Kansas Nocturnal Boundary Layer and Minimum Temperatures

• What is the Boundary Layer

• Atmospheric Boundary Layer Experiment (ABLE)

• Goal of study

• Method
Boundary Layer

• Definition: part of the troposphere that is directly influenced by the surface and responds to surface forcings within an hour or less

• Small scale not captured by data network

• Parameterized in models
ABLE

- Mini Sodar
- Radar Acoustic Sounding System (RASS)
- Eddy Correlation
- Energy Balance Bowen Ratio (EBBR) station
- Radiosonde system
- Automatic Weather Station (AWS)
- Radiometry/Vegetation site
Instrumentation

• Sodar: Uses sound waves emitted on 3 different axes to compute wind direction and speed.

• RASS: Uses a combination of radar and sound emissions to calculate temperature, and wind direction and speed.
Goal

• Create a dataset focussing on nocturnal boundary layers during minimum temperatures

• Identify any topographic influences
Near-surface Profile

Potential Temperature Profile 991005

<table>
<thead>
<tr>
<th>Height (m)</th>
<th>Potential Temperature Profile</th>
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<tbody>
<tr>
<td>400</td>
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<tr>
<td>450</td>
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Potential Temperature (K)

- 279
- 279.5
- 280
- 280.5
- 281
- 281.5
- 282
Radiosonde Profile
Joint Urban 2003

- Defense Threat Reduction Agency
- Department of Defense
- Department of Homeland Security
- Chemical & Biological National Security Program
Objective

• Gather meteorological and tracer data for circulations ranging in scale from several km, encompassing suburban areas, to single city block.

• Look at outdoor to indoor penetration and dispersion.
Global Change

• Social states
• Urban modifications of the boundary layer
• Pollution studies
Why Oklahoma City?

- Climatological south winds
- Relatively calm
- Inactive weather
- Oklahoma Mesonet
- Proximity to Storm Prediction Center and local radars
Instrumentation

- 215 tracer bag samplers
- 25 fast response tracer analyzers
- 1 5-level tracer profiling system
- 22 surface meteorology stations
- 164 sonic anemometers
- 6 surface energy budget stations
- CTIWind Tracer lidars
- 2 Radiosonde systems
- 2 tethersonde systems
- 4 RASS profilers
- 1 FM-CW radar
- 3 cielometer
- 9 sodar
- 1 remote sensing instrumented helicopter
3-D Sonic Anemometer

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www.campbellsci.com
Intensive Operating Periods (IOP)

• SF6 releases
• Radiosonde balloon launches
• Instrumented Helicopter
• Park Canyon Ralley
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