Vivian Hail Stone July 23, 2010

Note: This report was originally compiled and published by the National Weather Service Weather Forecast Office in Aberdeen, SD. It has been preserved here to accompany the associated NCEC Record Event Report. The web page was retrieved on 5 January 2011 from http://www.crh.noaa.gov/abr/?n=stormdamagetemplate. This document will not reflect any changes made by WFO Aberdeen since that date.

Summary

During the late afternoon and early evening hours of 23 July 2010, thunderstorms developed over portions of central South Dakota. Several storms quickly became severe in an environment favorable for supercell thunderstorms. In particular, one very strong supercell thunderstorm moved southeastward across portions of Stanley, Jones, and Lyman counties. One of the hardest hit locations was the community of Vivian, South Dakota, where extremely large hail, destructive winds to 80 mph, and a brief tornado were reported.

A record setting hailstone was ultimately discovered in Vivian, measuring 8.0 inches in diameter, 18.625 inches in circumference, and weighing in at an amazing 1.9375 pounds. This hailstone broke the previous United States hail size record for diameter (7.0 inches - 22 June 2003 in Aurora, NE) and weight (1.67 pounds - 3 September 1970 in Coffeyvile, KS). The Aurora, Nebraska hailstone will retain the record for circumference (18.75 inches).

The hailstone's official record dimensions were as of the time personnel from the NWS in Aberdeen first observed and measured it. The stone did shrink considerably (melting and sublimation) between impact and when it was first measured by NWS personnel due in part to a power outage at the residence of the individual who found the stone. It should also be noted that many other stones with diameters exceeding 6 inches were also noted during the storm survey.

NOAA Press Release

Hail and Damage Photos

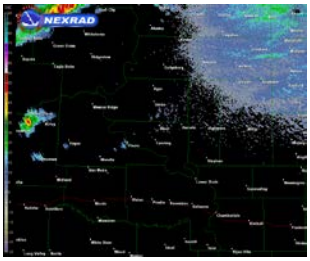



Diameter = 8.0 in Circumference = 18.625 in **Weig**ht = 1 lb 15/16 oz (1.9375 lbs)

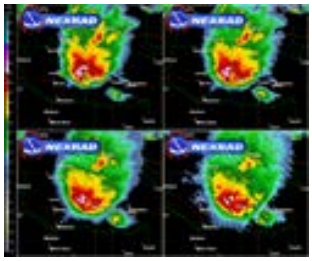

Hail Divot


Hail stone crashes through deck

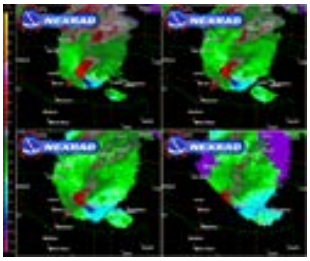
Radar Imagery



0.5 Degree Reflectivity Loop of Event



4 Panel Radar Reflectivity valid at 2258 UTC (0.5, 0.9,1.3, 1.8 degrees)



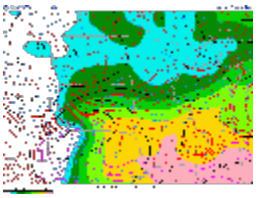
4 Panel Storm Relative Velocity valid at 2258 UTC (0.5, 0.9, 1.3, 1.8 degrees)

The storm scale structure of the storm was very impressive. In the images above, three body scatter spikes (TBSSs) are noted at several elevation angles at 2258 UTC. In addition, a very pronounced bounded weak echo region (BWER), and very intense mesocyclone are also indicative of a strongly rotating updraft.

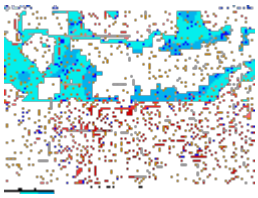
Initial estimates indicate that the updraft strength in the Vivian hail storm likely ranged from 160-180 mph.

Meteorological Analysis

The images below depict the synoptic and mesoscale environment at 22:00 UTC (6PM CDT) - about one hour before the record hailstone fell in Vivian. Note that the kinematic and thermodynamic environment was very supportive of supercell thunderstorms due to the high shear and high CAPE environment.

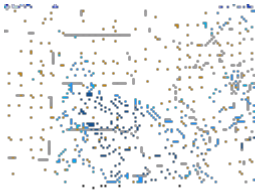


22Z - Surface MSLP, Temperature, Dewpoint

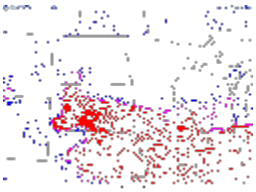


22Z - Lowest 100mb MLCAPE

22Z - 0-6KM Bulk Shear Magnitude



22Z - Supercell Composite Parameter



22Z - Craven/Brooks Significant Severe (MLCAPE*0-6KM Shear)

22Z - Significant Hail Parameter (SHIP)

Additional Storm Reports from July 23, 2010 – The reports show times, event, location, County/State and additional Remarks for the event.

Citing the Article

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