An Overview of the 20 June 2015 Convective Initiation Event during PECAN

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INTRODUCTION:

The poorly understood catalysts for convective initiation (CI) motivate questions surrounding the timing, location and physical processes of CI, particularly during the Afternoon-Evening Transition (AET). During the Plains Elevated Convection at Night (PECAN) field campaign, a CI mission was conducted near Hays, KS on 20 June 2015. All UAH-based mobile assets were deployed for this mission and data from those instruments will be considered most heavily. The present hypothesis of this study is that a closer investigation of the finer scale features found during the AET of the boundary layer may shed light on the evolution of microscale mechanisms initiating convection, such as a reduction in turbulence and turbulent momentum fluxes, and a subsequent increase in boundary layer convergence.

SYNOPSIS:

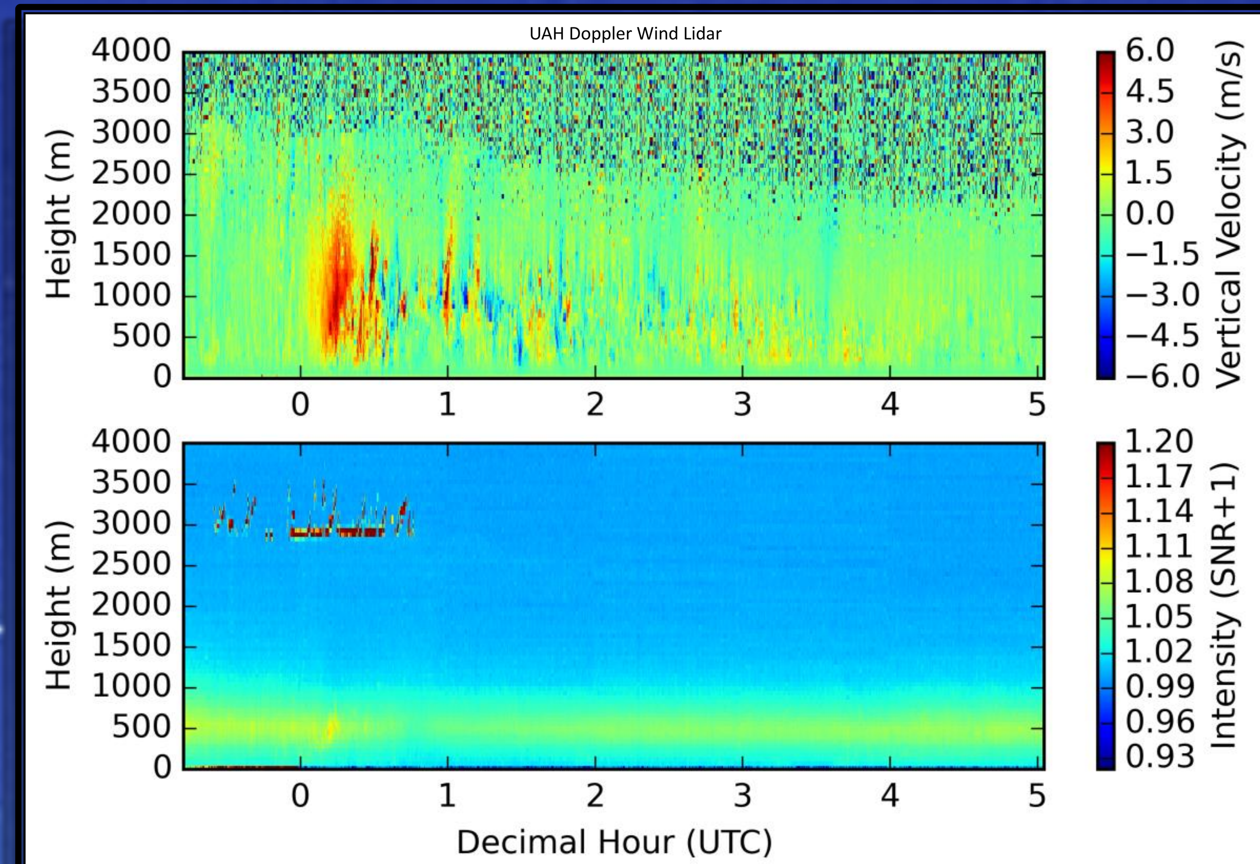
- A weak, SW- to NE-oriented cold front entered the domain, progressing to the SE at approximately 3.5 m/s
- Presence of HCRs and other linear features
- Surface winds were primarily out of the SE ahead of the front and between 5 and 8 m/s, turning to ENE behind the front with little change in speed. Upper lever winds were west- southwesterly.
- Wind profiles and soundings indicate strong veering in the lowest 500 m AGL
- Lidar measurements illustrate a characteristically turbulent BL, with BL height at approximately 3.2 km and descending to 2 km by the end of the mission
- Deep convective clouds rapidly developed along the cold front during the AET as the cold front passed over the MIPS
- Surface-based initiation of a high-based, single-cell storm was observed along the front as it collided with another boundary at approximately 2317 UTC
- Formation of misovortices upon collision of the boundaries
- MIPS DWL measured an 8 m/s updraft for ~15 minutes shortly after 0000 UTC. BL remained uncharacteristically turbulent long after CI and frontal passage

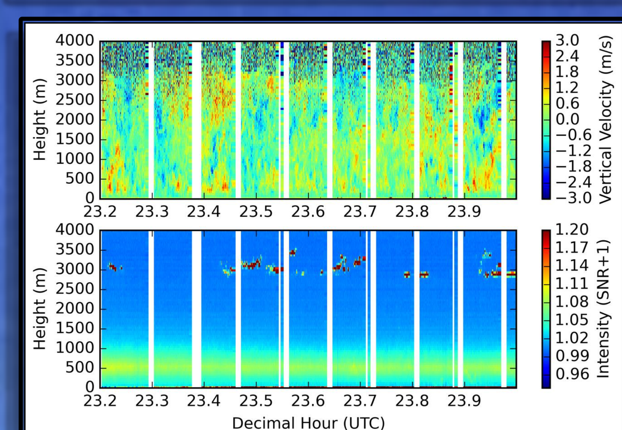
PROPOSED METHODS:

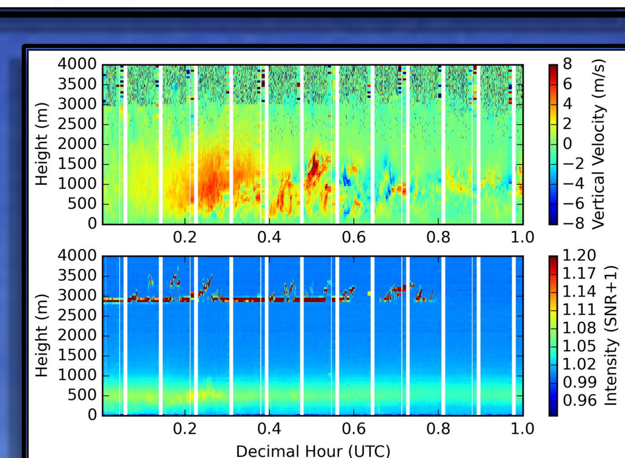
- Conduct single- to triple-Doppler radar analysis
  - → Edit individual files from S-Pol, DOW7 and DOW8
  - → create 2-D and 3-D flow fields
  - → Generate horizontal and vertical convergent/divergent fields
- Document the evolution of the cold front and identify/characterize the other boundaries and linear features that were present
- Identify the key triggers and the most influential physical and thermodynamic parameters for convective initiation with this event
- Determine the role of misovortices and horizontal convective rolls as a lifting mechanism and enhancement to low-level convergence along the boundaries
- Run a high-resolution model analysis and pick out environmental parameters from various grid points to conclude why convective initiation was favored in the location it occurred and at that particular time
  - → maximum vertical motion → CAPE → CIN → convergence
  - → height of max. vert. motion → subcloud wind shear
  - → depth to LFC → active cloud-bearing layer lapse rate

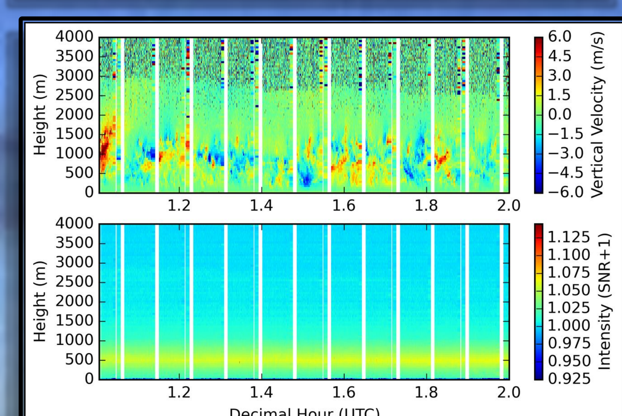
LOCATIONS

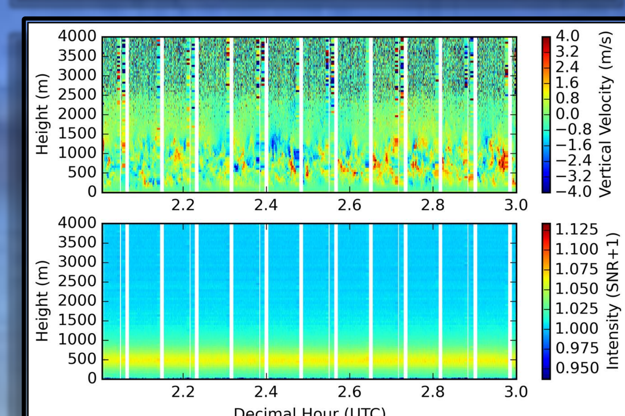
LIDAR

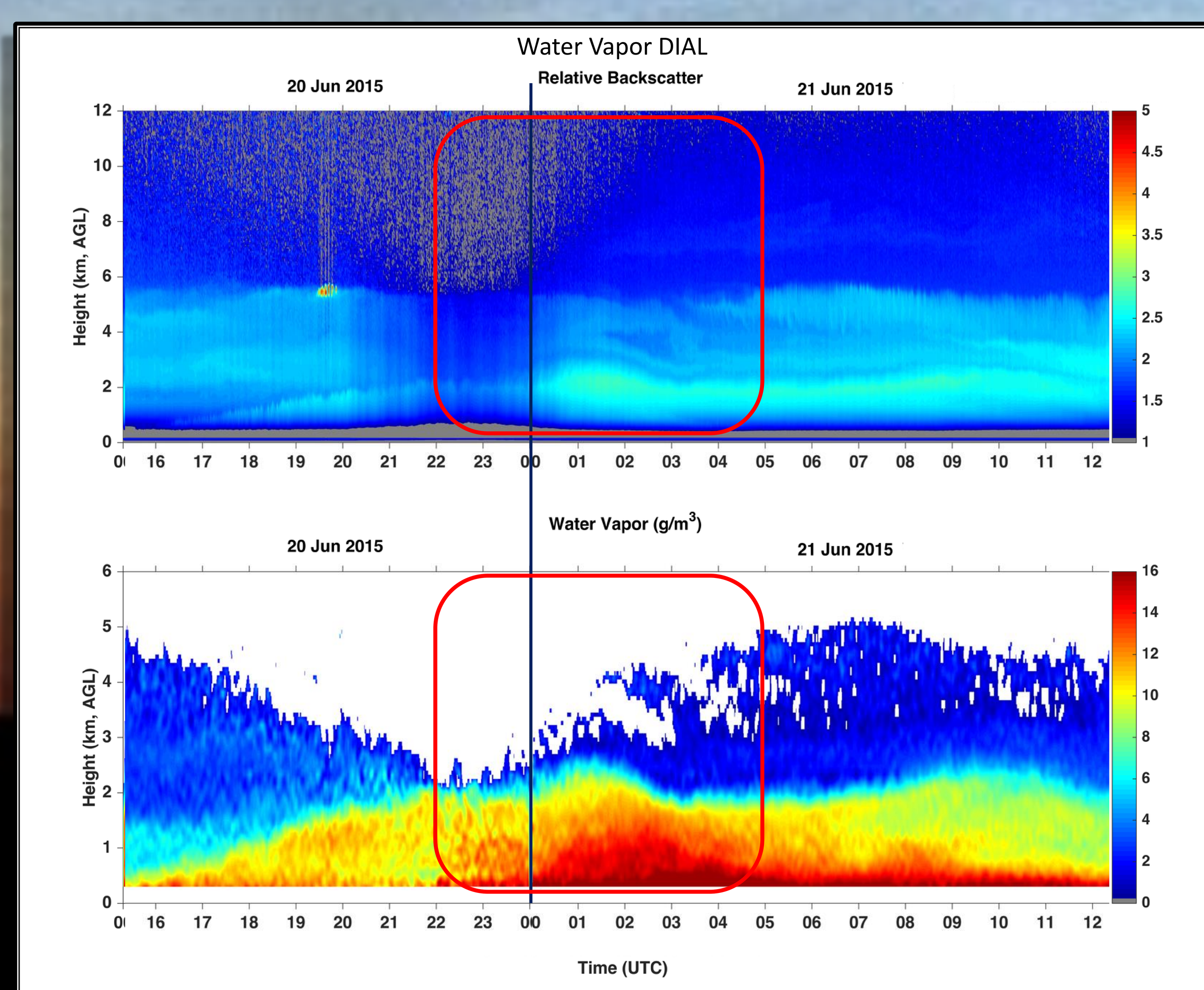








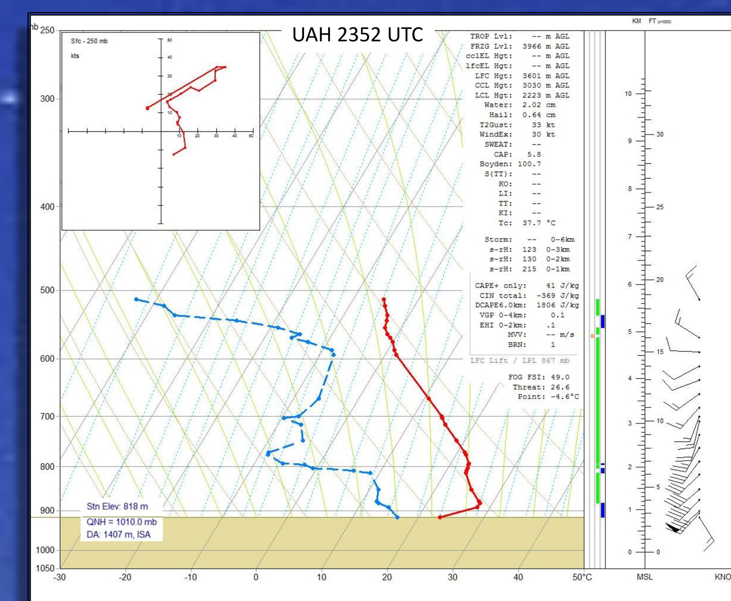


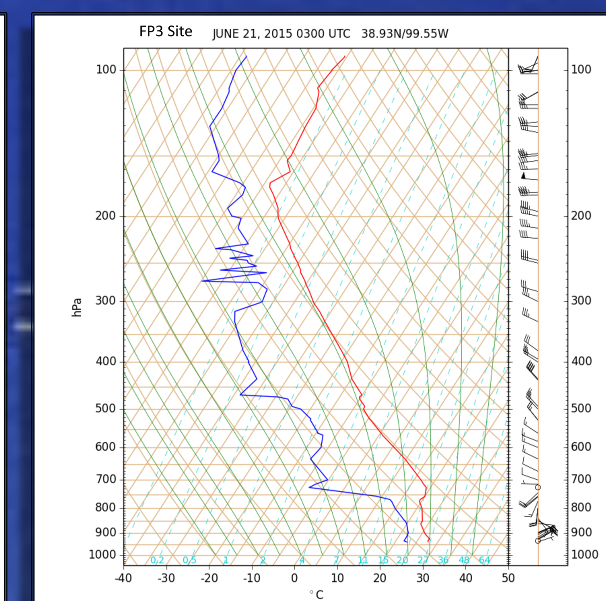


INSTRUMENTS

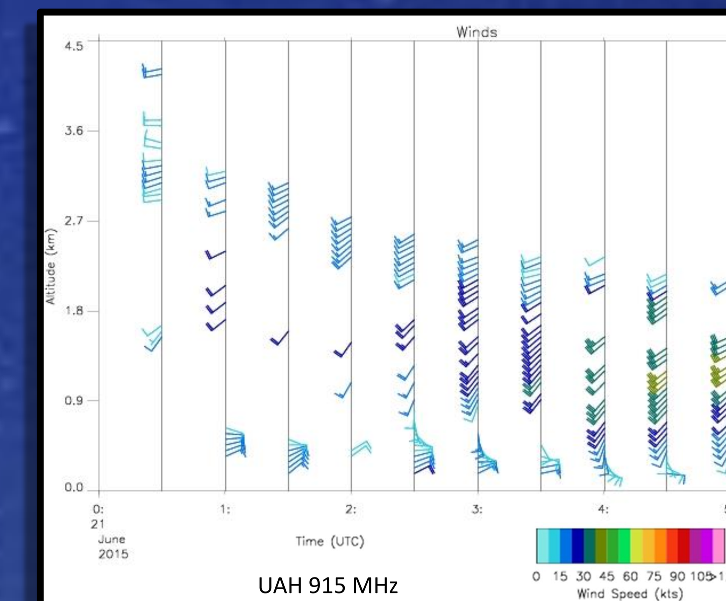
FP3	FP3 (cont.)	OU RaXPol	UAH MAX	UAH MIPS	UAH M3V	UAH MoDLS	SPARC	CSWR DOWs	CSWR Mobile Mesonets	NCAR S-PolKa
449 MHz Profiler	AERI	X-band Radar	X-band Radar	SurfaceMet	SurfaceMet	SurfaceMet	AERI	DOW7	Scout 1	S-band Radar
DIAL	MWRP		SurfaceMet	Ceilometer		DWL	SurfaceMet	DOW8	Scout 2	Ka-Band Radar
MPWR	Sodar			915 MHz Profiler		Radiosondes	HSRL	SurfaceMet	SurfaceMet	
Tether&Radiosonde	SurfaceMet			XPR			Radiosondes			
MPL	Surface Flux			MPR						

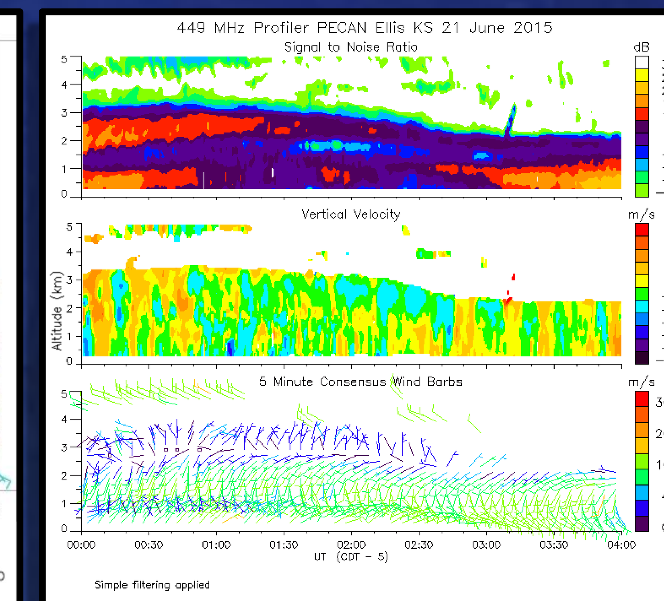
SOUNDINGS





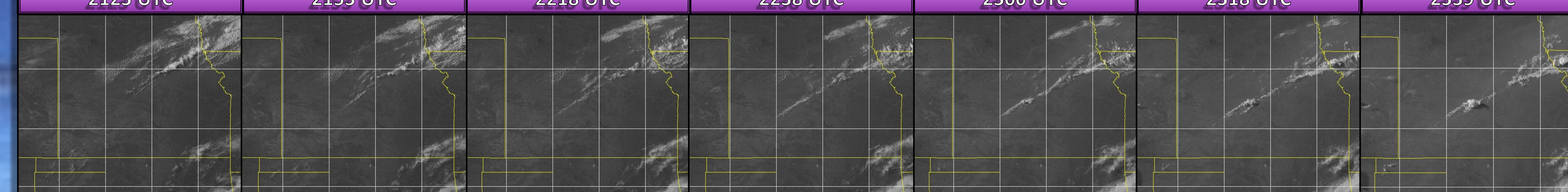
WIND PROFILER



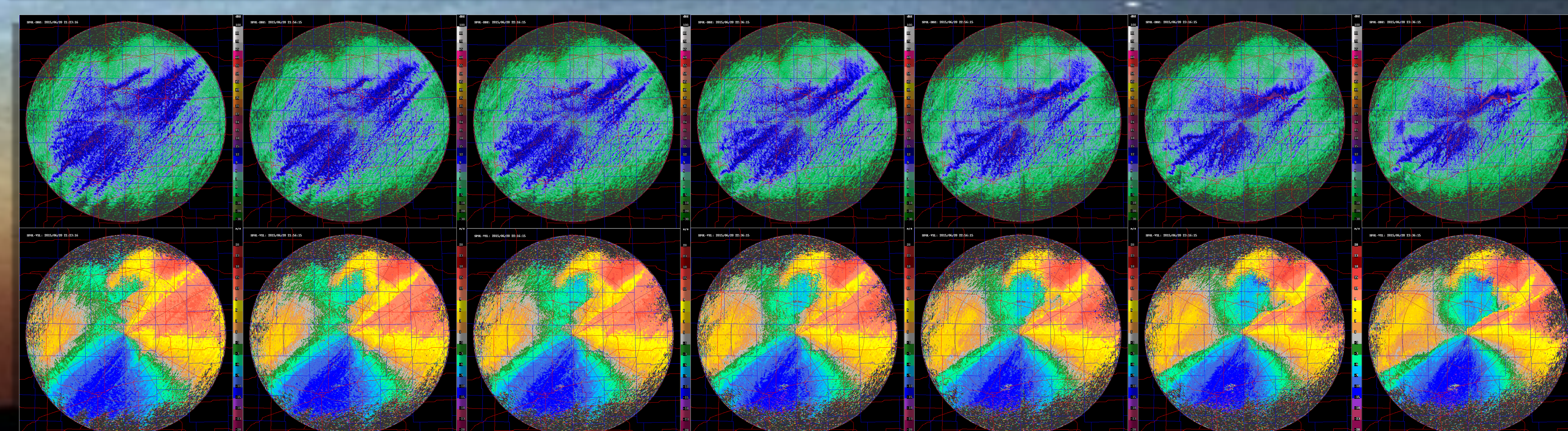


SATELLITE

2123 UTC | 2153 UTC | 2218 UTC | 2238 UTC | 2300 UTC | 2318 UTC | 2339 UTC



RADAR



ACKNOWLEDGEMENTS:

This research is funded by National Science Foundation Grant No. 1359771, The Origin and Evolution of Waves and Bores within the Great Plains Nocturnal Boundary Layer and their Interaction with Mesoscale Convective Systems. BML acknowledges and gives thanks for the ongoing support of Dr. Kevin Knupp and Ryan Wade through this process.