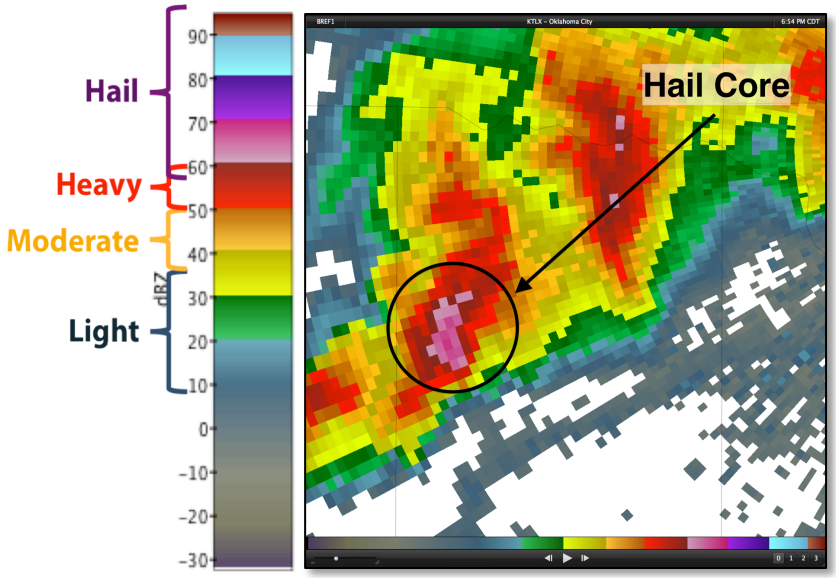
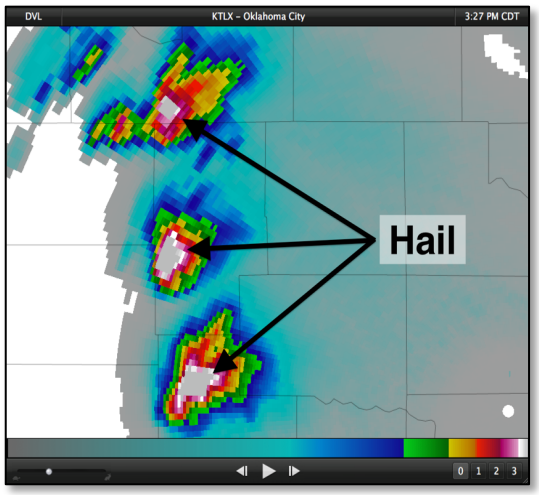
# Hail

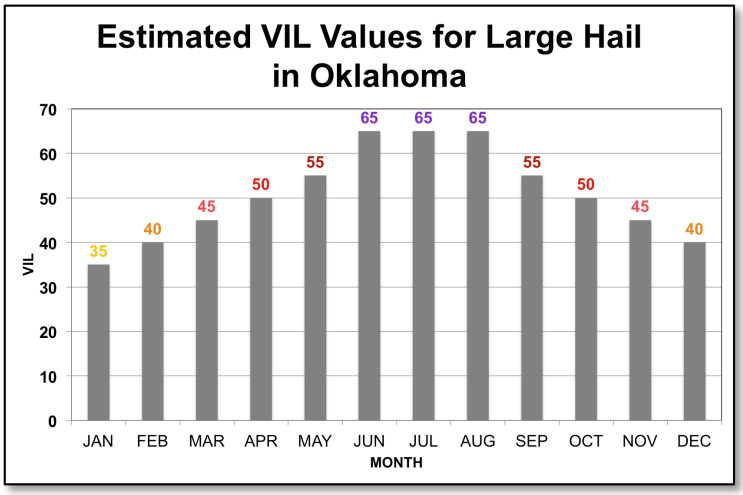
Hail can be identified through several radar products including Base Reflectivity and Digital Vertically Integrated Liquid (DVL). Hail is most commonly associated with supercells and squall lines, but it can occur in any thunderstorm with a strong enough updraft.

To the right is an example of a supercell thunderstorm showing where hail is within the storm using **Base Reflectivity (BREF)**. When using reflectivity be mindful of the reflectivity scale and what the values generally mean. It is also important to keep in mind that high reflectivity values do not always mean gigantic hail but instead could be indicating a significant number of smaller hailstones. When using reflectivity to diagnose hail, look at multiple reflectivity tilts (BREF1, BREF2, etc.) to see what is occurring higher in the storm. Though there is not an exact BREF value for hail, in general values greater than 55 dBZ are typical for hail.



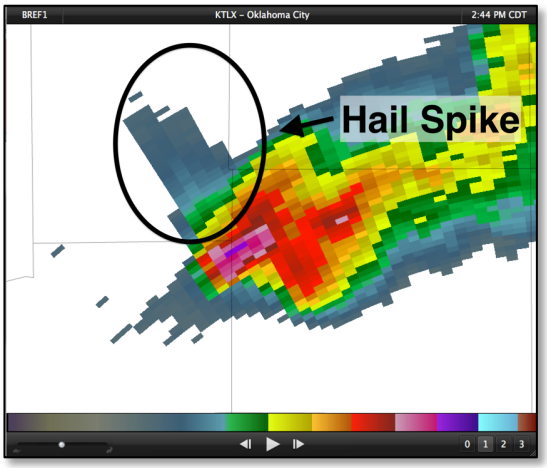

Another tool that can be used to diagnose hail is the **Digital Vertically Integrated Liquid (DVL)** product. This product was originally developed to estimate the rain rate by summing the reflectivities in a vertical column of air but was found to perform poorly due to hail. As a result, the product is used primarily for hail detection. Below is an example of the DVL product during a supercell event. So what value is needed to expect hail? Because DVL is dependent on the temperature of the atmosphere this number changes during the year – see the chart below. This shows that during the winter a lower DVL number can result in large hail (since the atmosphere is colder), while a higher number is needed in the warm months to expect large hail.



# Hail Spike

A hail spike is a phenomenon seen on radar in certain circumstances. It is as an area of reflectivity that extends away from the radar (along the radar beam) directly behind a thunderstorm that has large hail. The spike occurs because the signal from the radar bounces off the ground before being reflected back to the radar. This time delay in receiving the signal back results in the radar painting a thin strip of reflectivity beyond the storm. While hail spikes are a good indicator of hail occurring within a thunderstorm, hail will not be occurring in the hail spike itself. Hail spikes tend to appear at multiple elevations of Reflectivity data (BREF1, BREF2, BREF3, etc.) and commonly become more pronounced at higher tilts.

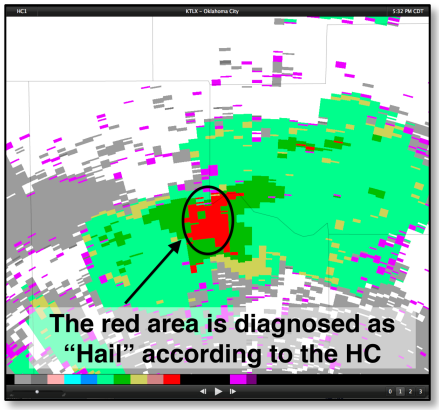



To the right is an example of storm producing very large hail as seen in Base Reflectivity data. The hail spike branches to the north and west of the storm away from the radar (KTLX).

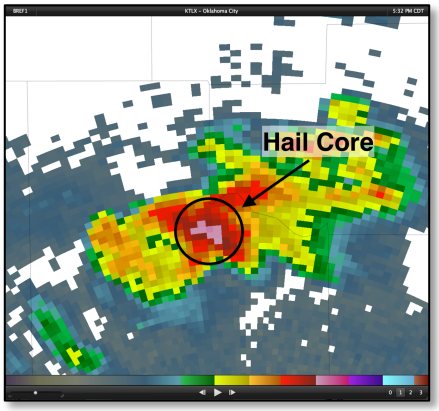
# Hail in Dual-Polarization Data

Since the advent of modern radar technology such as dual polarization, the identification of the shape, size, and variety of hydrometeors has been greatly improved. These improvements include an improved detection of hail.

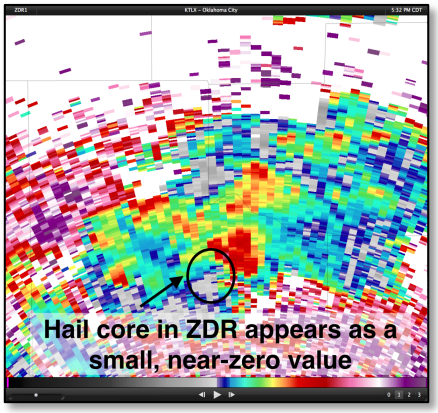
The example below shows a hail-producing supercell as viewed with traditional Base Reflectivity data (below middle) as well as two dual-pol radar products – Differential Reflectivity (ZDR, below right) and the Hydrometeor Classification (HC, below left) product. ZDR calculates the difference in radar reflectivity factors from the horizontal dimension to the vertical dimension. Hail tends to be fairly spherical and tumbles as it falls, so it appears as a sphere to the radar and commonly has small to near-zero ZDR values. The HC product uses several products to produce a best estimate for the type of precipitation. The red region below has been identified as hail. The key with dual pol products is that they **MUST** be used in combination with traditional radar products (Base Reflectivity and Base Velocity) in order to understand what you are looking at.




Hydrometeor Classification (HC)




Base Reflectivity




Differential Reflectivity (ZDR)

Mesonet