MESO-ANALYST SEVERE WEATHER GUIDE

Category	**FACTOR (notes: see related number on next page)**	**VERY FAVORABLE**	**FAVORABLE**	**SO - SO**	**UNFAVORABLE**
Storm Initiation	(1) Low Level Boundary (convergence, frontogns)	- Strong	- Moderate	- Weak	- Lack of boundary
	(2) 2 x Sqrt(CAPE)+SR-Inflow (Sqrt=square root)	- > 125kts	- 100 - 125	- 80 - 99	- < 80
	(3) CIN (J/Kg)	- < 15	- 15-30	- 30-60	- > 60
	(4) 700-850mb Isentropic Flow	- Strong Upglide	- Weak/Mdt Upglide	- Little/No Upglide	- Downglide
	(5) B.Lyr - 400mb Wind Speed/Direction Difference	- > 100	- 75-100	- 50-75	- < 50
Large Hail	(6) 400-700mb SR-Flow (kts)	- > 30	- 20-29	- 12-19	- < 12
	(7) Environ. or Updraft Freezing Level Height (AGL)	- < 11,000 ft	- 11,500 - 13,500 ft	- 14,000 - 16,000 ft	- 17,000+ ft
	(8) Mesocyclone Intensity/Depth	- Strong, deep meso	- Mdt, deep meso	- Weak, shallow meso	- No meso
	(2) 2 x Sqrt(CAPE) + SR-Inflow =	- > 125 kts	- 100-125	- 80-99	- < 80
Dmgg Winds	(9) 500-700mb Dewpt Depression (C)	- > 20	- 10-19	- 5-9	- < 5
	(10) 850-500mb Lapse Rate (C/km)	- > 7.5	- 6.5-7.5	- 5.5-6.5	- < 5.5
	(11) Sfc thetaE-lowest thetaE in 400-700mb layer (K)	- > 25	- 18-25	- 12-18	- <12
	(6) 400-700mb SR-Flow (kts)	- > 30	- 20-29	- 12-19	- < 12
	(12) 3-hour Surface Pressure Change (mb)	- > 6	- 4-6	- 3-4	- < 3
	(13) Lowest 50- to 100-mb Dewpt Depression (C)	- > 15	- 10-15	- 5-10	- < 5
	(14) Wet-Bulb Temperature curve below 700mb	- moist to dry adiabatic	- near moist adiabatic	- weak or shlw invrsn	- stg or deep invrsn
	(15) Mvmt of storm line relative to 500-700mb flow	- parallel	- < 45 degree angle	- 45-60 degree angle	- > 60 degree angle
Tornado	(16) 2 x Sqrt (Approx LFC-500mb CAPE) + SRI =	- > 100kts	- 80-99	- 60 -79	- < 60
	(17) 0-2km SR-Helicity (near storm inflow region)	- > 400	- 250-400	- 150-250	- < 150
	(6) 400-700mb SR-Flow	- > 30 kts	- 20-29kts	- 10-19kts	- < 10 kts (5)
	(18) Lowest 50- to 100-mb Dew Point Depression	- < 11F (6C)	- 12-18F (6-10C)	- 19-27F (10 - 15C)	- >27F (15C)
	(19) Mesocyclone movement relative to pre-existing or storm-induced boundary	- On cool side of shallow boundary, or directly on deeper boundary (if inflow air sufficiently unstable)	- Moving at small angle over cooler air behind a shallow boundary (if inflow air sufficiently unstable)	- No boundary detected, deviant motion observed.	- Moving at sharp angle over cool, stable air, or on warm side moving away from bndry
Flash Flood	(20) Storm motion (kts)	- < 5	- 5-10	- 10-20	- > 20
	(21) Precipitable Water (% of normal)	- > 200%	- 150-200%	- 100-150%	- < 100%
	(22) "Corfidi Vectors" suggest:	- Bckbldg/Stnry storms	- Slow storm mvmt	- Moderate mvmt	- Fast storm mvmt
	(23) Precip Efficiency (look for warm rain process)	- High	- Moderate	- Low	- Very Low
	(24) Flash Flood Guidance	- Well below normal	- Below normal	- Near normal	- Above normal
	(25) "Training" Pattern	- Classic (storm line stationary relative to training location)	- Near-classic (storm line mvmt < 10kts relative to training location)	- Semi-training (line mvmt 10-15kts relative to trng location)	- No training pattern observed

N O T E S

***** This is for guidance purposes only. Specific criteria numbers are provided as guidance. *****

(1) Look at strength of convergence and frontogenetic/frontolytic nature of boundary (frontal circulation).

(2) Take 2 times the square root of CAPE, and add the low-level SR-Inflow in knots. You are incorporating both SR-inflow and CAPE to come up with a theoretical updraft intensity. (**Note:** Take square root of CAPE rather than square root of 2 x CAPE to account for factors like entrainment). Volume browser could be set up to help with this.

(3) Some CIN is a favorable condition for severe convection. Here, CIN values provided are given for anticipating storm formation, not severe nature of storms.

(4) At times, convection can initiate when isentropic upglide allows parcels aloft to reach their LFC.

(5) Incorporate both speed and directional shear below 400mb level by adding the amount of veering, in degrees, to the amount of speed shear, in knots. The greater either directional or speed shear, or both, the larger the result will be. **Note:** Do not utilize this factor when average wind speeds aloft are less than 20 kts.

(6) Compare average flow in the 400-700mb layer to individual storm motion (not average motion of all storms). Keep in mind weak SR-flow aloft can occur in microburst environments. **Note:** May want to look at SR-flow at the rear-inflow-jet level for squall lines.

(7) Environment Freezing Level (where environmental temp. curve crosses 0C) or Updraft Freezing Level (where updraft parcel crosses 0C): use appropriate one given situation (e.g. strong SR-flow aloft, use environment level...weak SR-flow aloft, use updraft level). This may be important for correctly accounting for hail melting potential.

(8) Look for mesocyclone to be at least 10,000 feet deep, persisting for at least several volume scans. Mesocyclonic flow alters storm-relative flow pattern such as to distribute precipitation away from the warm, saturated updraft core.

(9) Use the average dew point depression value in the 400-700mb layer. Volume browser can be set up to help with this.

(10) Volume browser can be used to determine this lapse rate.

(11) Take the difference between the surface theta-e and lowest theta-e value in the 400-700mb layer. Can do this with “DIFF” button on volume browser. This is helpful for determining the potential for damaging winds and wet-microbursts. The steeper the lapse rate, and/or the drier the air aloft, the greater this “difference” will be.

(12) Can get values on volume browser or LAPS/MSAS menus. This can be helpful for detecting the initiation of wake low damaging winds.

(13) Difference between surface temperature and dew point values...helpful for determining microburst potential.

(14) Subjective view of wet-bulb temperature (Tw) curve below 700mb. How deep of a Tw inversion is there, and how strong is it? Is the Tw curve closer to moist-adiabatic or dry-adiabatic? Damaging winds can reach the ground with a temperature inversion (e.g. during the evening hours), but this is more difficult when you have a wet-bulb temperature inversion (and thus little dry air for evaporative cooling to counter effects of low-level inversion). **Note:** Incorporate Tw inversion strength as well. The closer the Tw curve is to moist-adiabatic, the deeper it can be and still allow damaging winds to reach the ground.

(15) Damaging winds are often less likely to result from a line of storms moving at a sharp angle to the flow aloft compared to a line of storms moving along the mean flow (where momentum mixdown can result). Also look at environmental ingredients for damaging winds (dry air aloft, steep lapse rate, etc).

(16) Come up with approximation of CAPE below 500mb or 600mb and divide it by 100, then divide low-level SR-inflow (SRI) by 5, and add the two together. Research has found that CAPE in the lowest few hundred mb to be an important factor for determining tornado potential.

(17) 0-3 km layer may be too deep. Try to determine how much of calculated 0-3km SRH is within 0-2km layer from hodographs. Focus on small-scale wind changes near storm inflow region, not general environmental SRH values. Small-scale changes in near-surface wind can drive SRH up or down substantially.

(18) LCL heights can be approximated using lowest 50-mb or 100-mb average dew point depressions. Every 5F (~3C) of dew point depression roughly correlates to 1,000 feet of cloud base height AGL. Research suggests low LCL heights (below 1000 meters) is favorable for tornado development. **Note:** Influx of saturated air from FFD area into updraft can cause lowering of LCL height to favorable level.

(19) Determine movement of mesocyclone relative to pre-existing or storm-induced boundary. How deep is the cool air behind the boundary? Is the cooler air unstable enough to allow convection to survive, or will it be too stable and cause rapid storm weakening?

(20) Slower storm motion yields greater potential for excessive rainfall.

(21) Greater precipitable water values (relative to normal) increase potential for excessive rainfall.

(22) Backbuilding or slow moving convection has greater potential for producing excessive rainfall.

(23) Greater precipitation efficiency yields greater precipitation rates. Look for conditions favoring warm rain process (e.g. depth of layer from LCL to freezing level at least 3-4 km, low cloud base heights, etc). Also look for weak SR-flow at storm top (don’t lose as much precip through anvil), K-index values of 36+, etc.

(24) Lower flash flood guidance (FFG) values favor a greater flood threat.

(25) Are storms training over the exact area? If the overall line motion is near 0 (relative to the area where training is occurring), you have ideal training. The more a line moves, relative to its orientation (e.g. east/west mvmt of north-south oriented line), the less “ideal” the training setup is for excessive rainfall.