Several Convective Events in Guilin China between 2013 and 2014

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Introduction

Affected by the cold and warm air, several convective events occurred in Guilin between 2013 and 2014. A tornado generated at 2300 UTC on 16 Apr. 2013 in Chaoyang village, Guilin, along with the downburst and gale. The hour rainfall of Chaoyang station reached 52mm and the temperature dropped by 1.5°C. The flash floods also occurred in Longhu village and Yongfu village. The 3 hours rainfall of Longhu reached 293 mm at 15-17UTC on 15 May 2013. The hourly rainfall of Yongfu reached 95 mm for 1800-1900 UTC on 21 May 2014. A downburst occurred in Yangshuo county at 1825 UTC on 30 Mar. 2014. In only six minutes the strong reflectivity core descended down from 9km to 3km lower level. Serious hail storms occurred in 7 counties in Guilin in the night on 23 Mar 2014. The hail storms were associated with the bow echo. The VIL reached 60 kg·m⁻². Base on the radar data of the Guilin and Liuzhou radar, some characteristics of the convective events of Guilin, such as tornado, flash flood, downburst and hail between 2013 and 2014 were analyzed comparatively, to improve the accuracy of nowcasting.

The Tornado

A tornado occurred on 16 Apr. 2013 in Chaoyang village, Guilin China.

Hail Storm

In the night of March 23, 2013, Ziyuan, Quanzhou, Lingchuan, Yongfu, Gongcheng, Yangshuo counties and Guilin Qixing District suffered the hail.

Flash Flood

Flash flood on Longhu village on 15 May 2013

Downburst

The downburst occurred about at 18:35 UTC on 30 Mar 2014 on Yangshuo.

Summary

The analysis shows that the inflow and outflow of the tornado cyclone is not balanced. The maximum radial wind shear reached 35m/s. At the initial primary stage of tornado, the section of reflectivity displayed hook structure. The velocity section displayed convergence at the 3 kilometers lower layer and divergence at 6 kilometers higher layer. The divergence area tilted upward the convergence area. The strong reflectivity centroid descended downdraft sharply, along with downburst. The flash floods super cells often generated in the warm zone jet in stratiform cloud. The radial velocity showed adverse area characteristic. The magnitude of VIL and reflectivity of floods obviously were not more than that of the downburst. The strong reflectivity centroid converged rapidly characteristic. Serious hail storms often associated with the bow echo, mesocyclone, and significant positive-negative velocity opposite pair. When the CAPE on Guilin was only 367 J·kg⁻¹, the K index was only 26K, to forecast a tornado would generate in 11 hours is a difficult work. To estimate the accurate rainfall of the heavy precipitation super cell is also a challenge.

Contrast analysis of the characteristics of convective cells

<table>
<thead>
<tr>
<th>Cell type</th>
<th>cyclone scale (km)</th>
<th>cell character</th>
<th>radial velocity shear (m·s⁻¹)</th>
<th>echo top (km)</th>
<th>echo top height (dBZ)</th>
<th>echo chord length (km)</th>
<th>echo chord (km)</th>
<th>VIL (kg·m⁻²)</th>
<th>CHF (mm)</th>
<th>Characteristic</th>
<th>Accumulated weather</th>
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<tbody>
<tr>
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<td>single cell</td>
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<td>45</td>
<td>10</td>
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<td>hook echo</td>
<td>downburst</td>
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<tr>
<td>Flash flood</td>
<td>15</td>
<td>multi cells</td>
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<td>60</td>
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<tr>
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<td>hook echo</td>
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