Cool-season intermittent precipitation cells in the Pacific Northwest

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I. Introduction and Location

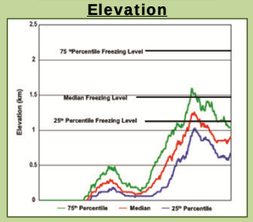
Purpose

To examine the spatial patterns and life-cycle statistics for tracks of convective cells observed by the operational WSR-88D radar at Portland, Oregon during cool-season storms.

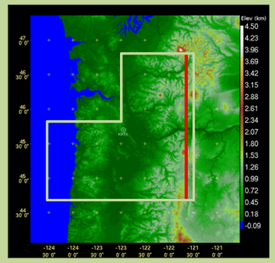
Study Domain

- Focusing on the southern and northeastern quadrants of the Portland, Oregon radar domain minimizes beam blocking issues.

Median North/South Elevation

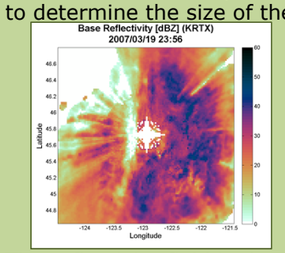


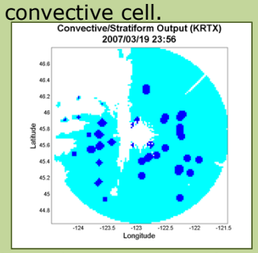
Area of Interest



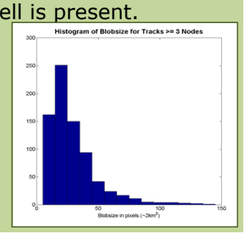
Convective/Stratiform Identification

- Convective cells are identified inside of larger scale stratiform precipitation by identifying local peaks in radar reflectivity within 11km diameter subregions
- The area around the peak reflectivity is also examined to determine the size of the convective cell.



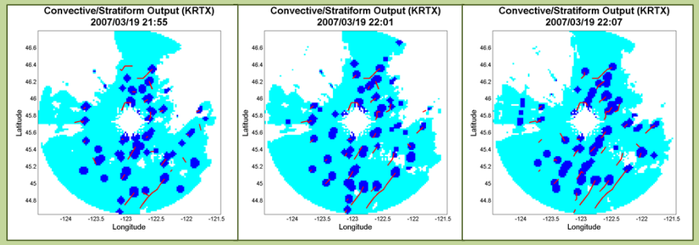


- The reflectivity field is thereby reduced to a 3 value field shown above, right. The image shows white where reflectivities are very low or non-existent, light blue where stratiform precipitation is present, and dark blue where an embedded convective cell is present.
- The size and position of these convective "blobs" are recorded for each time step.
- The distribution of blob sizes shows that the majority of tracked blobs are less than 50 pixels in size (<100 km^2).

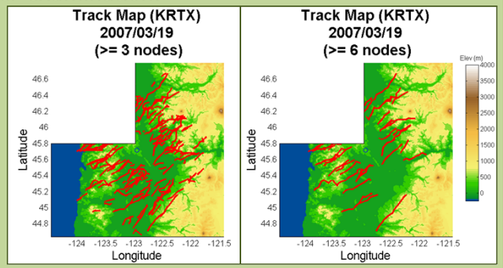


II. Cell Tracking Methodology

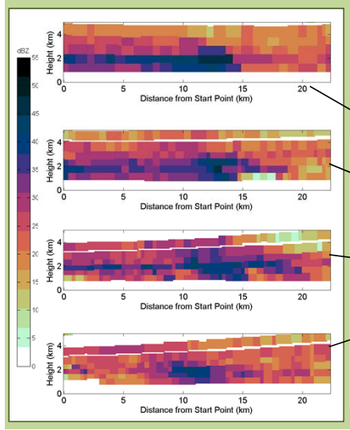
- Using the recorded blob size and center, tracks are made by linking the nodes together sequentially in time.
- Filtering criteria for tracks include distance between nodes, minimum size of blobs, and location.
- Blobs are allowed to split off and form new tracks or merge into existing tracks.
- The result is a track of convective cells that follows the feature through its lifecycle.



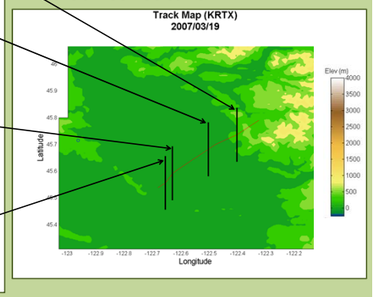
- Once all tracks have been identified, the longest tracks are isolated for further examination.
- For the 12 hour period of the storm on 19 Mar 2007, 195 paths were found that had at least 3 nodes compared with 40 tracks with at least 6 nodes.



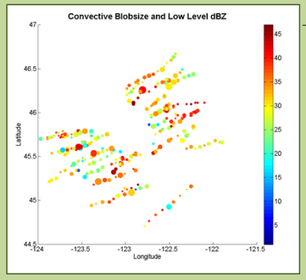
- These 40 longest tracks were used in this initial investigation for computing track data in section III.



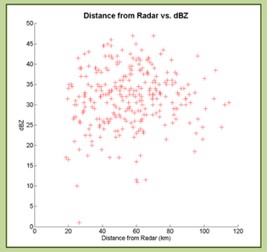
- 0.2° latitude reflectivity cross sections of track nodes confirm that the tracking methodology is following a distinct feature.



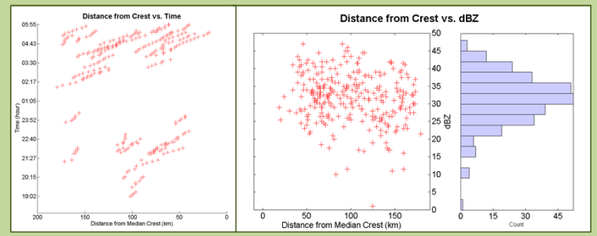
III. Results



- Visualization of the data by convective blobsize and low level (0.5 degree) reflectivity shows a wide variation of feature size and intensity.



- No significant range effects are present in the convective cell reflectivity as a function of radial distance from the radar.



- The median crest longitude of the Cascade Range (121.66° W) is used as the reference point.
- Convective cells are referenced by their distance to the crest in the figures above.

Conclusions

- While further cases must be compiled, for this case the convective cells showed little enhancement in reflectivity as they traveled upslope suggesting that embedded convection life cycles may not be closely tied to underlying orography.
- The longest tracks for this case, occurred toward the beginning and end of the storm, but not during the middle.
- Examples such as these will aid in isolating conditions conducive to the formation of embedded convective cells and in quantifying their life cycles.

Acknowledgments

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