiarity with the marine wind phenomenon. The results have been presented at staff seminars on several occasions over the past year, with the mechanisms for the phenomenon now well established. The forecasters now have a working understanding of the dynamics and predictability of the marine wind phenomenon. The full benefits of these research results will be available to NWS Gray forecasters when the predictive web page becomes fully functioning.

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 the current research, and related research that took place between 2005 and 2007. 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 this year.

For now, I attach three student papers covering the results of this year's work. Two are by Mr. Michaud, and the third is by Mr. Bedard. I am also including the presentation (.ppt) given by Mr. Michaud at the Northeast Storm Conference in Springfield, Massachusetts, in March of this year.

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

Mr. St. Jean travelled to Plymouth State University twice during the course of the 2007-2008 academic year for face-to-face conferences involving the project participants. There were also frequent telephone and e-mail exchanges to coordinate our work.