Horizonatlly Oriented Weak Echo Regions

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Overview

- Introduction
- Methodology
- Examples
- Results
- Conclusions
- Future Work

Introduction

- Hypothesis
  - Hallam, NE May 22, 2004
  - Notion of entrainment/WER role in hail development
- Literature review
  - Many papers on hail development
  - Lack of prior work on role of these WER's

Introduction

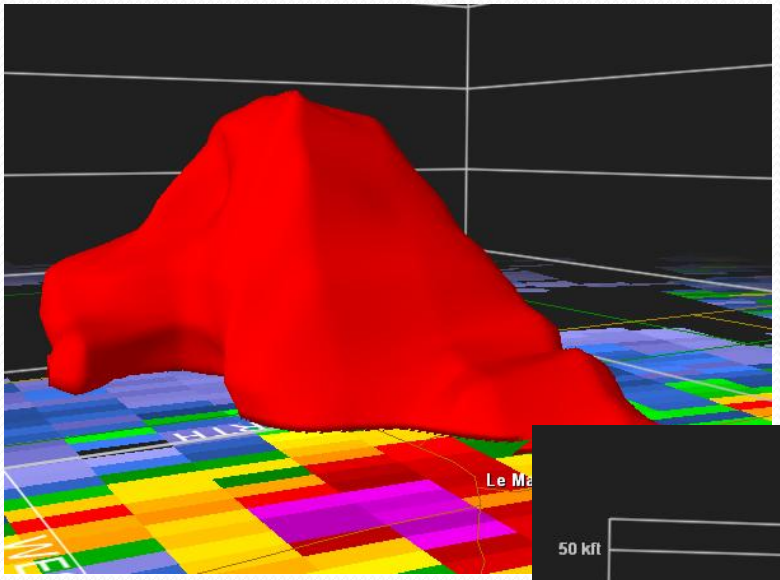
- Literature Review
  - WER's are regions deficient in collectors, and therefore regions where more hailstones would grow if appropriate embryos were supplied … WER 's provide an environment in which hail can grow rapidly. - Charles A. Knight and Nancy C. Knight ; Severe Convective Storms , Chapter 6.
  - The freezing level will lower if there is dry air in the mid-levels of the atmosphere. This occurs due to evaporative cooling of environmental air that entrains into a thunderstorm. Jeff Haby – The Weather Prediction
  - Most postembryonic growth in a narrow height range, -11° to -19 ° C. Grenier et al (1983)
  - There are results showing a net flow of ice nuclei toward an evaporating droplet. Young (1974)
  - Evaporating droplets are cooler than the surrounding environment and have a better chance of freezing. Blyth (1992)
  - Enhanced supersaturations in regions containing fewer cloud droplets as a result of entrainment Blythe (1992)

Methodology

- GR2Analyst
- Midwest Supercells
- Reflectivity Isosurfaces
  - 50 dBz
- Definition of WER
  - Measure of concavity scale
- Case Development
  - Large hail cases with/without WER's
  - Small hail cases with/without WER's
  - 15 nmi to 80 nmi from radar
- Table

WER Scale

1



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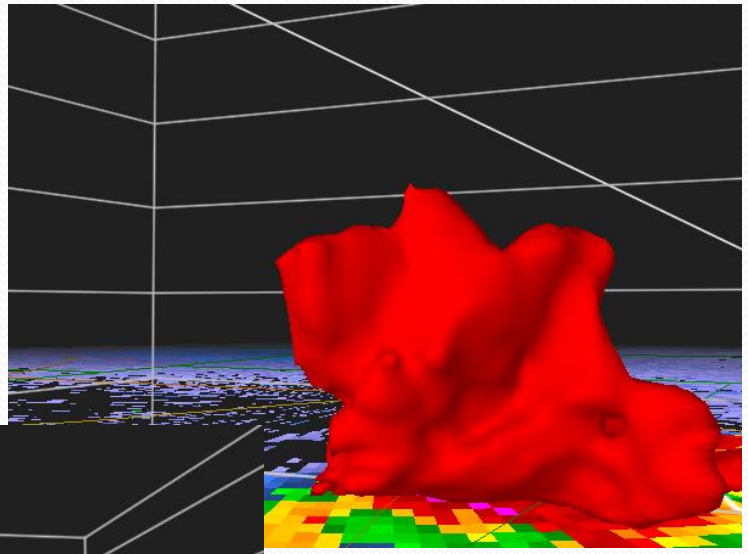

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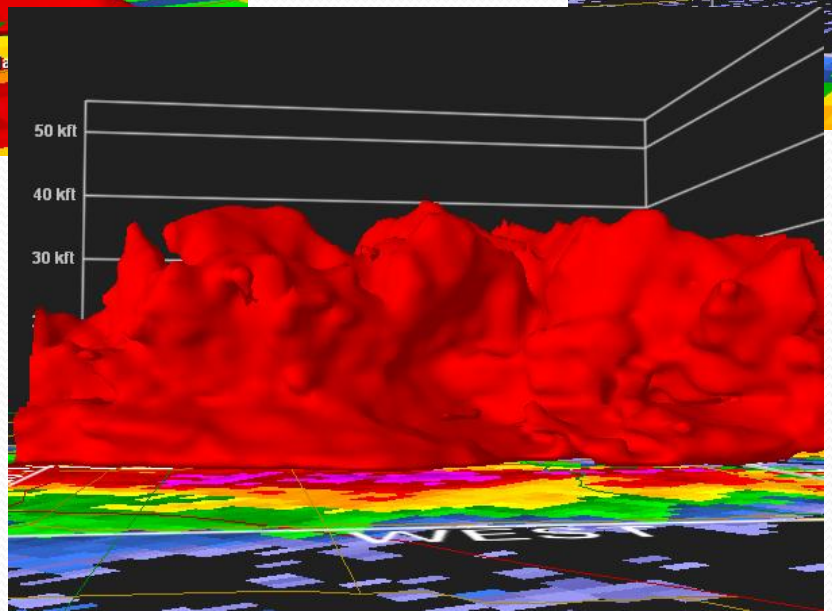


Case Listing Table

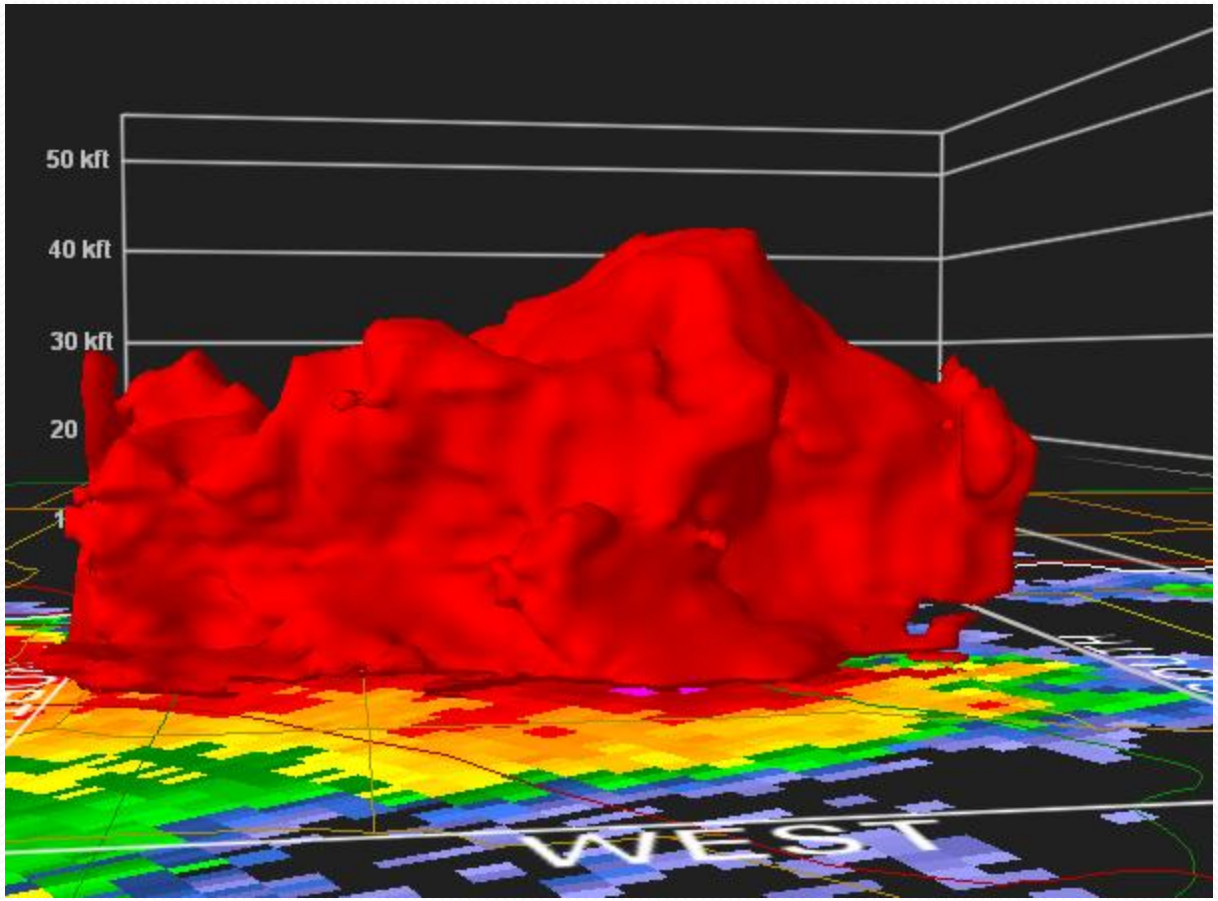
Location	Date	WER (1-3	Hail Siz	Tornado
Sarpy County, NE	5/4/2003	3	4.50 in	Yes - Small
Aurora, NE	6/22/2003	2	4.50 in	Yes - Small
Turner County, SD	5/1/2008	3	4.25 in	UNK
Ozark County, MO	2/5/2008	2	4.25 in	No
Parkersburg, IA	5/25/2008	3	4.25 in	Yes -Large
Hallam, NE	5/22/2004	3	3.00 in	Yes -Large
Guthrie Center, IA	5/22/2004	3	3.00 in	UNK
Livingston County, MO	4/19/2006	3	3.00 in	Yes - Small
Deshler, NE	5/24/2004	3	3.00 in	UNK
Washington County, NE	5/22/2004	3	3.00 in	No
Greensburg, KS	5/4/2007	3	2.00 in	Yes -Large
Menno, SD	5/25/2007	3	1.75 in	UNK
York, NE	5/29/2008	1	1.00 in	No
Saunders County, NE	6/4/2007	2	0.88	UNK
Serward, NE	9/18/2007	1	0.75 in	No
Serward, NE	6/22/2007	2	0.75 in	No

Examples

- Sarpy County, NE - May 4, 2003
- Turner County, SD - May 5, 2007
- Seward, NE - September 18, 2007

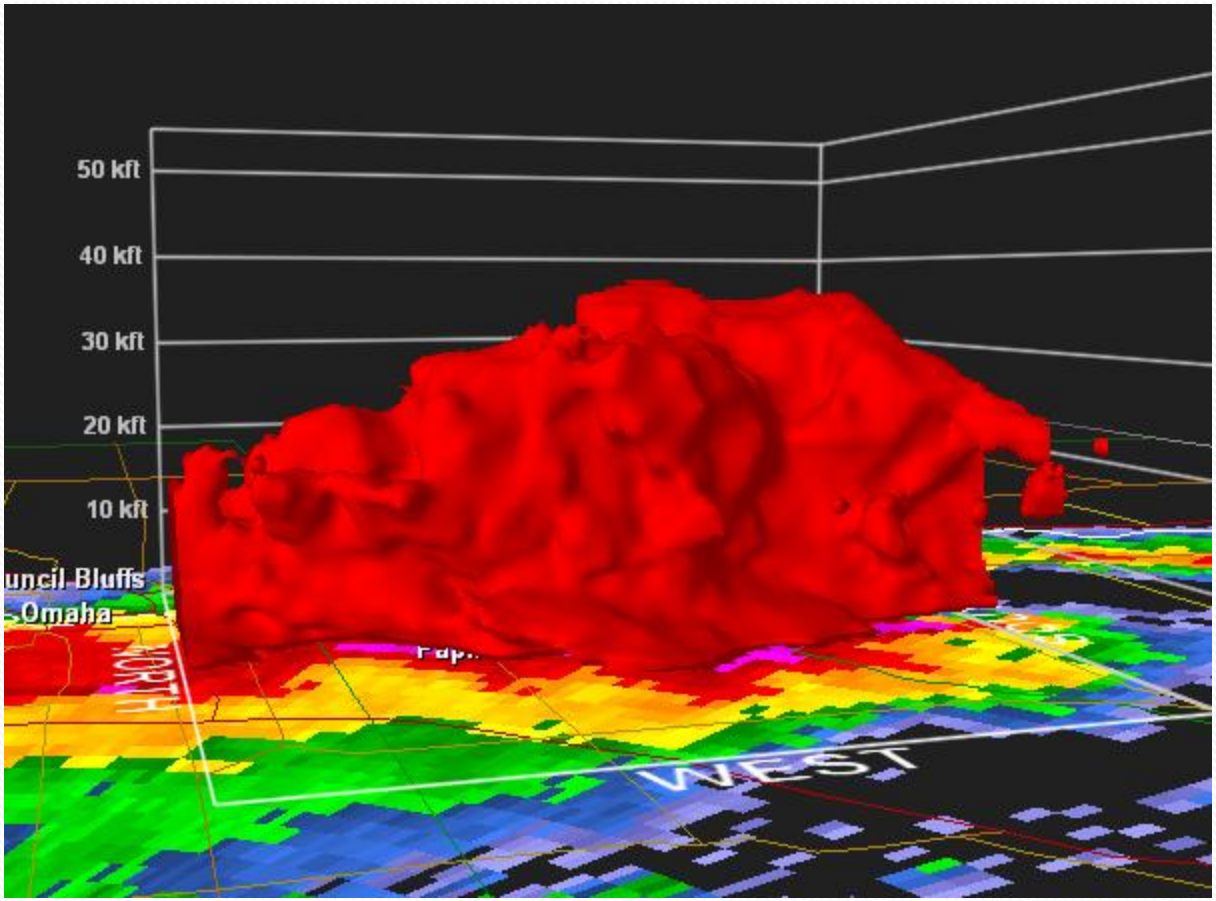
Sarpy County, NE 5/4/2003

Sarpy County, NE 5/4/2003 2112 Z



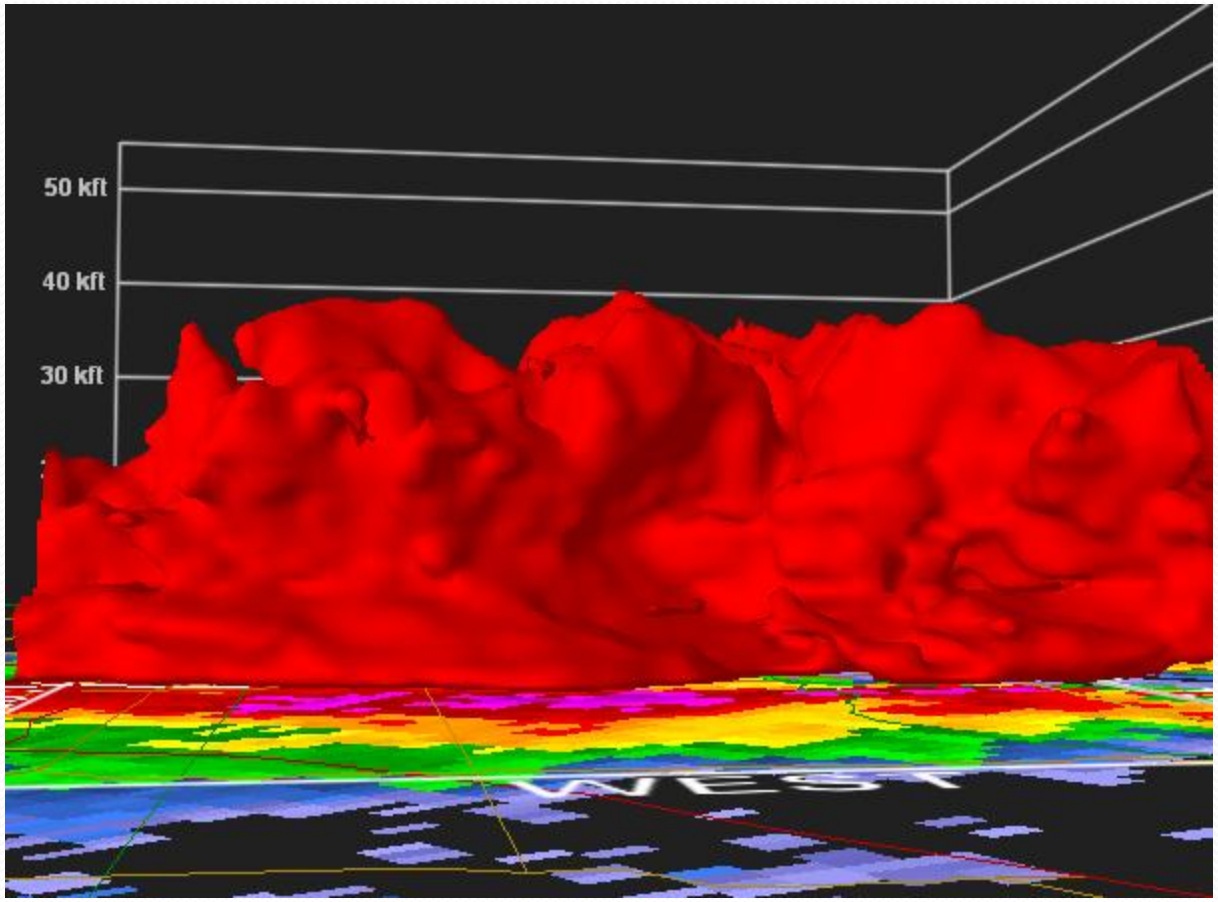
4.50 in hail reported 2124 Z
Produced small tornado

Sarpy County, NE 5/4/2003 2117 Z



4.50 in hail reported 2124 Z
Produced small tornado

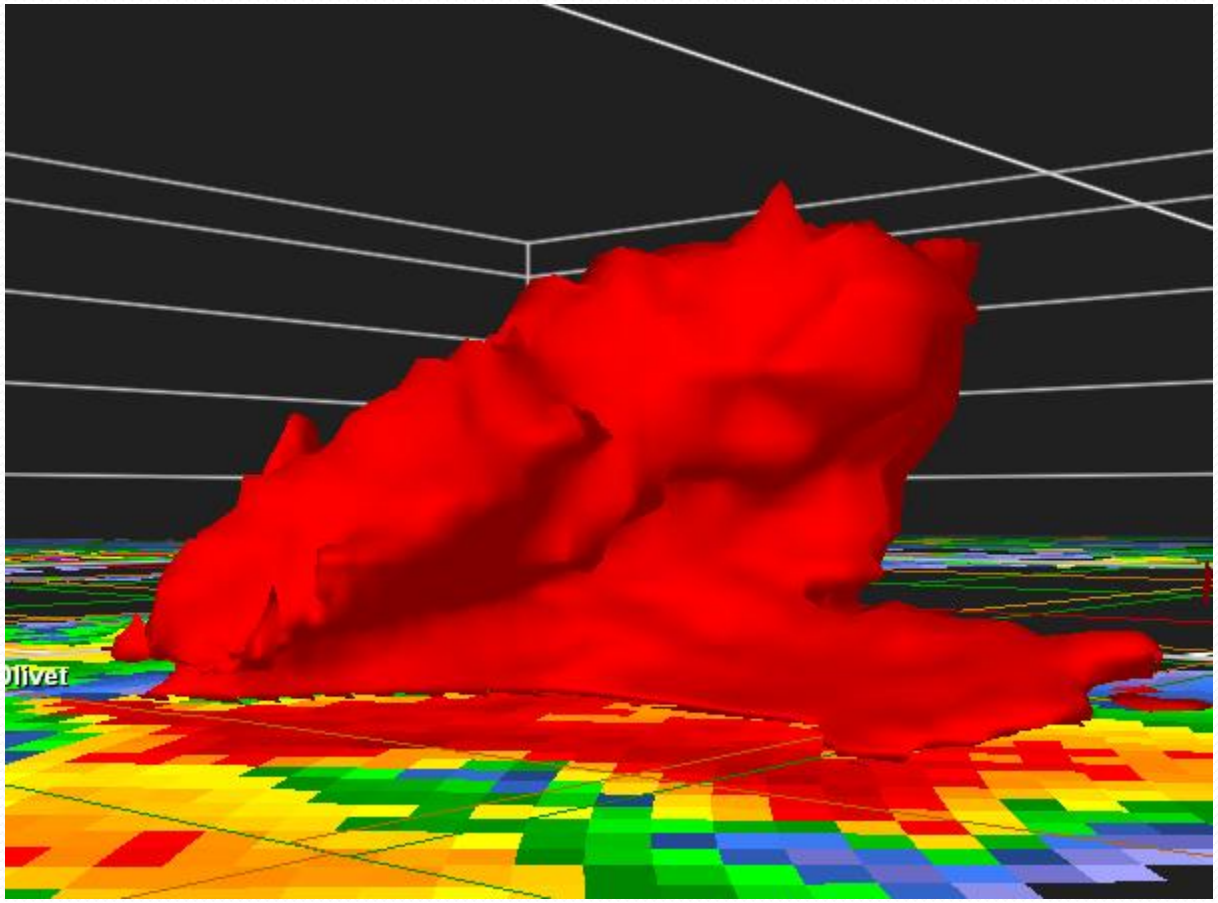
Sarpy County, NE 5/4/2003 2122 Z



4.50 in hail reported 2124 Z
Produced small tornado

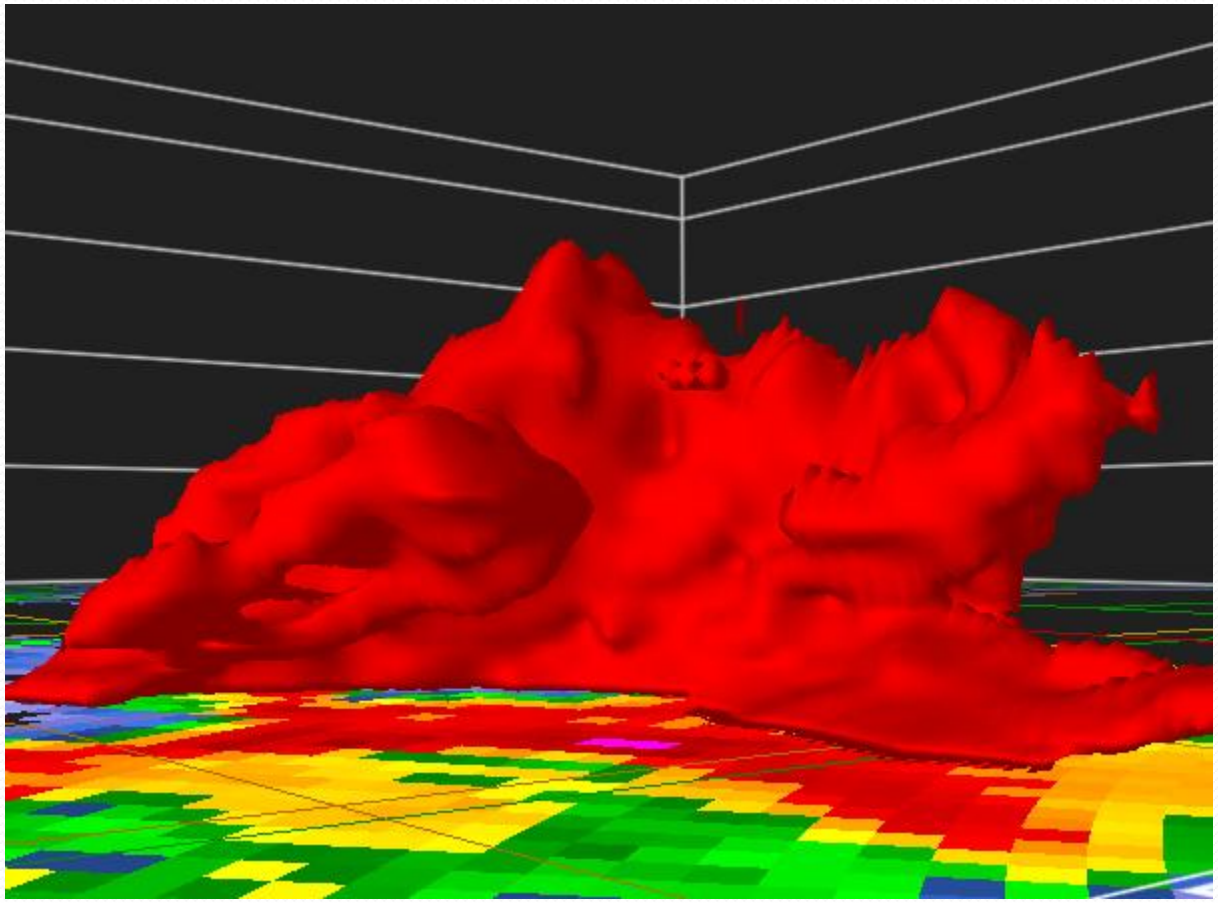
Turner County, SD 5/5/2007

Turner County, SD 5/1/2008 2325 Z



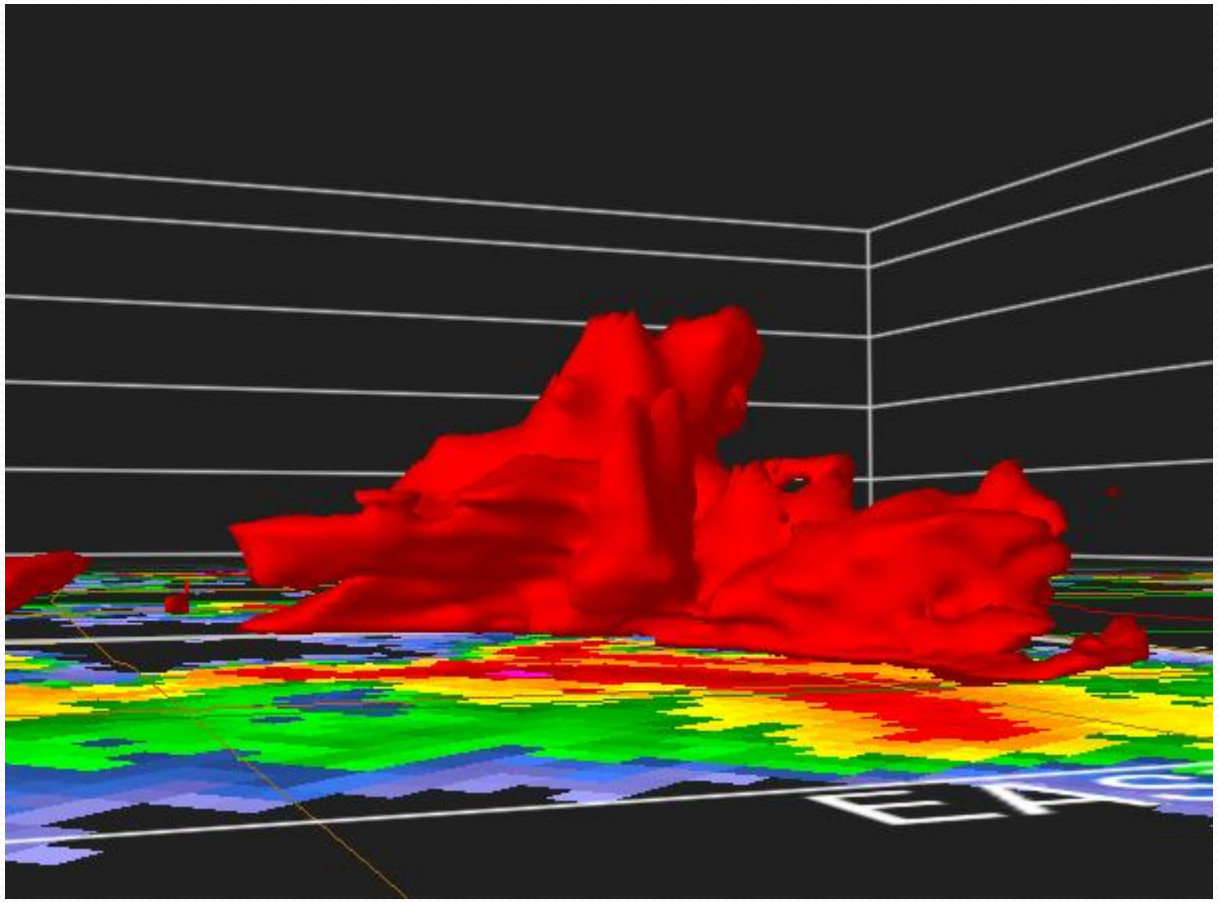
4.25 in hail reported at 2339 Z

Turner County, SD 5/1/2008 2329 Z



4.25 in hail reported at 2339 Z

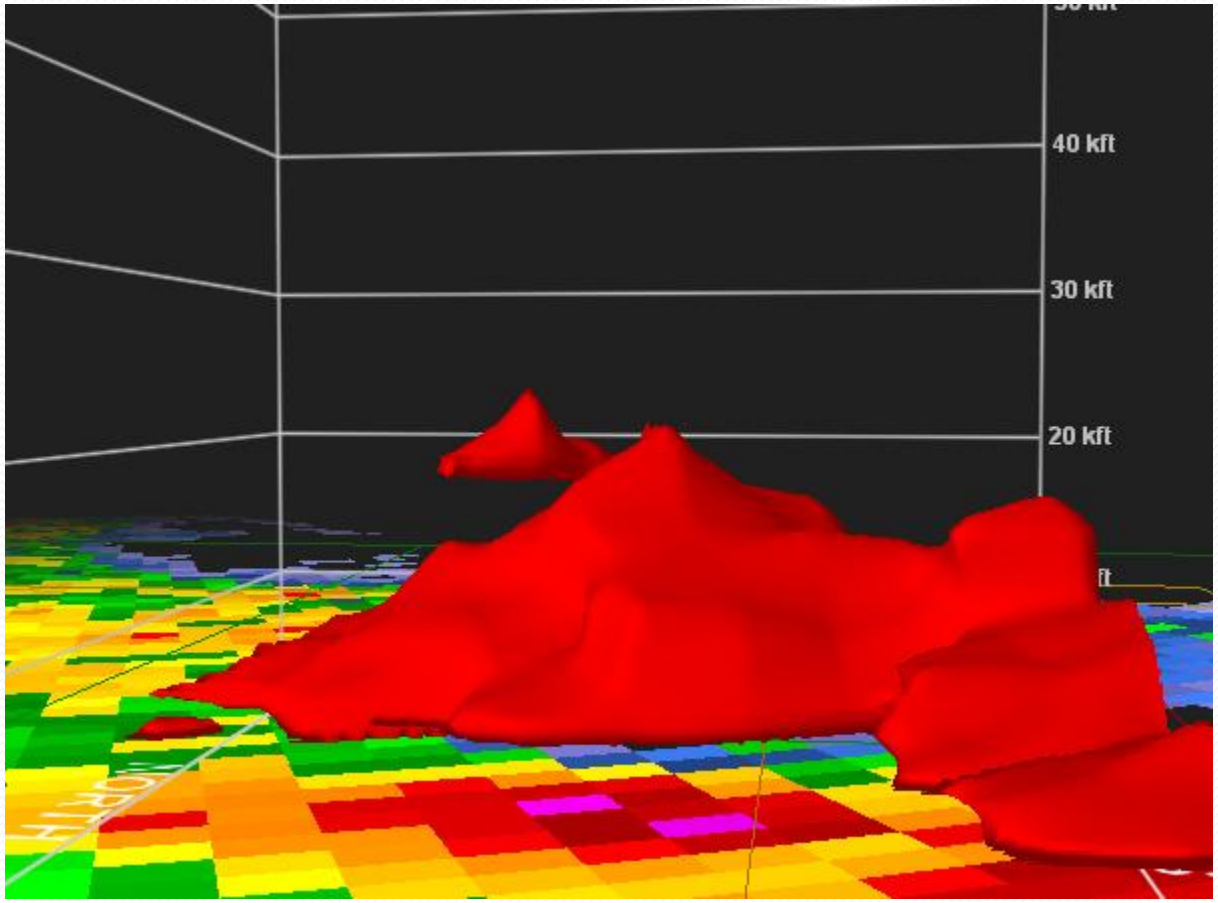
Turner County, SD 5/1/2008 2333 Z



4.25 in hail reported at 2339 Z

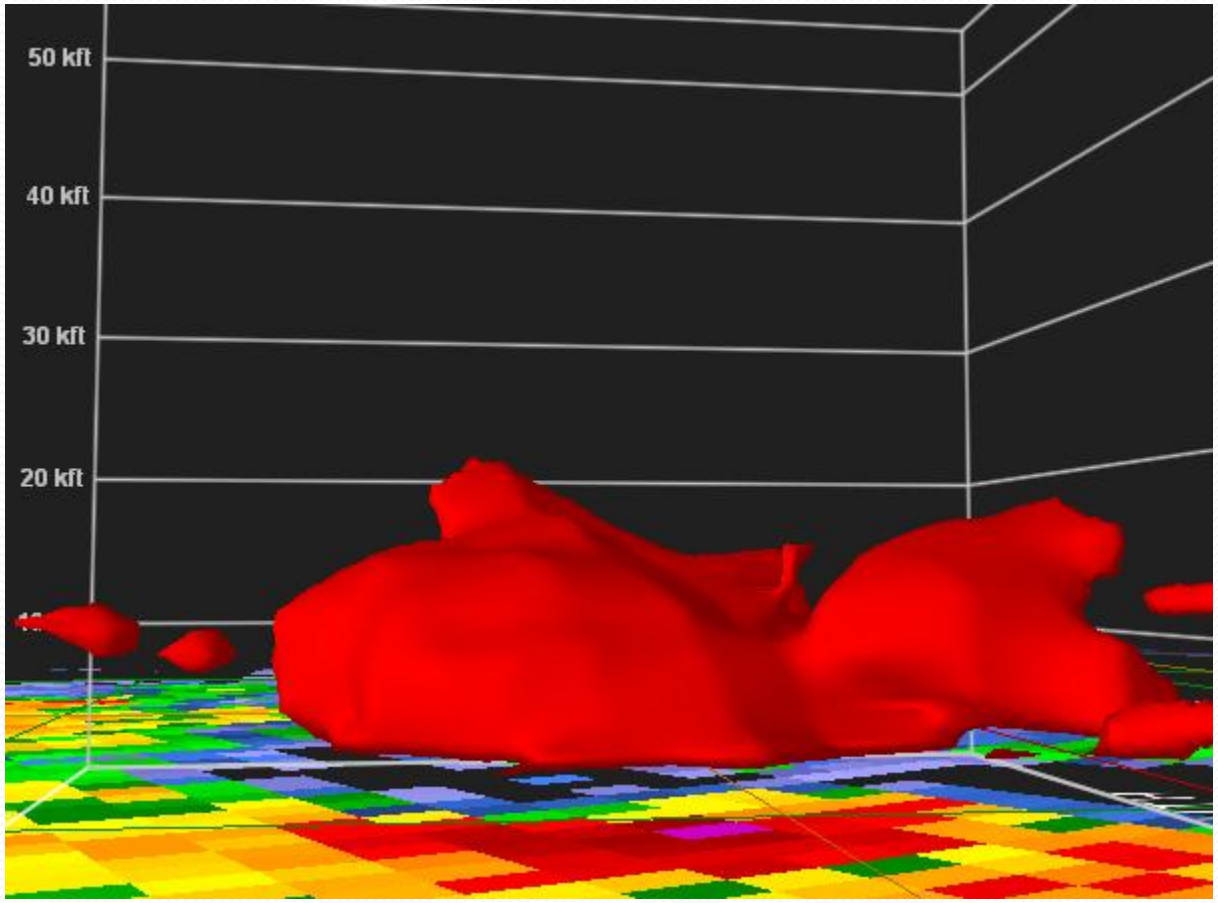
Seward County, NE 9/18/2007

Seward County, NE 9/18/2007 2230 Z



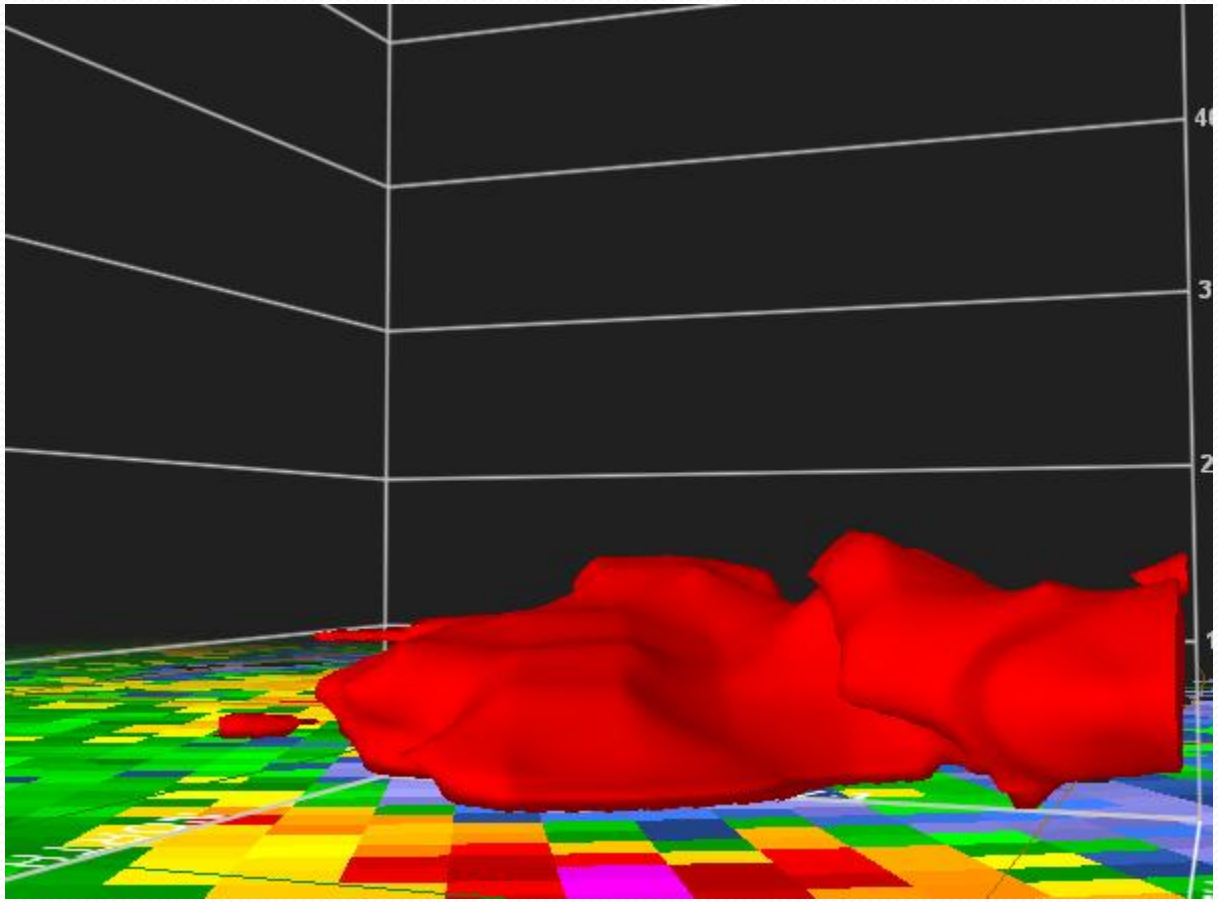
0.75 in hail reported at 2243 Z

Seward County, NE 9/18/2007 2234 Z



0.75 in hail reported at 2243 Z

Seward County, NE 9/18/2007 2238 Z



0.75 in hail reported at 2243 Z

Results

- 8 out of 10 (80%) of large hail cases (>3.00 in) contained very pronounced horizontal WER's
- 2 out of 5 (40%) of small hail cases (<2.00 in) did not contain pronounced horizontal WER's

Conclusions

- Did it work?
  - Large hail cases - Yes
  - Small hail cases - Not really
- Need more cases to be more accurate
- Possible error in spotter reports and radar data
- Environments different between each case

Future Work

- More cases to find a lead time
- Possible index of computed surface area of the isosurface may be helpful
- Relationship to occurrence of tornadoes

Questions?