Communities near the Great Lakes are frequently inundated with substantial lake-effect snowfalls each winter, which can cripple aviation, ground transportation, industry, and result in injuries, deaths, and significant damage to property (Kistinovich et al. 2000). The Ontario Winter Lake-effect Systems (OWLeS) Project collected a comprehensive dataset on several lake-effect systems during the winter of 2013/14. This work is the foundation of an analysis which will examine the evolution of vertical air motions and the vertical structure of long lake-axis-parallel (LLAP) bands as they move over Lake Ontario and the adjacent topography east of the lake. Previous research by Minder et al. (2015) suggests that as lake-effect convection moves inland, it weakens and transitions to a stratiform morphology, becoming less intense, shallower in depth, more spatially uniform, and less turbulent. Moreover, their findings contradicted their initial hypothesis that the inland intensification of lake-effect snowfall is caused by orographic invigoration of convection.

**Wyoming Cloud Radar Data**

Generating Cells and Surface-based Convection: **Leg 2**

![Generating Cells](image)

**Lake-to-land Transition: **Leg 4

![Lake-to-land Transition](image)

Gravity Waves and Elevated Convection: **Leg 12**

![Gravity Waves](image)

**Generating Cell Analysis**

<table>
<thead>
<tr>
<th>Cell</th>
<th>GCS Presence</th>
<th>Horizontal Extent</th>
<th>Vertical Extent</th>
<th>Updated Speed</th>
<th>Day/ Night</th>
<th>Synoptic Conditions</th>
<th>Archetype of Convection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td>250-1000 m</td>
<td>~0.2 m/s</td>
<td>Day</td>
<td>Pre-frontal</td>
<td>Large mesoscale band</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>~0.5 m/s</td>
<td></td>
<td>Pre-frontal</td>
<td>Large mesoscale band</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Yes</td>
<td>0-1000 m</td>
<td>~0.5 m/s</td>
<td>Night</td>
<td>Pre-frontal</td>
<td>Large mesoscale band</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>No</td>
<td>0-1000 m</td>
<td>~0.5 m/s</td>
<td>Night</td>
<td>Post-frontal</td>
<td>Large mesoscale band</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>No</td>
<td>--</td>
<td>--</td>
<td>Day</td>
<td>Post-frontal</td>
<td>Multiple mesoscale bands</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Yes</td>
<td>0-1000 m</td>
<td>~0.5 m/s</td>
<td>Day</td>
<td>Post-frontal</td>
<td>Small mesoscale band</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Selected physical characteristics of generating cells seen in LLAP bands.

**Conclusions**

- Several different archetypes of vertical motion are present in LLAP bands, including generating cells, deep and shallow surface-based convection, elevated convection, and possible gravity waves.
- GCSs are ubiquitous atop the LLAP bands and occur equally during the day and night.
- The horizontal extent of GCSs is 100-1000 m and their vertical extent is ~250-1500 m, while the updraft speed within them is 0.5-2 m s⁻¹. These characteristics are similar to those observed by other studies (e.g., Rosnow et al. 2014; Kumjian et al. 2014).

**Future Work**

- Construct contoured frequency by altitude diagrams (CFADs) to examine the distributions of vertical radial velocity and reflectivity within LLAP bands and to associate the measured vertical radial velocities to vertical air motions within the bands.
- Analyze the thermodynamic characteristics of GCS environments.
- Create a conceptual model of LLAP bands based upon CFAD analysis.

**Acknowledgements**

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