ing network together with a number of research aircraft. The ACTIVE aircraft were also deployed during TWP-ICE. Key science questions to be answered with this component of the summer's activities include:

- What is and what controls the chemical composition of the Tropical Tropopause Layer (TTL)?
- How fast are short-lived chemical species (e.g., bromine compounds) transported into and through the TTL, and what is their likely impact on the ozone budget?
- How do tropical cirrus clouds affect the water and radiation budgets?
- How does deep convection transport aerosols and chemical species into the TTL?
- What is the relative importance of deep convection and large-scale advection in determining the composition of the TTL?

CONCLUDING REMARKS. Detailed atmospheric measurements were made in the Darwin area through the whole Austral summer of 2005, giving unprecedented coverage of convective clouds through the premonsoon and monsoon periods. There was clearly great synergy between the pre-TWP-ICE and TWP-ICE activities. Together, these datasets are expected to address the relative roles and impacts of intense continental-type storms and the more widespread but weaker oceanic storms, with TWP-ICE collecting one of the most comprehensive datasets ever on tropical convection. Much of the data is already available to the community through the ARM Web site (www.archive.arm.gov) as an Intensive Observation Period (IOP) dataset, while data from the ACTIVE experiment will be available from the British Atmospheric Data Centre (http://badc.nerc.ac.uk/home/index.html) in early 2008.

More details about the experiment are available at:

- http://www.bom.gov.au/bmrc/wefor/research/twpice.htm
- http://science.arm.gov/twpice
- http://personalpages.manchester.ac.uk/staff/geraint.Vaughan
- http://www.ozone-sec.ch.cam.ac.uk/scout_o3

CHAPTER CHANNEL

Cool-Season Heavy Rainfall Events over West-Central Florida

While most cool-season, nontropical rainfall in the western Florida peninsula is brief and associated with strong cold fronts, occasionally nearly stationary bands of precipitation feature a procession of northeast-moving convective cells that produce heavy rains while moving inland from the Gulf of Mexico. Such events, which are difficult to forecast, were the topic of discussion for the October meeting of the West Central Florida chapter. Research on this topic was done by Anthony Reynes and John McMichael, along with Charles Paxton, who was the presenter.

Paxton, the Science and Operations Officer with the NWS, Tampa Bay Area, explained the criteria used to decide which cases to include in the study: Each had to be a nontropical event, with a recorded rainfall amount of 5 inches or more, occurring between the months of September through May. The years of study were 1948 through 2006. Paxton noted that for the 26 cases studied, the events usually lasted anywhere from 4 to 12 h. He then went on to show specific examples of these rainfall events, and their relationship to El Niño–Southern Oscillation (ENSO).

The 8 May 1979 event was the researcher's most compelling case study, with Tampa International Airport and two other locations receiving more than 11 inches of rain. A similar occurrence on 3 February 2006 was another example of the typical heavy-rain event that fit the criteria of the study. It occurred when a cold front stalled over the area, dumping 8 inches of rain in 5 hours, and just over 13 inches of rain total on coastal county of Pinellas, according to radar estimates. By studying the soundings for this event, it was noted that atmospheric conditions were moderately unstable with low-level veering and increasing winds aloft. Paxton noted by using the base velocity product within GR2Analyst (GRLevel2 Analyst Edition is an advanced Nexrad Level II analysis application) that there

ECHOES

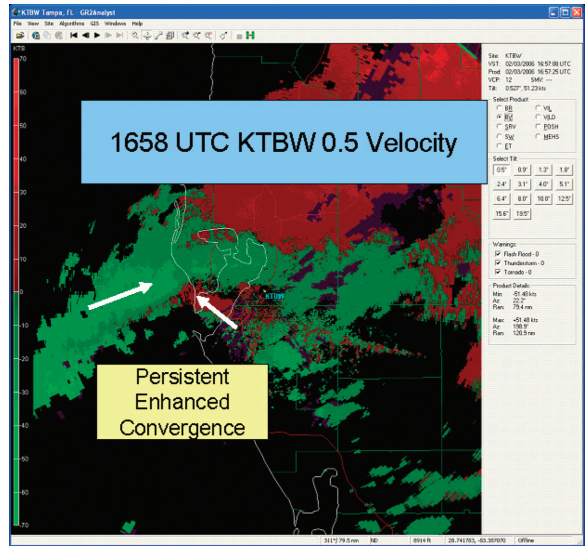
"It was like something on the Discovery Channel about the North Pole."

—Buffalo Bills running back Marshawn Lynch, on his team's December game against the Browns in Cleveland. Snow that began falling soon before the game and wind gusts of up to 40 mph combined to hamper visibility and create treacherous field conditions. The Browns won the game, 8–0. (Source: Associated Press)

was an area of convergence located directly over Pinellas County, which caused a bow in the frontal system (see figure). Paxton hypothesized that it may have been this convergence that helped stall the front in this area, allowing an incredible amount of rain to fall in such a short period of time.

Paxton then discussed how the occurrences of the 26 total rain events and ENSO compare. Most events (15) occurred in neutral ENSO phases; eight cases occurred in the warm ENSO phase and four in the cool ENSO phase. Although there was not a strong statistical connection, there was some indication—four events from 1997–98—of a positive correlation between the rain events and warm-phase ENSO.

Paxton presented composites of the 26 cases as the day of the event approached. The first composite showed surface low pressure intensifying and moving toward Florida. The next composite indicated that winds at 1000 hPa strengthened and veered from southeasterly to southerly for the day of the event. The third composite showed wind vectors at 250 hPa that revealed upper divergence over the Tampa Bay area. The fourth composite, of specific humidity at 700 hPa, showed that an area of higher specific humidity consolidated and gradually increased over central Florida on the day of the event. Another composite viewed the area of divergence aloft and convergence at the surface over central Florida. Paxton also averaged the sounding parameters for the 26 events and stated that the values favored convection.



Convergence directly over Pinellas County, Florida, caused a bow in the frontal system. Base velocity data are from GR2Analyst.

Paxton concluded his presentation by stating the average conditions necessary for such heavy rainfall events. He said they are most likely to occur when there is a "mid- to upper-level trough far west of Florida, a surface low pressure to the west, and an elongated, slow-moving surface trough over Florida." Paxton also cited the Gulf of Mexico as a source of moisture and instability, and that coastal convergence amplified the rainfall by strengthening convection. Although it is still difficult to predict exactly when and where these rainfall events will occur, this research has provided forecasters with a more detailed understanding of the atmospheric conditions prior to such rainfall events, and could be used as a generalized guide in order to predict them. More information on this research can be found at http://ams.confex.com/ams/pdfpapers/118525.pdf.

—Jennifer M. Collins
West Central Florida chapter

BLOATING IN THE TROPICS

The tropics may need to start dieting. A recent study published in *Nature Geoscience* shows that the width of the tropical belt has expanded by 2°–4.8° latitude—or 140–330 miles—since 1979. Researchers used a variety of upper-air measurements—including ozone concentrations, atmospheric temperature, and tropopause height—to define the tropical region. They explained that there are a number of factors that could be causing the tropical bulging, including global warming, stratospheric ozone depletion, and increasing sea surface temperatures. While it is unknown if the trend is temporary, continuing growth of the tropics could impact precipitation throughout the world and "have obvious implications for agriculture and water resources," according to the study.