Symmetric Convergence in the United States Southern Great Plains: Case Study and Dynamic Analysis using Raman Lidar and Radar Wind Profiler Remote Sensing

Kylie Hoffman[1, 2], **Belay Demoz**[1, 2], **David D. Turner**[3]

[1] *The University of Maryland, Baltimore County, Baltimore, MD, USA, kyliehoffman@umbc.edu*

[2] *NOAA Cooperative Sciences Center in Atmospheric Sciences and Meteorology, Washington, DC, USA*

[3] *National Oceanic and Atmospheric Association, Global Systems Laboratory, Boulder, CO, USA*

An observation-based case study analysis of a boundary layer symmetric convergence event in the Southern Great Plains as measured by active and passive ground-based remote sensors is presented. Previous theories of convergence dynamics have demonstrated how forces such as environmental shear play a role in modifying convection initiation, although their research is confined to a limited regime of environmental conditions. This case study builds on existing theories by introducing a framework for balanced convergence lifting and demonstrates how water vapor transport, Convective Available Potential Energy (CAPE), and vorticity all play a role in the process of convection initiation. Remote sensing observations are used to provide insight into water vapor transport along the cross-frontal and vertical plane, convergence dynamics, and elevated convection while surface meteorological observations provide perspective on the spatial scales and extent to which features are present throughout the domain. Water vapor observed from the Raman lidar profiling system is used as the primary data set in this study to determine the timing and extent of the convergent boundary, although additional observations discussed in the study including those collected from active instruments 915MHz Radar Wind Profiler, CT25k Ceilometer, Radio Acoustic Sounding System (RASS), the passive instrument Atmospheric Emitted Radiance Interferometer (AERI), and in-situ surface meteorological stations and meteorological towers. Findings show that during the symmetric convergence event, planetary boundary layer and low tropospheric moisture and temperature observations were a primary factor in explaining CAPE associated with elevated convection hours before the passage/arrival of a surface-based convergence boundary or front. The symmetric convergence case study presents a unique event to the literature and extends the conversation surrounding convergence structure occurring on the southern-most tail end of the frontal structure.