Level of Free Convection (LFC) and Equilibrium Level (EL)

Level of Free Convection (LFC)

The level of free convection is the height at which a parcel of air lifted dry adiabatically until saturated and then moist adiabatically thereafter, would first become warmer (less dense) than the surrounding environmental air. The parcel would then continue to rise freely above this level until it becomes colder (more dense) than the surrounding air. Note, a LFC may not be present for all atmospheres.

a parcel which is forced upward will first cool at the dry adiabatic lapse rate until it is saturated, (follow the dry adiabat to the LCL). Thereafter as it is forced upward, it cools at the saturation adiabatic lapse rate, (moisture is condensing out of the parcel; follow the saturation adiabat from the LCL upward). The parcel must be forced upward as long as it is cooler than the surrounding air. Once the parcel becomes warmer than the surrounding air it rises by itself.

Equilibrium Level (EL)

The equilibrium level is the height where a buoyantly rising parcel, (rising freely because it is warmer than the surrounding air), again becomes equal to the temperature of the surrounding environmental air. Above this level, the parcel is cooler, (denser) than the surrounding air and will not rise freely. Note, an equilibrium level may not be present for some atmospheres.

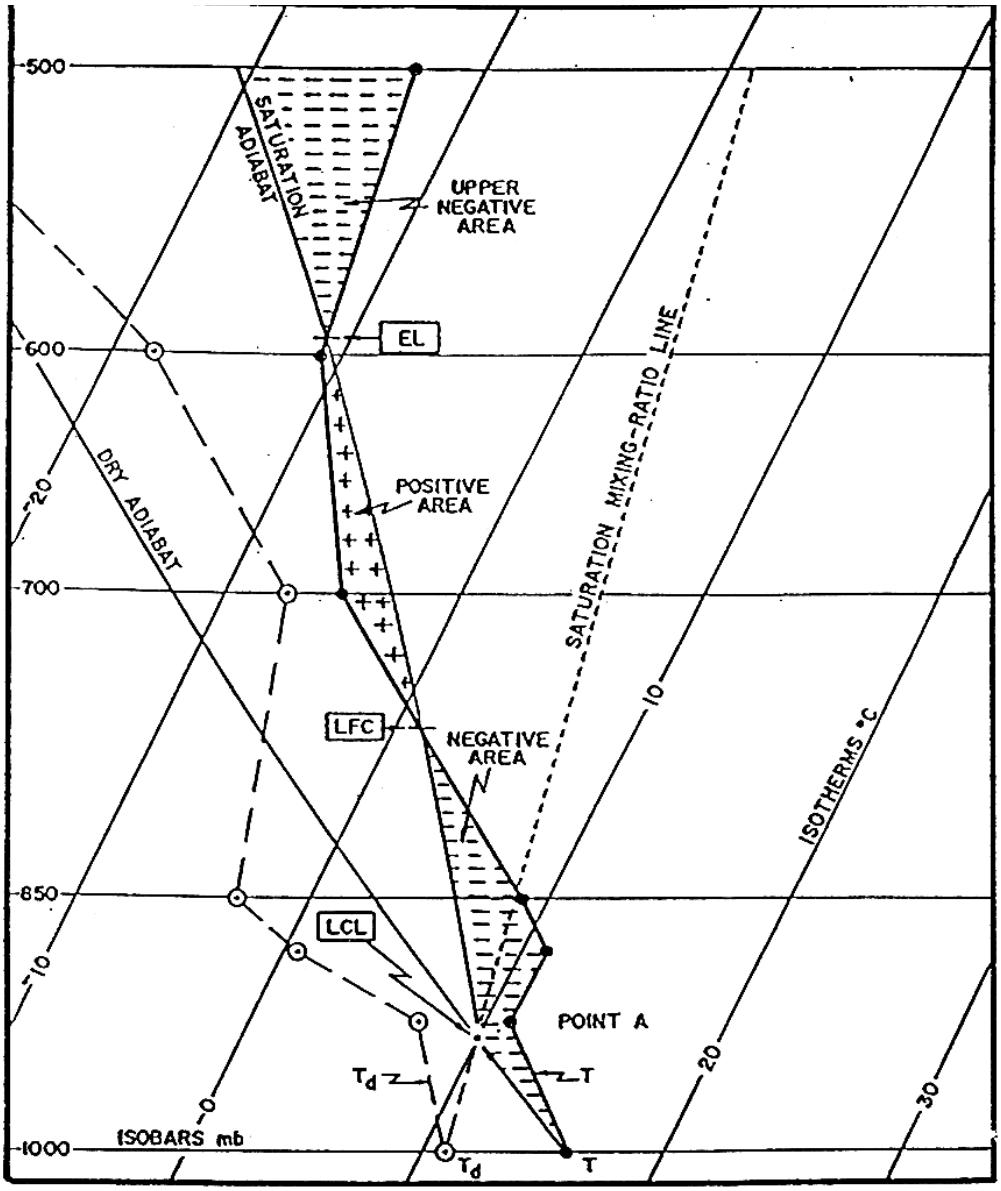
Procedure:

Start at the lifting condensation level (LCL) of the level for which the LFC is desired, (i.e., if the LFC for air at 700 mb is desired, the calculate the LCL for 700 mb). From the LCL go upwards parallel to the saturation adiabats until you intersect the temperature curve. The level where the intersection occurs is the LFC.

Procedure:

For mechanical lifting. From the LFC, continue drawing a line upward

paralleling the saturation adiabat lines until the drawn line intersects the temperature curve. This is the equilibrium level. See the figure


500
600
700
850
1000
SATURATION ADIABAT
UPPER NEGATIVE AREA
EL
POSITIVE AREA
DRY ADIABAT
SATURATION MIXING-RATIO LINE
LFC
NEGATIVE AREA
LCL
POINT A
T_d
T
ISOBARS mb
ISOTHERMS °C
-20
-10
0
10
20
30

From the information below **FIND:** LCL , LFC, EL and discus the result.

P(kPa)	T(°C)	T_d(°C)
20	–25	–55
30	–25	–50
40	–20	–20
45	–15	–15
50	–10	–24
70	12	–20
80	19	3
90	21	15
99	29	17
100	33	20