



By Jay Martineli, Remote Sensing Committee

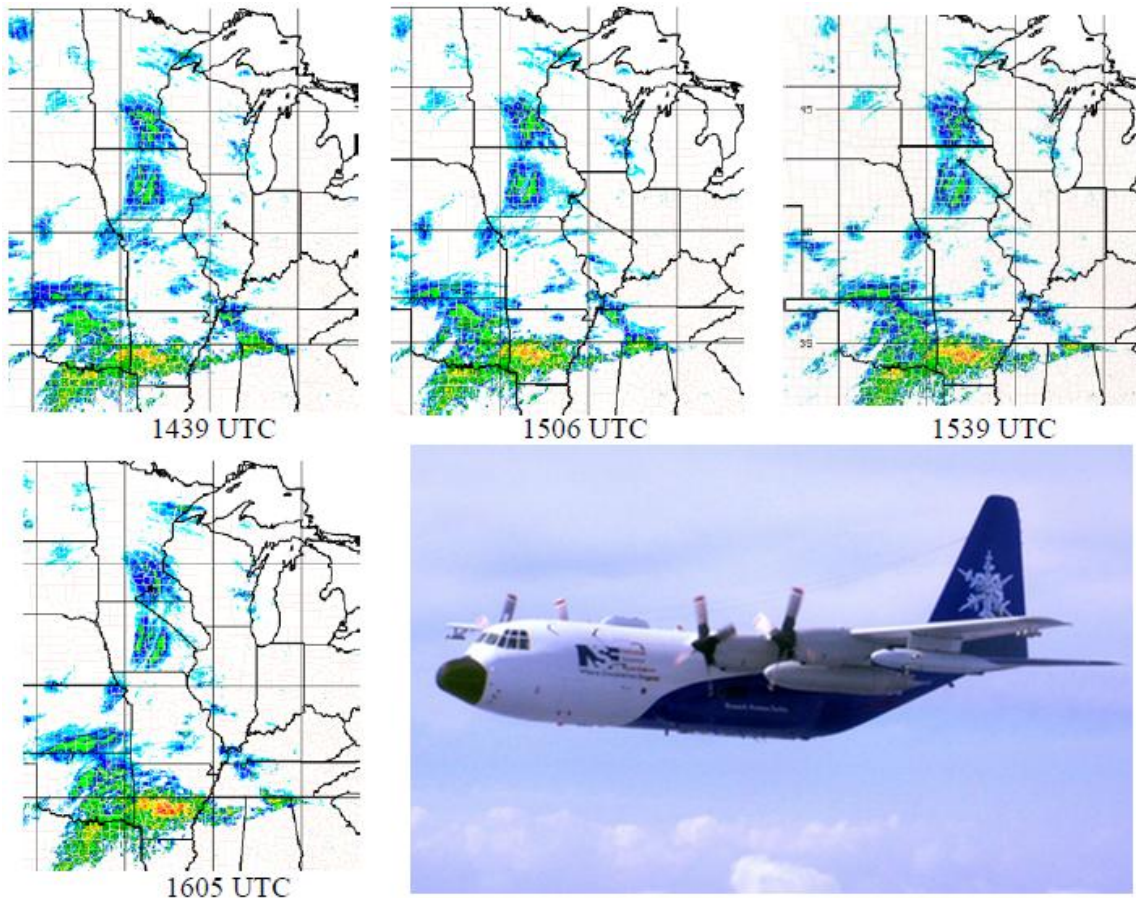
Adverse road conditions associated with winter storms are responsible for a large portion of the nearly 7000 deaths, 600,000 injuries and 1.4 million accidents that occur in the United States per year. Improving cool season quantitative precipitation forecasting depends largely on developing a greater understanding of the mesoscale structure and dynamics of cyclonic weather systems. The Profiling of Winter Storms (PLOWs) project is aimed at doing just that. During the 2008-2009 and 2009-2010 winter seasons, the University of Illinois (UI), the University of Alabama at Huntsville (UAH) and the University of Missouri (UM) placed teams of researchers in the field to study winter cyclones across the Midwestern United States as part of the PLOWs project.

PLOWs was designed to be a comprehensive field campaign, with complementary numerical modeling studies, that will address outstanding scientific questions targeted at improving our understanding of precipitation substructures in the northwest and warm frontal quadrants of continental extratropical cyclones. The field strategy was designed to answer questions about the mesoscale structure of winter storms including:

- What are the predominant spatial patterns of organized precipitation substructures, such as bands and generating cells, in these quadrants and how do they evolve?
- What are the thermodynamic and kinematic structures of these frontal systems including the distribution of moisture and vertical motion?
- What instabilities and types of mesoscale forcing (e.g., moist CSI, moist frontogenesis, gravity waves and elevated upright convection) control the generation and evolution of precipitation substructures?
- How do microphysical processes vary between the different precipitation substructures and what are the consequences?

Mobile field equipment was used for PLOWs. In the air, the National Science Foundation/National Center for Atmospheric Research (NCAR) C-130 Hercules Aircraft carried a suite of instrumentation to measure in flight dew point, radiation fluxes and

basic cloud physics parameters such as water content and cloud drop size distributions as well as dropsondes. Additionally, the University of Wyoming Cloud Radar and Cloud Lidar were used to provide high-resolution cloud-base measurements and cloud extinction coefficients. On the ground the UAH Mobile Integrated Profiling System (MIPS) and Mobile Alabama X Band (MAX) Doppler/Polarization radar were accompanied by the NCAR Mobile Integrated Sounding System and the UM sounding system to produce high resolution ground based measurements. The teams conducted 23 different missions as they roamed the Midwestern United States from Minnesota to Texas and Nebraska to South Carolina. Students from nine universities participated in the study, which was funded by the National Science Foundation. You can learn more about PLOWS by visiting the project website www.atmos.uiuc.edu/plows.



The images above show the C-130 (bottom right) flight track departing Terra Haute, IN overlaid on radar composites during IOP 18 from 1439 UTC through 2605 UTC on 8 February 2010. Times shown are the times of the radar composites. The flight track flown just prior to the time of the composite is shown.

The aircraft's purpose during IOP-18 was to examine the precipitation feature associated with the Alberta Clipper wave moving in from the northwest. As the C-130 moved along its path shown above, it scanned the storm using its onboard cloud-radar. In addition to the cloud radar, the C-130 also dropped sondes along its path.

Data collected during PLOWS will be used in conjunction with high-resolution numerical simulations from the Weather Research and Forecasting model (WRF) in order to determine if modeled precipitation structures are consistent with those observed in the collected data.