Analysis of the 14 July 2015 Nocturnal Convective Initiation Event During the PECAN Field Campaign

Ashley Ravenscraft, UAH Atmospheric Science Department

Overview

• The purpose of the PECAN project is to better understand the initiation and maintenance of nocturnal thunderstorm complexes on the Great Plains
• On 14 July 2015, a boundary moved over western Kansas and southwestern Nebraska
• A nocturnal convective initiation (NCI) event formed on the northern end of the boundary and a mesoscale convective system on the southern end
• This boundary is believed to be a bore driven by cold pool expansion that destabilized the boundary layer initiating convection

Explanation

• The findings of this research can be used to further improve forecasting and support current and future research on nocturnal weather phenomena on the Plains
• The UAH Mobile Integrated Profiling System (MIPS) is equipped with multiple vertically pointing profiling radars. This low-level boundary and associated convection moved over the UAH MIPS site, thereby allowing the MIPS to take detailed measurements of the vertical structure of this boundary
• Surface weather instrumentation indicated the boundary passage resulted in a 1 hPa semi-permanent pressure rise at the MIPS
• Upward vertical velocities greater than 10 m/s, in addition to steeper elevated lapse rates, resulted in thunderstorm initiation behind the boundary
• The pressure rise and thunderstorm initiation behind the leading edge of the boundary is consistent with the behavior of an atmospheric bore destabilizing a stable nocturnal boundary layer

Key Findings

• This NCI event was the result of a west to east moving bore that provided enough uplift for convection
• Rapid cold pool expansion from existing thunderstorms generated the bore that caused destabilization in the boundary layer over McCook, NE

Impacts

• Residents in the Great Plains experience nocturnal thunderstorms frequently throughout the summer
• The majority of summer precipitation in the Great Plains comes from nocturnal convection
• Some of these storms can be severe enough to produce hail and wind damage that pose a threat to life and property
• Better knowledge of NCI is a goal and impact of the PECAN project that will lead to more accurate forecasts that can help keep residents safe

Acknowledgements

I would like to thank Ryan Wade, Dr. Kevin Knupp, and Tony Lyza for their contributions to this poster. I would also like to thank the Office of the Vice President for Research and Economic Development for printing this poster. This research was funded by the National Science Foundation.