Operational Application of 0-3 km Bulk Shear Vectors in Assessing Quasi-Linear Convective System Mesovortex and Tornado Potential

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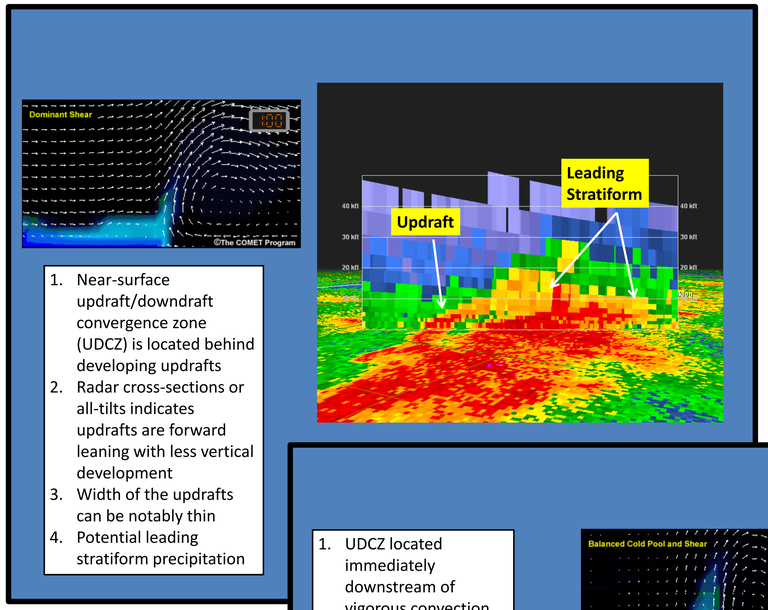
Shear/ Cold Pool Balance



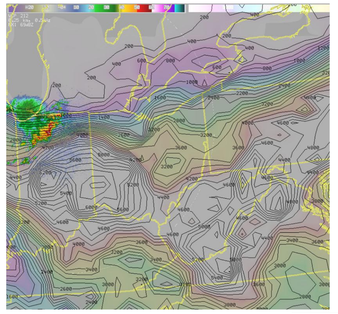
1. Near-surface updraft/downdraft convergence zone (UDCZ) is located behind developing updrafts
2. Radar cross-sections or all-tilts indicates updrafts are forward leaning with less vertical development
3. Width of the updrafts can be notably thin
4. Potential leading stratiform precipitation

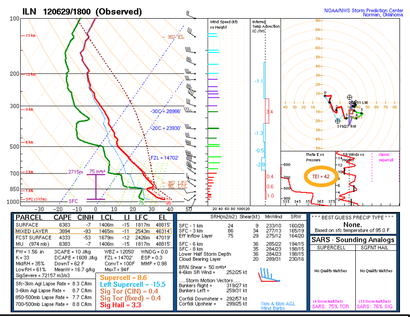
1. UDCZ located immediately downstream of vigorous convection
2. Radar cross-sections or all-tilts indicates updrafts are nearly vertical and deep in nature (perhaps compared to other convection within the QLCS)
3. A strong reflectivity gradient is noted on the forward flank of the segment
4. Echo tops are higher than surrounding convection
5. Trailing stratiform precipitation

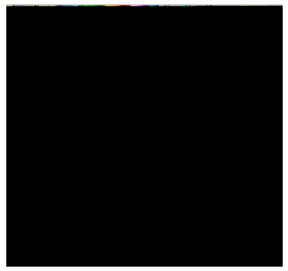
Mesovortex Genesis Favored

1. In a portion of the QLCS in which the cold pool and ambient low-level shear are nearly balanced or slightly shear-dominant. ***AND***
2. Where 0-3 km line-normal bulk shear magnitudes are equal to or greater than 30 knots. ***AND***
3. Where a rear-inflow jet (RIJ) or enhanced outflow causes a surge or bow in the line.

29 June 2012 Ohio Valley/Mid-Atlantic Derecho

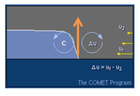






The environment during the afternoon of the 29th featured extreme amounts of instability from the Ohio Valley into the Mid-Atlantic region. The 18 UTC RAP40 depicted MUCAPE values in the 3500-5500 J/kg range (upper-left). An 18 UTC sounding out of Wilmington, OH (upper–right) also indicated a delta theta-e value of 42 degrees Kelvin when comparing parcels between the surface and 700 mb. This thermodynamic environment favored very strong cold pool potential and was a prime candidate for a forward propagating MCS. Radar imagery with 18 UTC RAP40 forward propagating Corfidi vectors overlaid (lower-left) indicated the potential for forward MCS speeds of around 50 knots.

Line Normal 0-3 km Bulk Shear Magnitude



Δu = sin(θ)m

Δu = line normal magnitude of 0-3 km bulk shear