Stability Indicies

1. **Showalter Index (SI)**

   In order to avoid local influences a parcel is lifted from an initial position at 850 mb. It is then lifted dry adiabatically to its LCL and then pseudo-adiabatically to 500 mb. The parcel temperature is then subtracted from the environmental temperature.

   $$SI = T_{500} - Tp_{500}$$

$SI > 3$	No significant activity
$1 \leq SI \leq 3$	Showers probable, isolated thunderstorms possible
$-2 \leq SI < 1$	Thunderstorms probable
$-6 \leq SI < -2$	Severe thunderstorms possible
$SI < -6$	Tornadoes possible

2. **Lifted Index (LI)**

   In order to give greater considerations to boundary layer temperature and moisture conditions, the initial parcel is taken from 25 mb above the surface with the temperature and mixing ratios equal to the means of the lowest 50 mb of the atmosphere. This hypothetical parcel is then lifted dry adiabatically to the LCL and pseudo-adiabatically to 500 mb. The LI again is the temperature difference between the parcel and the environment at 500 mb.

   $$LI = T_{500} - Tp_{500}$$

$LI > 2$	No significant activity
$0 \leq LI \leq 2$	Showers probable, isolated thunderstorms possible
$-2 \leq LI < 0$	Thunderstorms probable
$-4 \leq LI < -2$	Severe thunderstorms possible
$LI < -4$	Severe Thunderstorms probable, tornadoes possible

3. **Total Totals Index (TT)**

   $$TT = T_{850} + Td_{850} - 2T_{500}$$

44-45	Isolated moderate thunderstorms
46-47	Scattered moderate / few heavy thunderstorms
48-49	Scattered moderate / few heavy / isolated severe thunderstorms
50-51	Scattered heavy / few severe thunderstorms and isolated tornadoes
52-55	Scattered to numerous heavy / few to scattered severe thunderstorm / few tornadoes
> 55	Numerous heavy / scattered severe thunderstorms and scattered tornadoes

4. **K Index (K)**

   The K index is similar to TT but takes into account the lack of dry air at 700 mb in contributing to air mass thunderstorm development (temperature is in Celcius)

   $$K = T_{850} - T_{500} + Td_{850} - (T_{700} - Td_{700})$$

$K < 15$	0% Air mass thunderstorm probability

15–20	<20%
21–25	20–40%
26–30	40–60%
31–35	60–80%
36–40	80–90%
K > 40	>90%

5.   SWEAT (Severe Weather thrEAT) Index (I)
US Air Force Index that takes into account vertical wind shear and horizontal wind speeds

$$I = 12*D + 20*T + 2*F_{850} + F_{500} + 125*S$$

if $Td_{850} > 0$ then
       $D = Td_{850}$ (Td in Celcius)
else
       $D = 0$
if TT > 49 then
       $T = TT - 49$
else
       $T = 0$
F_{850} = wind speed at 850 mb in knots
F_{500} = wind speed at 500 mb in knots
if $D_{850} >= 130°$ and $D_{850} <= 250°$ and $D_{500} >= 210°$ and $D_{500} <= 310°$ and $(D_{500}-D_{850}) >= 0$
       and $F_{850} >= 15$ knots and $F_{500} >= 15$ knots then
       $S = \sin(D_{500} - D_{850}) + .2$
else
       $S = 0$

Most tornadoes and severe thunderstorms occur with I > 400

6.   **Energy Index (EI)**
This index relates the energy contained in the atmosphere at two levels to its stability.

$$EI = E_{500} - E_{850}$$

$$Ei = CpTi + gZi/4.2x10^7 + L\omega i$$

Cp	=	.24 cal/gm°K
Ti	=	temperature in °K
g	=	980 cm/sec²
Zi	=	geopotential height in cm
L	=	600 cal/gm°K
ωi	=	mixing ratio in gm/gm

EI > 0	No activity expected
$-1 \leq EI < 0$	Isolated severe thunderstorms
$EI \leq -2$	Severe thunderstorms probable, tornadoes possible