Final Report Instructions for Partners and Cooperative Projects

Listed below are the content elements that should be included in your final report. While the report does not need to be lengthy, it should provide a summary of the **entire** project (not just the accomplishments since the last 6-month report). **Both** the academic and the operational forecasting partners should complete the report. It is **particularly important** that the operational partner provide as much information as possible in the Benefits section (section 3) in order to demonstrate the value of the Outreach Program to the NWS and other funding agencies.

Please send the final report in electronic form to the <u>Outreach Program</u> so that we can post it on the COMET Outreach Program's Website. We also appreciate receiving copies of journal publications and student theses that have resulted from the project.

University: University of South Florida

Name of University Researcher Preparing Report: Dr. Jennifer M. Collins

NWS Office: Tampa Bay

Name of NWS Researcher Preparing Report: Daniel Noah

Type of Project (Partners or Cooperative): Partners

Project Title: Meteorological Conditions Surrounding Two Florida Tornadoes and Implications for Future Forecasting

UCAR Award No.: S08-68872

Date: 05/30/08 – 05/31/09

Section 1: Summary of Project Objectives

Objectives as defined in proposal:

Using the knowledge of local experts (operational meteorologist and researchers), our primary objectives are to:

- 1. Create a detailed description of meteorological conditions present at the time of the July 2005 Punta Gorda and June 2006 Port Charlotte tornadoes.
- 2. Identify case studies when similar meteorological conditions were present but yet a tornado did not form.
- 3. Publish a model of meteorological conditions expected when anticipating tornadoes that have narrow destruction paths.

Section 2: Project Accomplishments and Findings

After scouring through available data archives, we found four cases with similar tornado scenarios. In each case under dominant easterly flow, west coast sea breeze interactions created a surface mesoscale low pressure area up to 1.5 hours prior to tornado formation. The mesoscale low likely provides increased updraft and shear. That pattern is very promising as a precursor to tornadogenesis. Instead of focusing on non-events, the researchers felt it more important to delve deeper into the four similar cases and get an indepth view of the mesoscale low development. Limited in-situ data prompted use of the Weather Research and Forecasting model (WRF). We installed the WRF on the USF 150 node computing cluster and have run the model at 1 km resolution with success. In addition to a paper submitted to the Electronic Journal of Operational Meteorology which has been accepted (pending revisions), we are in the process of comparing different WRF model runs and writing a paper for the 26th Conference on International Interactive Information and Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology The 26th IIPS Conference, sponsored by the American Meteorological Society, and organized by the AMS Executive Committee, will be held 17–21 January 2010, as part of the 90th AMS Annual Meeting in Atlanta, Georgia. The WRF model output provides a 3 dimensional view of the weather pattern leading to tornado development.

Section 3: Benefits and Lessons Learned: Operational Partner Perspective

The benefits to the NWS office are immeasurable. So are those to the residents and visitors of southwest Florida who are more likely to receive tornado warnings when this pattern appears. Our warning meteorologists have been trained to identify this pattern, issue statements on the likelihood of a rapid tornado spin-up and then keep a close watch for tornado development and a warning issuance. Unfortunately with El Nino firmly in place and persistent westerly flow the pattern has not appeared thus far this warm season. The collaboration has allowed the NWS to take advantage of USF's facilities as the WRF model is run on USF's Research Computing's linux cluster so that the model run time is faster than what could be achieved at NWS alone.

In addition to the immediate meteorological benefits of the proposed research, collaboration and partnership between NWS and USF has grown. We have more recently had other papers and small grants accepted.

The primary problems were related to data collection for each event. The content of local archives varied considerably. One of the events had minimal data archived beyond standard radar data. Although most of the data could be harvested from the web, The Local Analysis and Prediction (LAPS) analyses found useful in three cases was missing from one of the archives. Also in the older cases, the radar data were lower resolution.

Section 4: Benefits and Lessons Learned: University Partner Perspective

Benefits are broader than initial scope of project. Collaborating on this projet has resulted in NWS and USF discussion on other topics. Such discussion has resulted in

- The development of a grant proposal to COMET partners which will be submitted at the next call entitled, "Warning system considering social characteristics regarding population at risk".
- Collaboration on Florida fog research and a paper accepted in the Papers of the Applied Geography Conferences entitled, "Geographical, Meteorological and Climatological Conditions Surrounding the 2008 Interstate-4 Disaster in Florida" and presentation of NWS GOTO online meeting. In addition to Charlie Paxton who has been key in the current COMET project, Richard J. Davis and Nicholas M. Petro from NWS (Tampa Bay) also contributed to this research.
- Collaboration on a grant awarded by the NOAA PAIG program in summer 2009.
- The COMET grant supported a student to be involved in the research project. Through the training of the student, Alicia Williams, on the current COMET grant in the use of GR2Analyst, she has been able to help other faculty at USF who needed to know cloud heights for their research on weather conditions and cave deposits.
- The student has been able to make contacts at the NWS and has been able to study in the environment (i.e. NWS) where she intends to get future employment.
- The student has been able to attend their first national AMS meeting and present.

Setbacks:

In the 2nd month of the project, we experienced a set-back as some of the data we required was not readily available; however we ordered it and have since been able to analyze it. We have had a few other problems with data availability.

Section 5: Publications and Presentations

Publication (peer-reviewed – status: accepted):

• J. Collins, C. Paxton, A. Williams and D. Noah, 2009: Southwest Florida Warm Season Tornado Development. Submitted to the National Weather Association's Electronic Journal of Operational Meteorology (June, 2009).

Publication (non-peer reviewed – status: published):

• J. Collins, C. H. Paxton, D.G. Noah and A. Williams, 2008: Southwest Florida warm season tornado development. The Symposium on Urban High Impact Weather, American Meteorological Society, January 2009, Phoenix, Arizona.

Presentations:

- J.M. Collins, A. Williams, C. Paxton and D. Noah, 2009, Southwest Florida Warm Season Tornadoes. Association of American Geographers. Las Vegas, NV.
- Collins, J.M., C. H. Paxton, D.G. Noah and A. Williams, 2008: Southwest Florida warm season tornado development. The Symposium on Urban High Impact Weather, American Meteorological Society, January 2009, Phoenix, Arizona.
- C. Paxton, J.M. Collins, A. Williams and D. Noah, 2009, Florida Super Fog -Carnage on Interstate -4. West Central Florida chapter of the American Meteorological Society, Tampa, Fl.
- C. Paxton, A. Williams, J. M Collins, 2009: South-West Florida Tornadoes, NWS GOTO online meeting.

Abstract submitted:

• Abstract entitled WRF modeling southwest Florida tornadoes submitted to 26th Conference on International Interactive Information and Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology (The 2010 Annual Meeting).

Charles. H. Paxton, C. Nicole Carlisle National Weather Service, Tampa Bay Area, Ruskin FL Jennifer M. Collins, Alicia. N. Williams University of South Florida, Tampa, FL

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

Describe the responsibilities of the various project participants over the course of the entire project.

The student was given training by both PIs (and other key NWS employee, Science and Operations Officer Charles Paxton) on the software (GR2 Analyst) to analyze radar data. She was also given instruction on soundings which we would later analyze. The team was involved in all parts of the project. During the early stage, the team identified case studies to investigate warm season tornado development. In the next phase of the project, we experienced a set-back as some of the data we required was not readily available; however we ordered it and have since been able do our analysis on the case studies. During this time we submitted an abstract (and conference paper) for the student to present at the national AMS meeting in Phoenix (Jan 2009). We were all involved with the writing. The team expanded the conference paper into a submission to the Electronic Journal of Operational Meteorology.

Dr. Collins arranged with USF's Research Computing department to configure the WRF model to run on the Linux cluster so that the model run time is faster than what could be achieved at NWS alone. Charles Paxton, Dr. Collins and Alicia Williams worked on this part and have run the model with success. Charles Paxton was largely responsible for writing an abstract for the upcoming (2010) AMS meeting in Atlanta.

The team also considered the non-cases. Again we have had some set-backs since because (as the name implies) these are non-cases where a tornado didn't form but yet there were similar conditions to our case studies, much meteorological data was not archived since it was not a significant event. We are considering alternative ideas including considering future non-cases where we identify the case that day and capture all the information we need on that same day.