

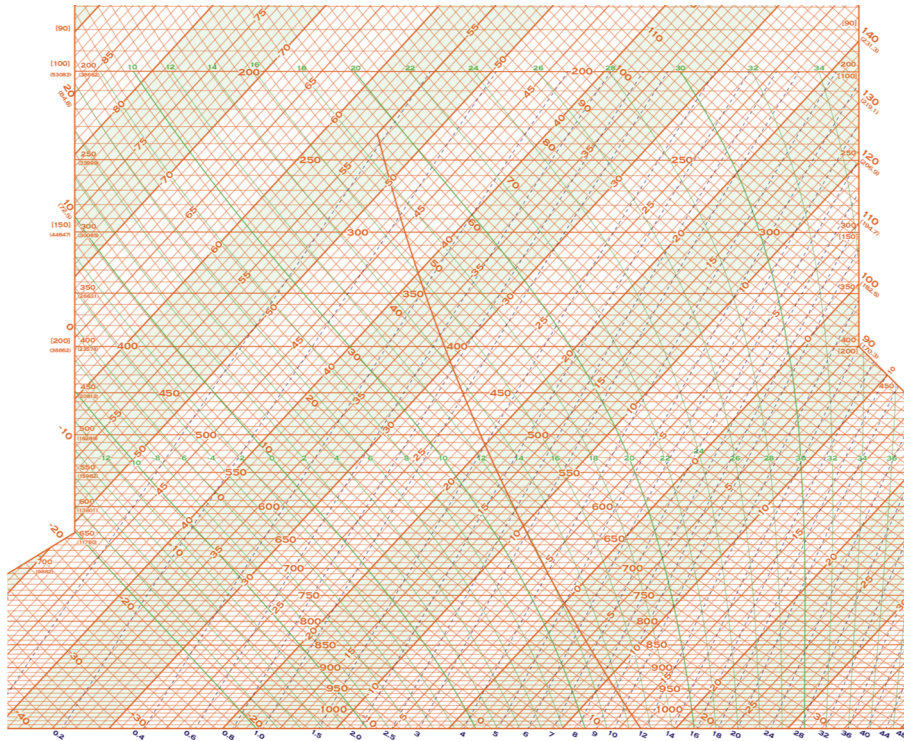
# Skew-T Analysis: Review of Key Concepts

Atmos 5110/6110  
Synoptic–Dynamic Meteorology I  
Jim Steenburgh  
University of Utah  
[Jim.Steenburgh@utah.edu](mailto:Jim.Steenburgh@utah.edu)

Based on notes from Peter Veals

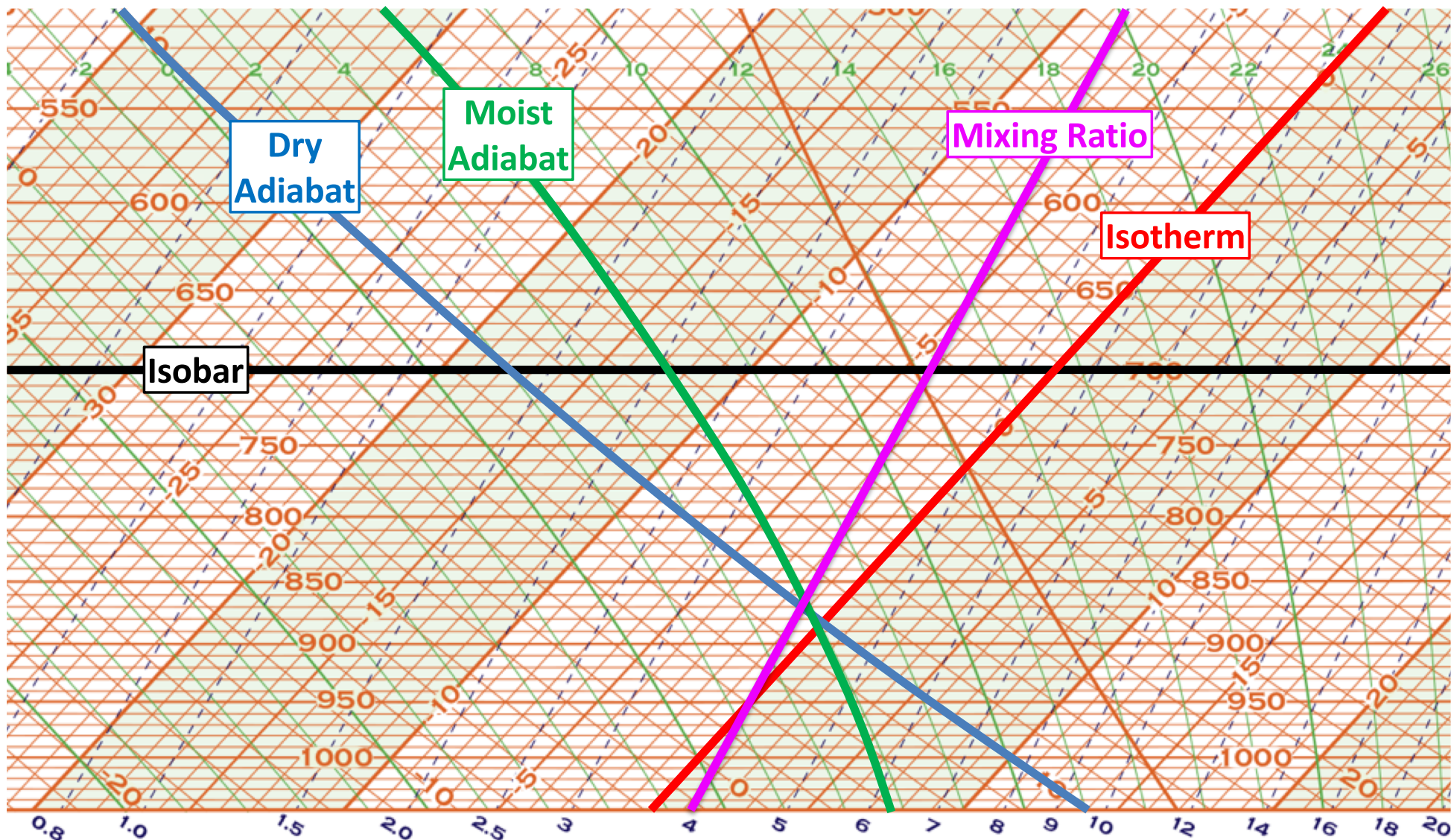
See Also: [http://www.meted.ucar.edu/mesoprim/skewt/table\\_of\\_contents.htm](http://www.meted.ucar.edu/mesoprim/skewt/table_of_contents.htm)

# Skew- $T$ log- $p$ diagram



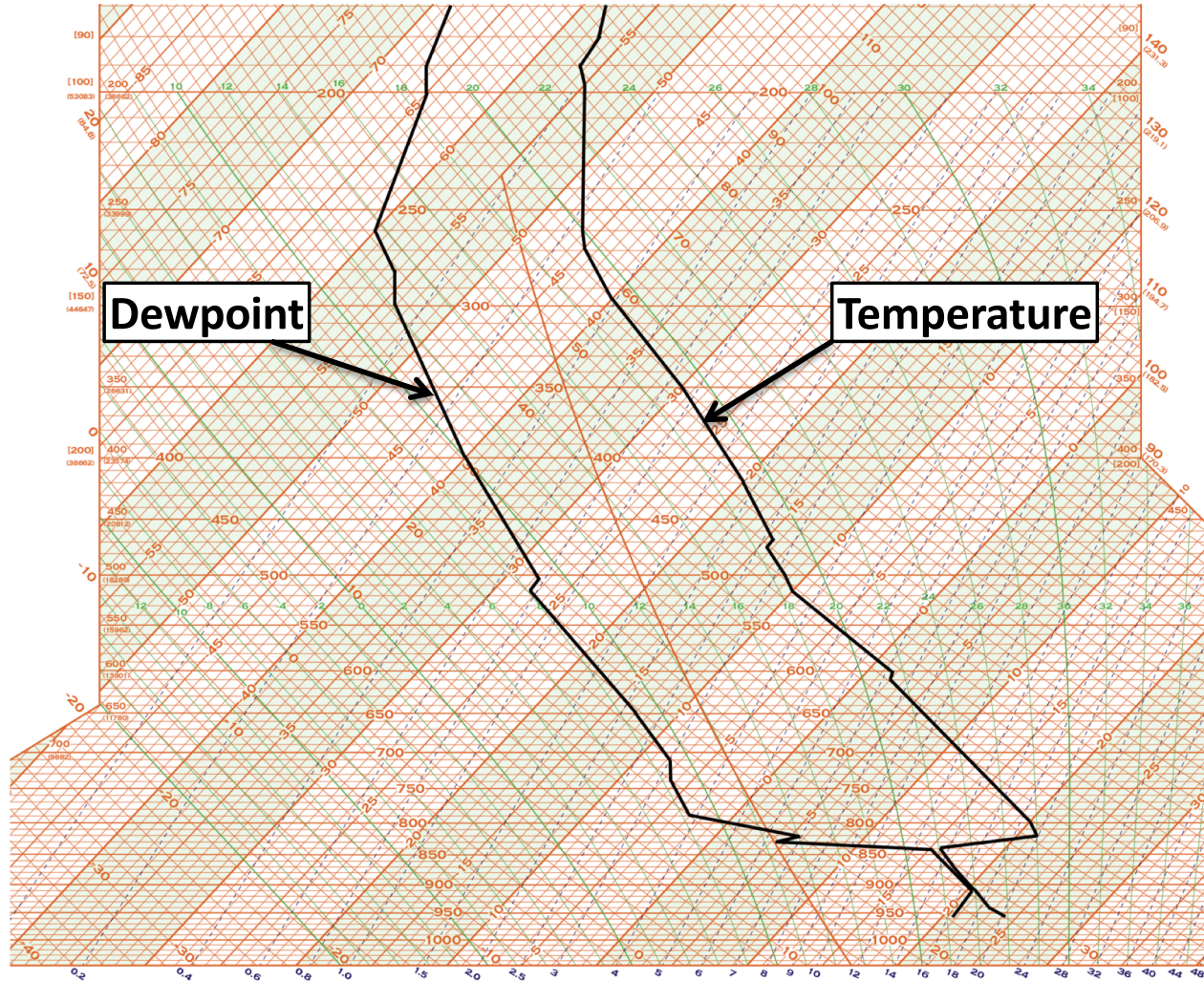
- Thermodynamic diagram used for weather analysis and forecasting
- Isotherms are “skewed”
- Large angle between isotherms and dry adiabats



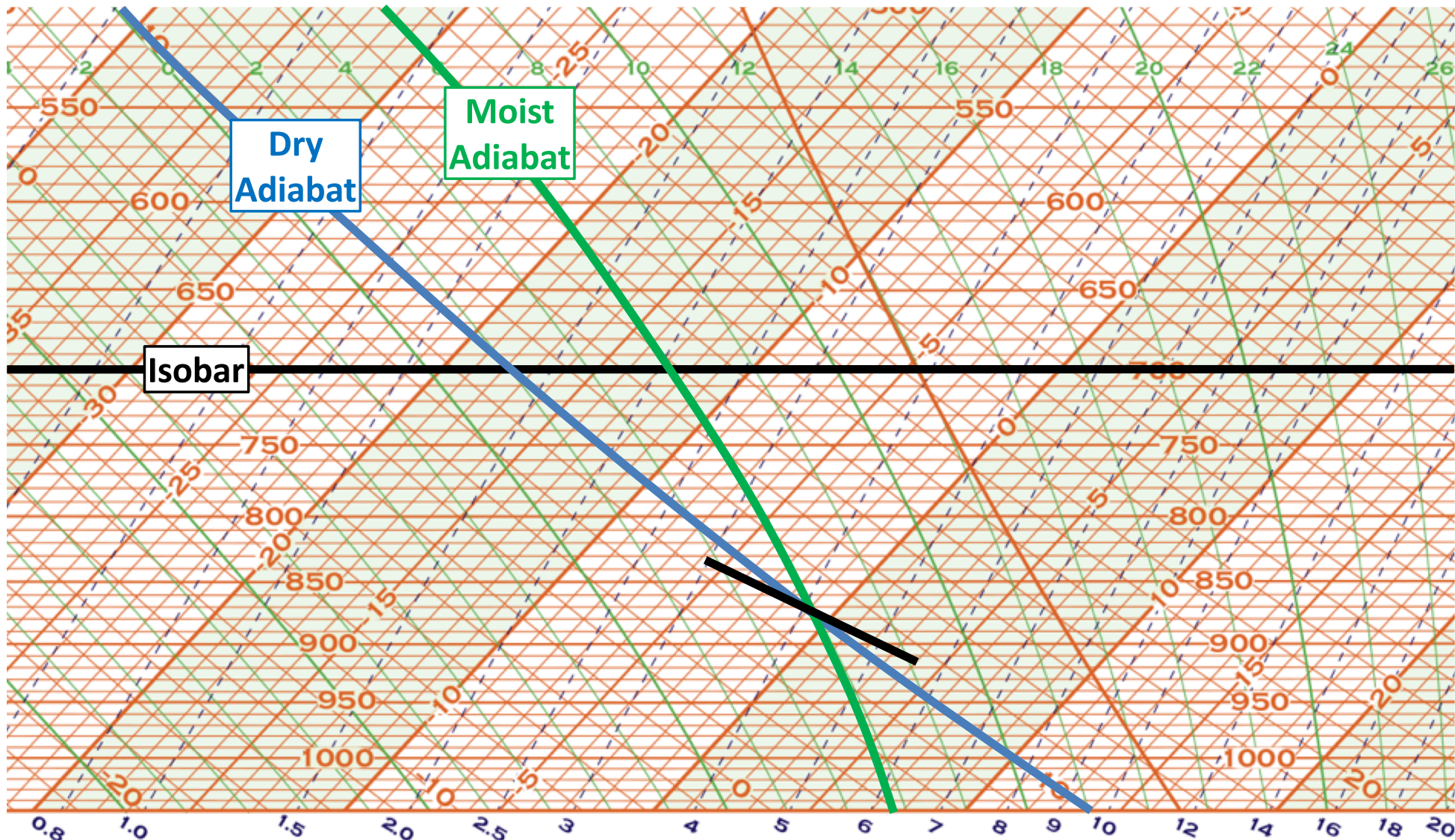




# Example

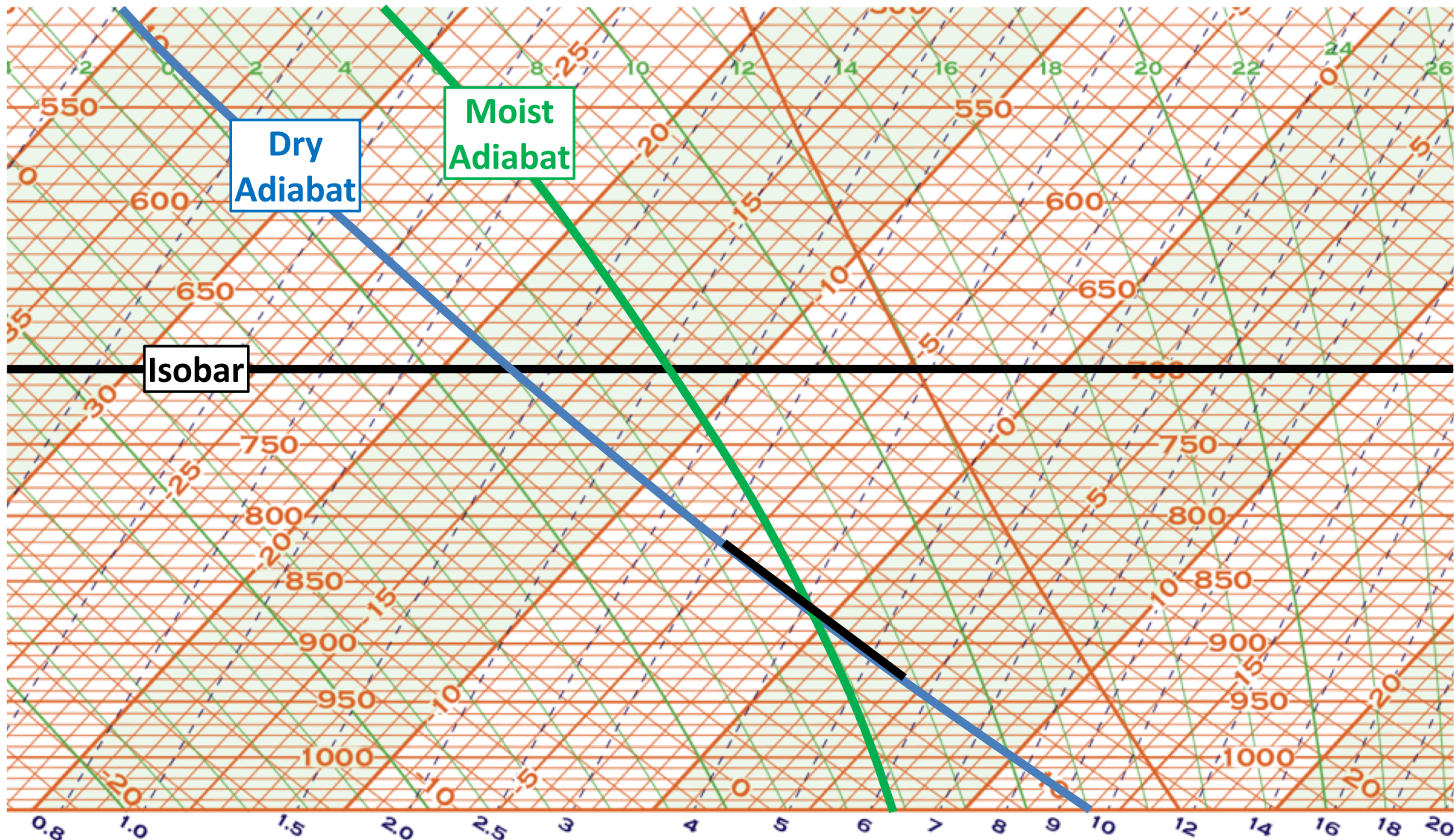






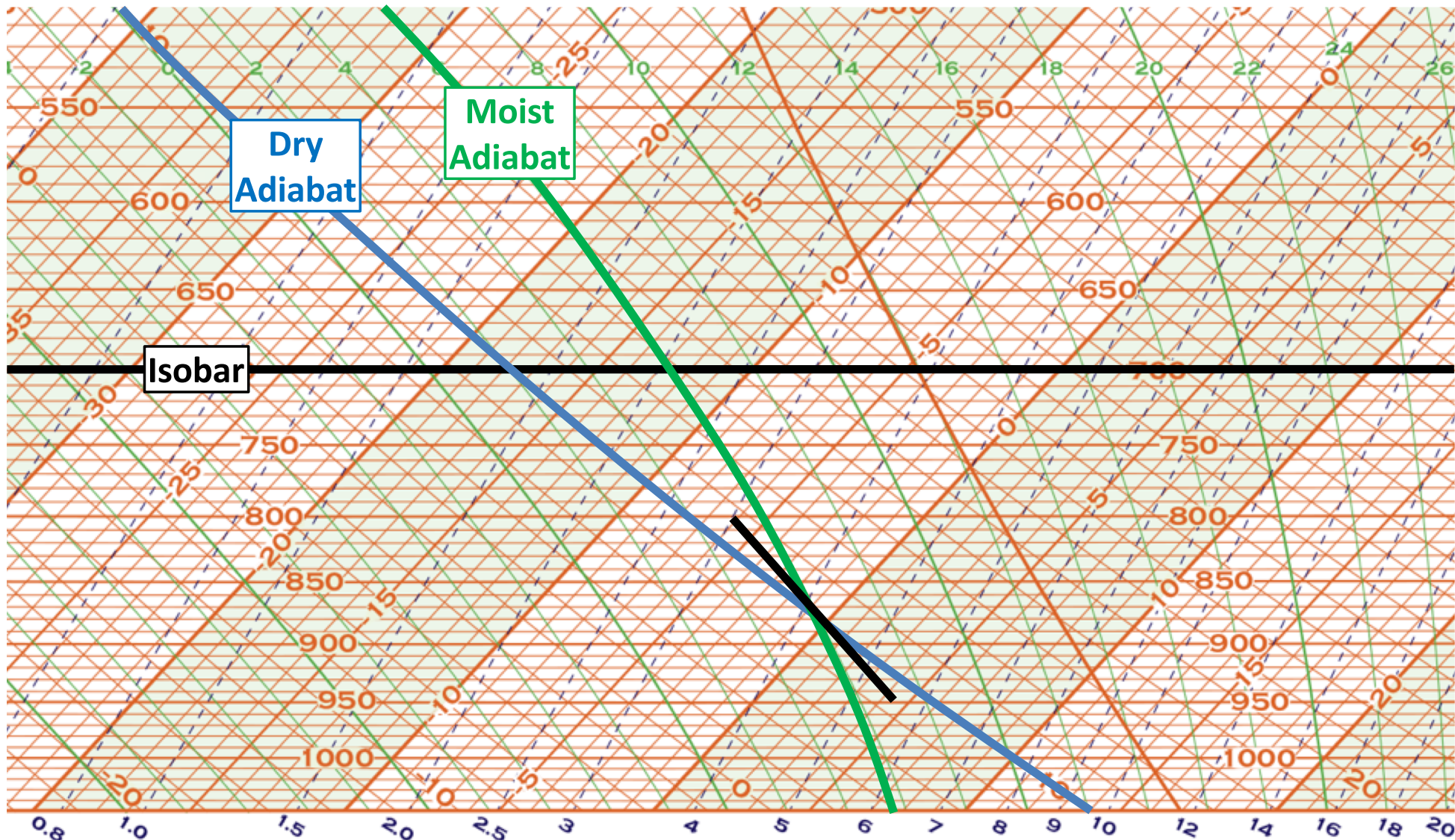
**Absolutely Unstable (Superadiabatic)**





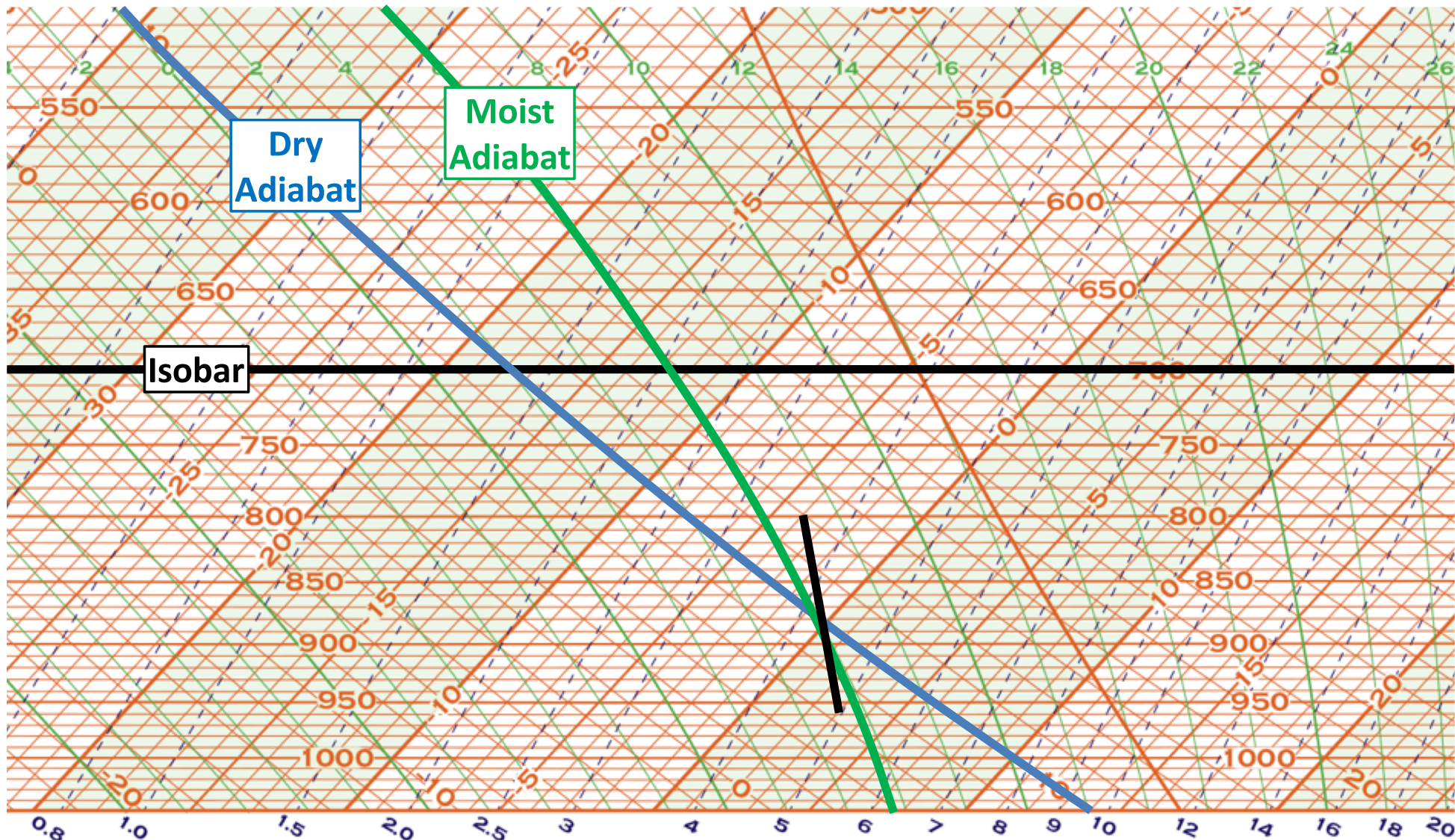
**Dry Adiabatic (Well mixed, dry neutral)**





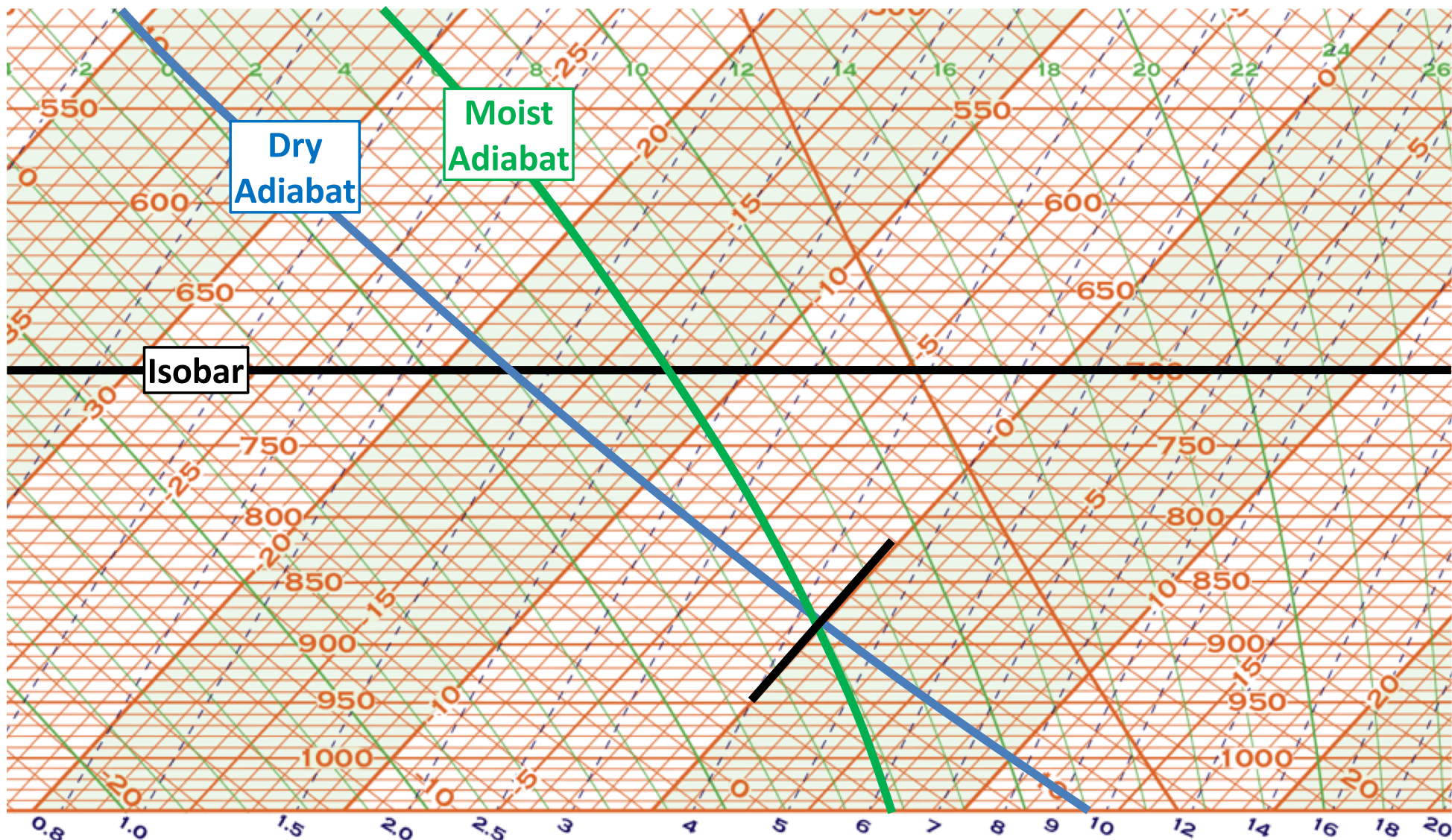
**Conditionally Unstable**





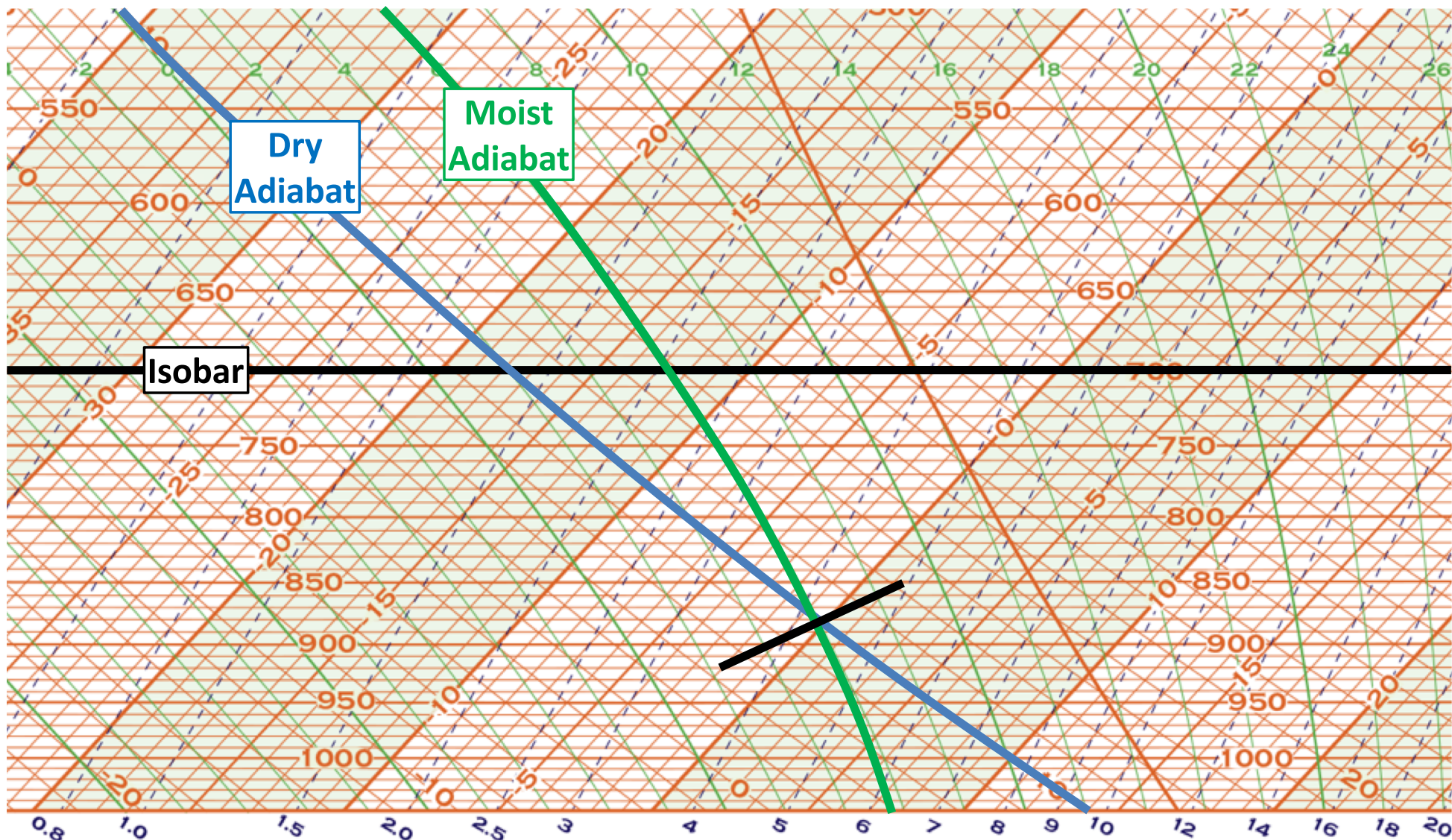
**Absolutely Stable**





Isothermal



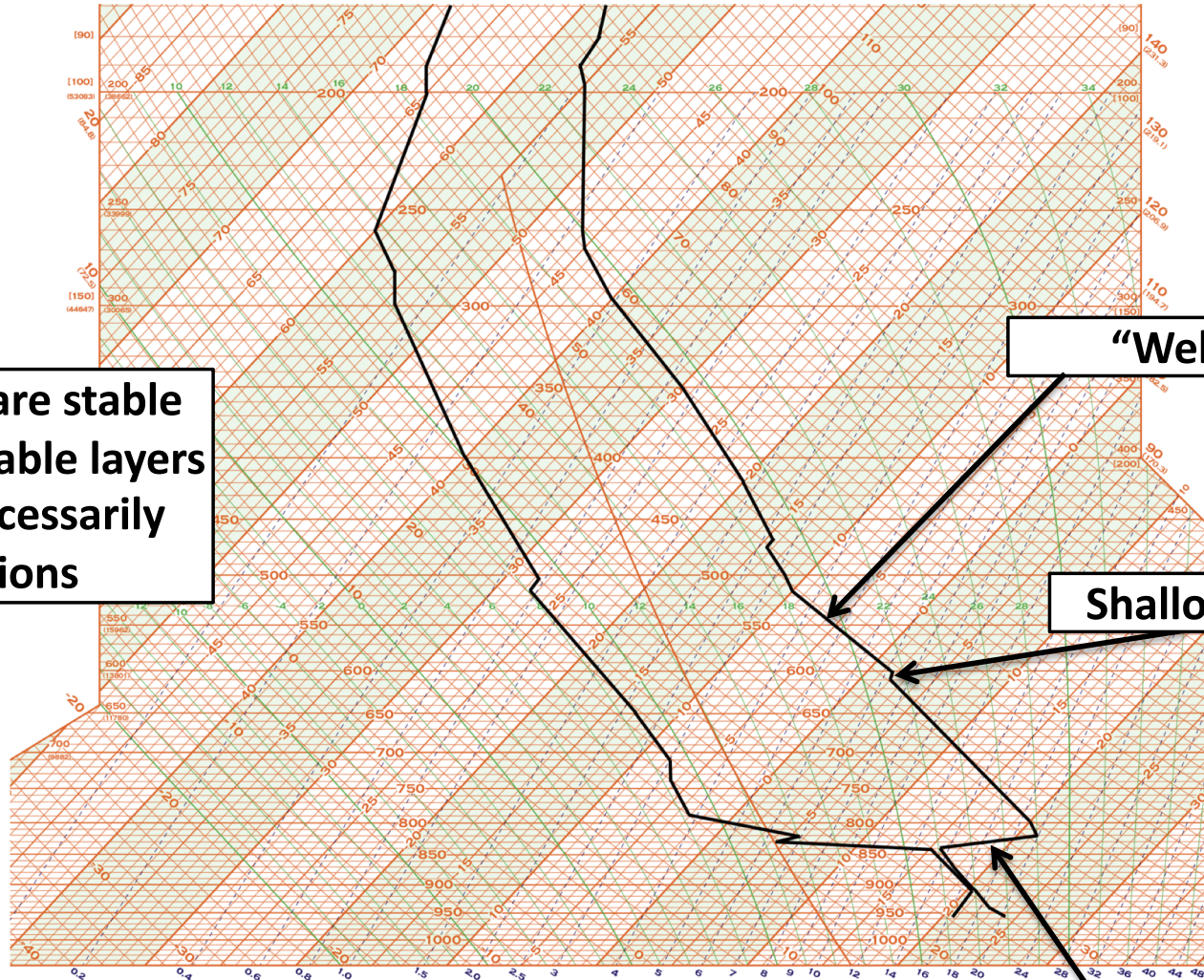


Inverted



# Example

Inversions are stable layers but stable layers are not necessarily inversions



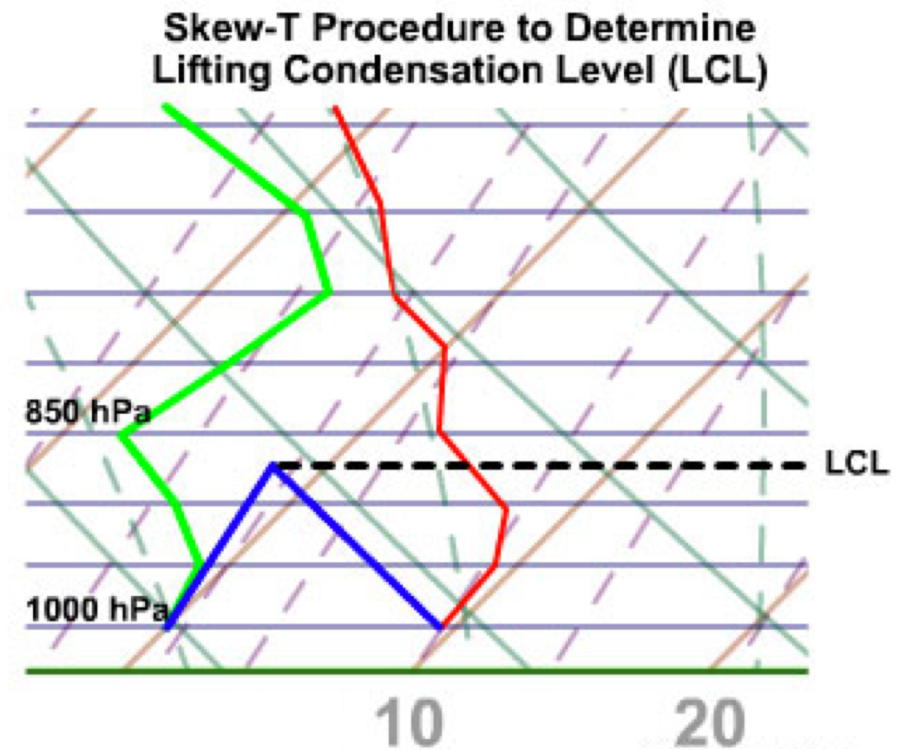
**“Well mixed”**

**Shallow stable layer**

**Inversion  
T increases with height**

# Lifting Condensation Level

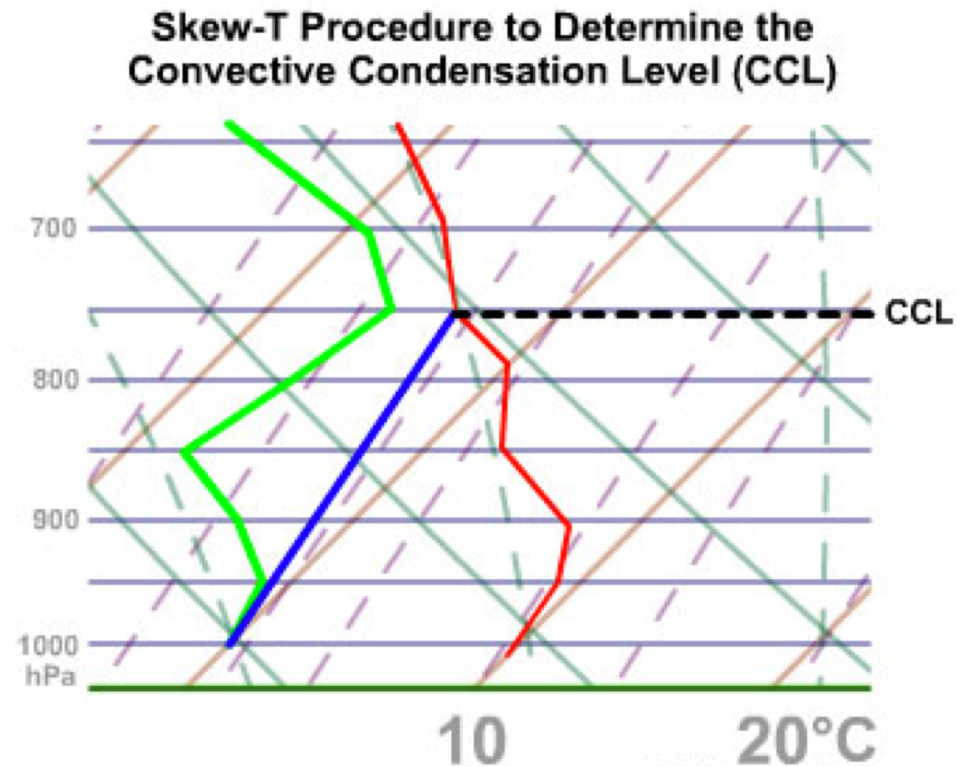
- Height at which a parcel of air becomes saturated if lifted dry adiabatically
- Found by finding where mixing ratio and dry adiabat for surface parcel intersect
- Sometimes average values for a layer are used instead (“mixed-layer” LCL)





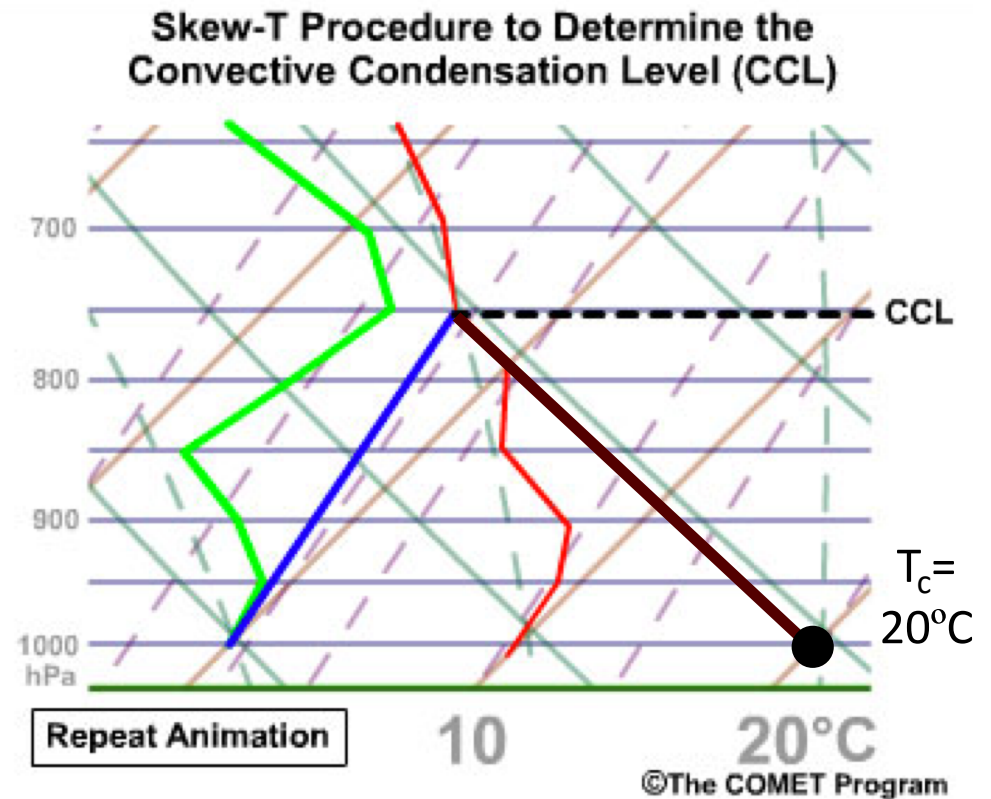
# Convective Condensation Level

- Height to which a parcel of air, *if heated sufficiently from below*, must rise adiabatically to reach saturation
- Found by following mixing ratio line to environmental temperature
- $CCL \neq LCL$ 
  - LCL – Cloud base if lifted
  - CCL – Cloud base if heated

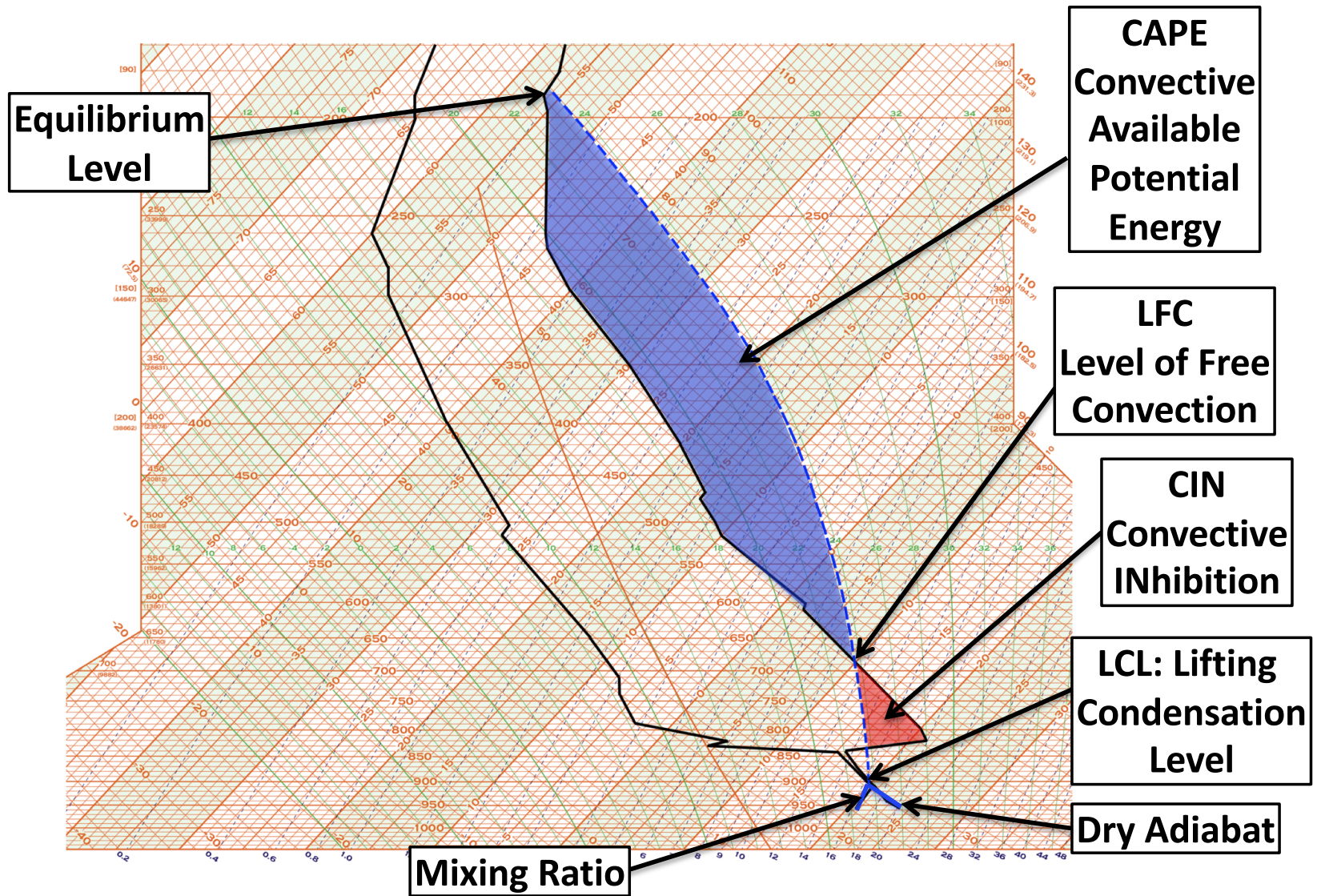


# Convective Temperature ( $T_c$ )

- Temperature that must be reached to form convective clouds from heating
- Found by following dry adiabat to surface from CCL



# CIN, CAPE, and Equilibrium Level



# Flavors of CAPE

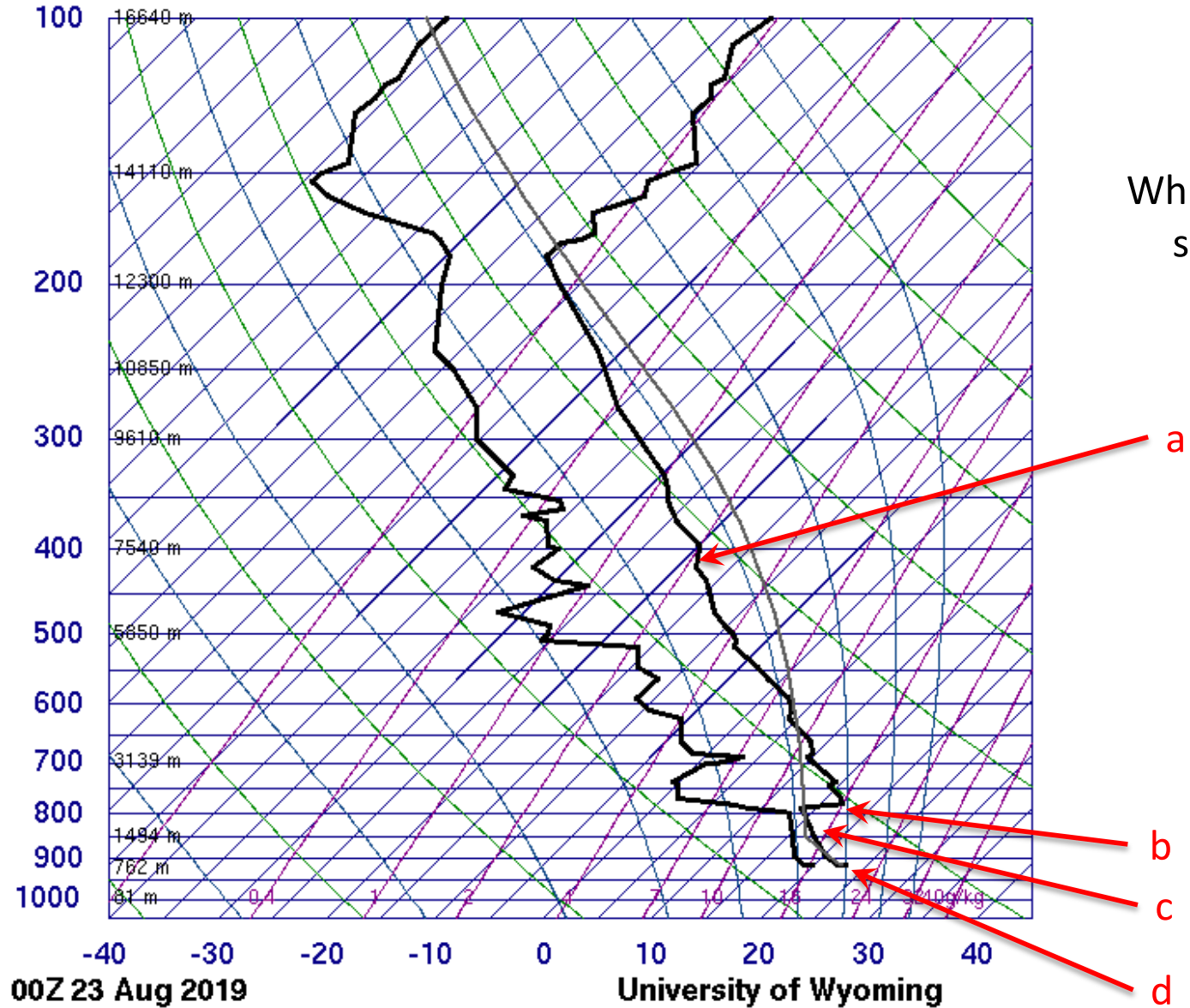
- SBCAPE (Surface-Based CAPE) – Calculated using surface parcel
- MLCAPE (Mixed-Layer CAPE) – Calculated using mean conditions of surface layer (often lowest 100 mb, but can vary)
- MUCAPE (Most-Unstable CAPE) – Highest value of all levels in sounding
- DCAPE (Downdraft CAPE) – Downdraft equivalent of CAPE

# Real-Time Examples

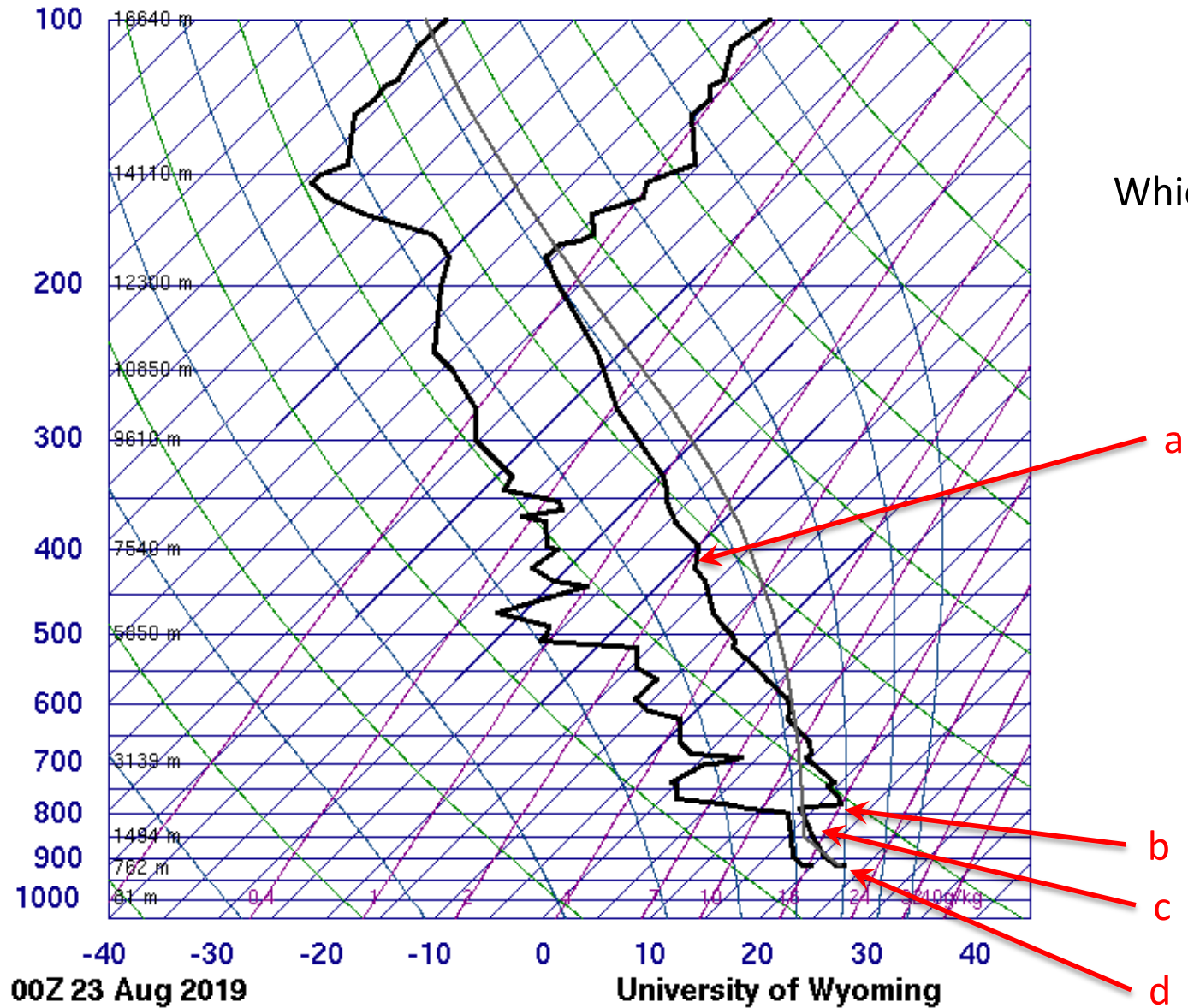


# ClassQuestion Review

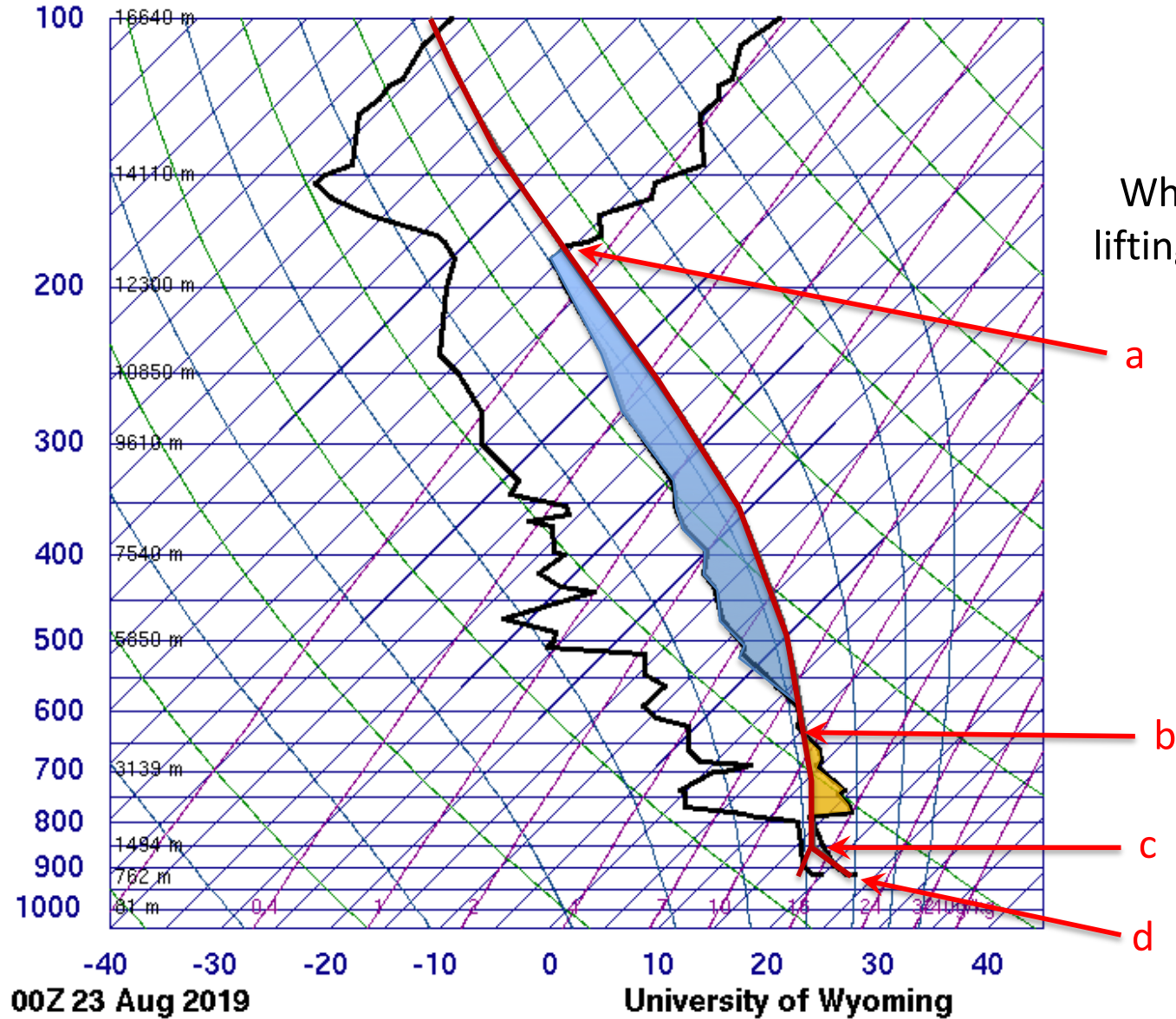
# 72562 LBF North Platte



# 72562 LBF North Platte



# 72562 LBF North Platte



Which of the following is the lifting condensation level (LCL)?

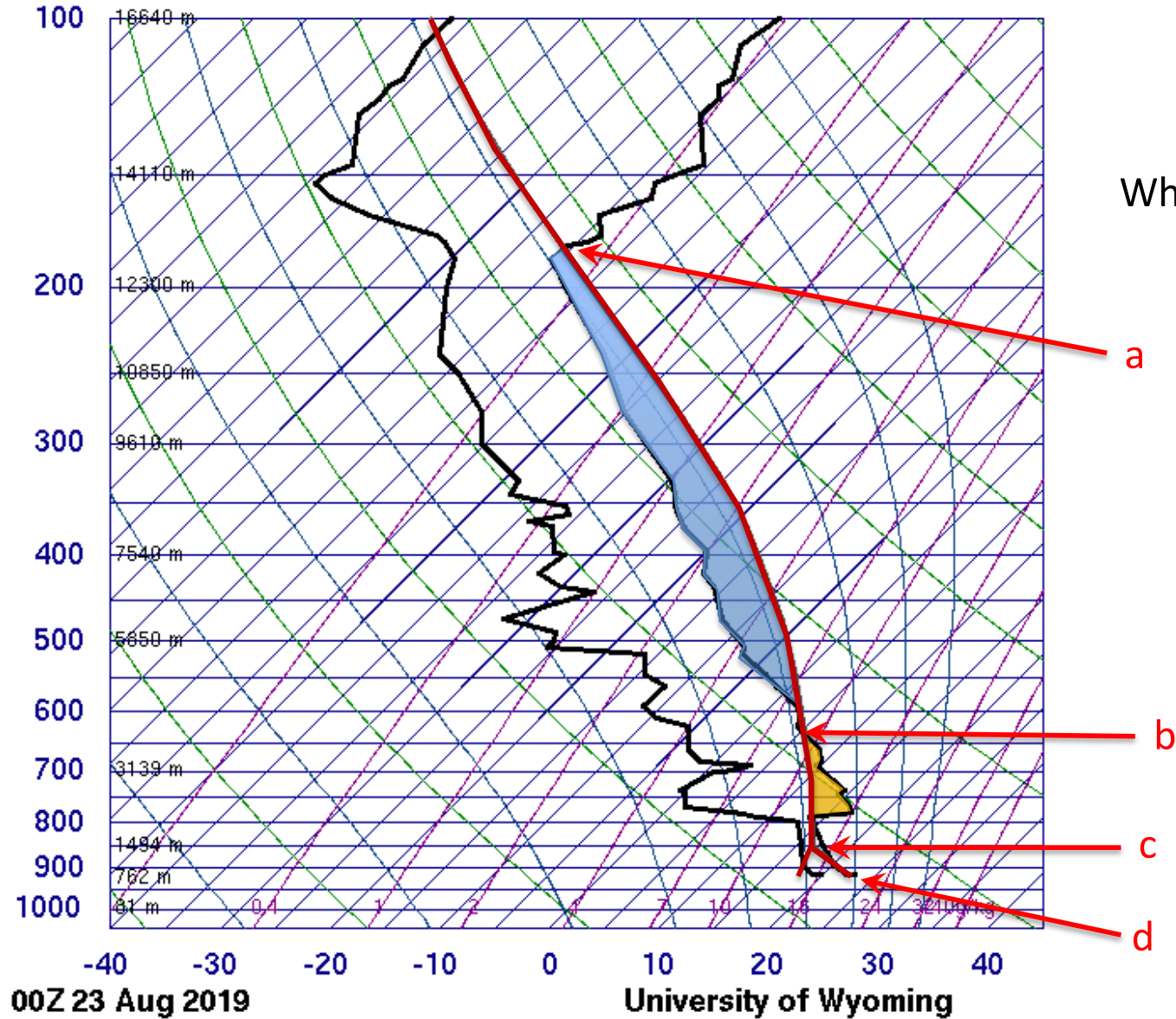
a

b

c

d

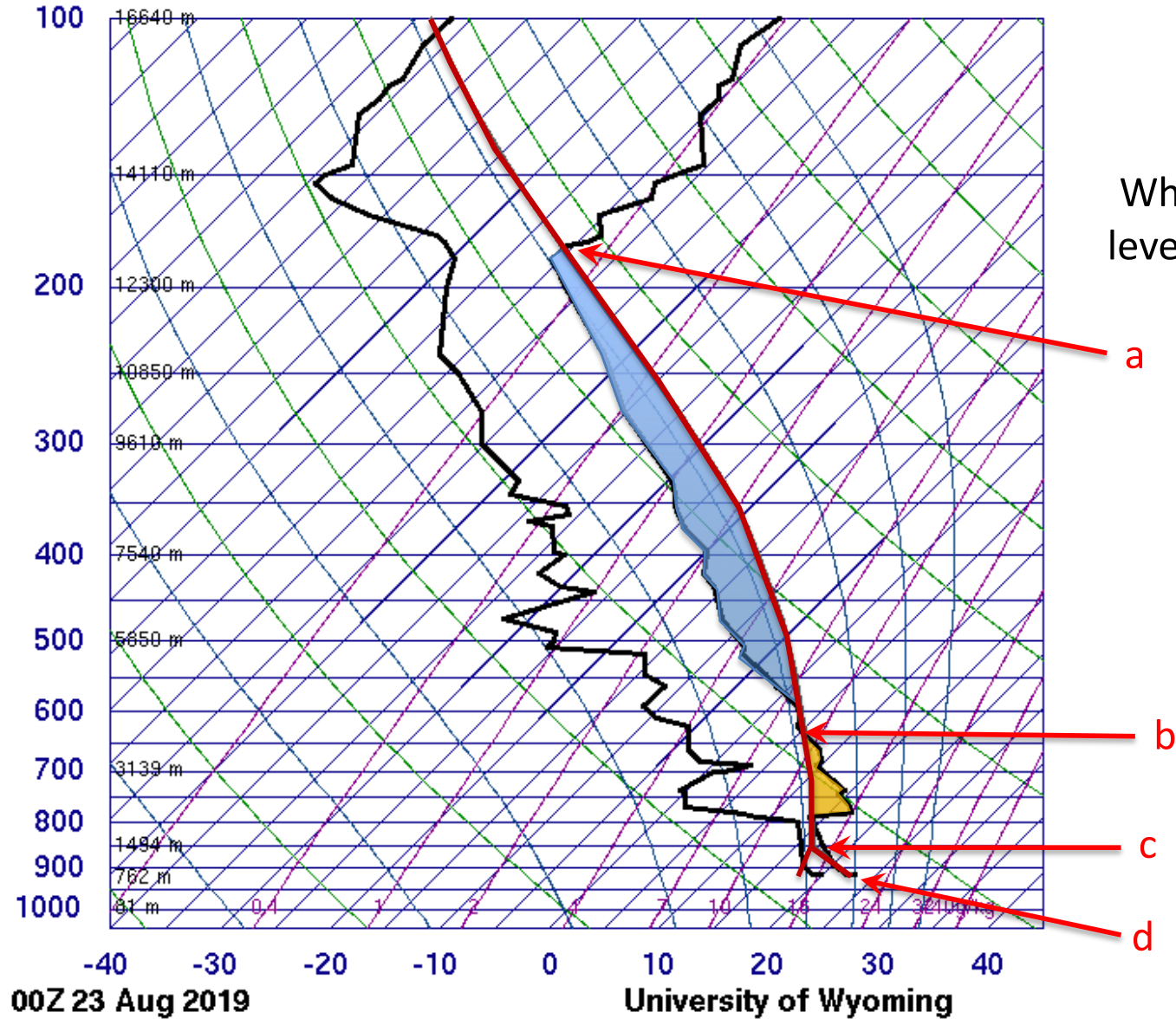
# 72562 LBF North Platte



Which of the following is the equilibrium level?



# 72562 LBF North Platte



Which of the following is the level of free convection (LFC)?

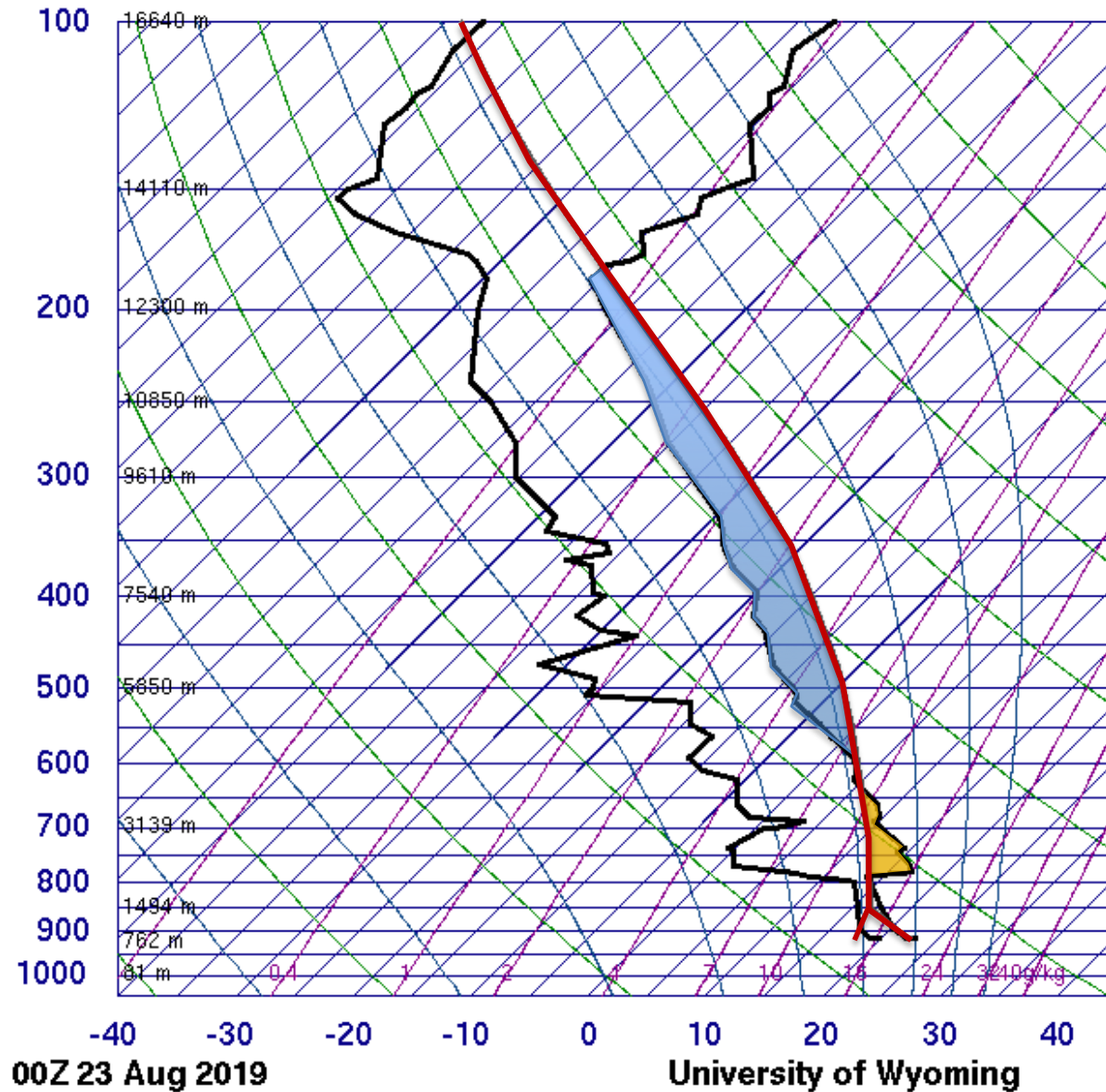
a

b

c

d

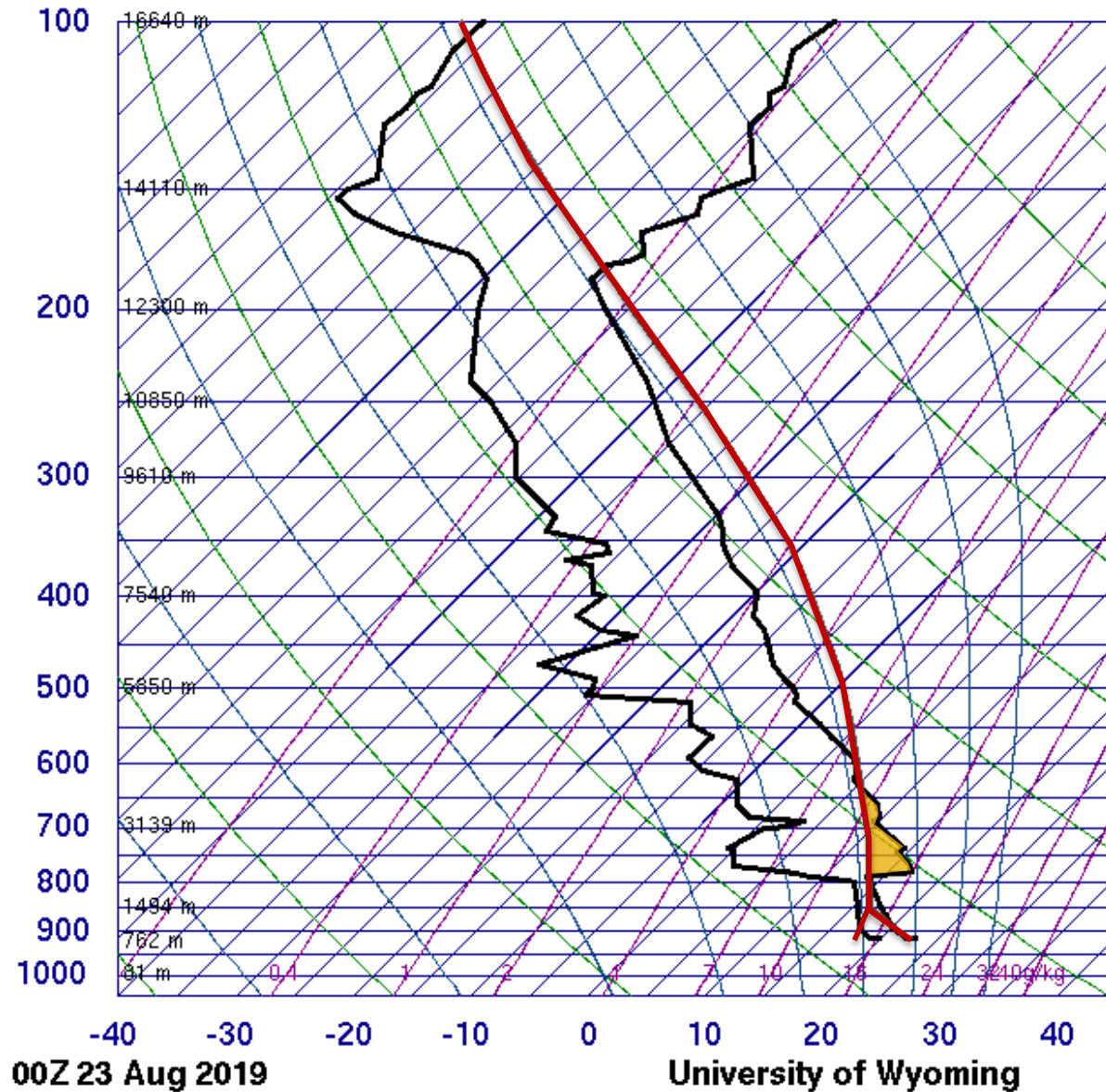
# 72562 LBF North Platte



Based on the parcel path in maroon, the area in blue is the

- a. Surface based CAPE (SBCAPE)
- b. Mixed layer CAPE (MLCAPE)
- c. Most unstable CAPE (MUCAPE)
- d. Downdraft CAPE (DCAPE)
- e. Convective Inhibition (CIN)

## 72562 LBF North Platte



Based on the parcel path in maroon, the area in orange is the

- a. Surface based CAPE (SBCAPE)
- b. Mixed layer CAPE (MLCAPE)
- c. Most unstable CAPE (MUCAPE)
- d. Downdraft CAPE (DCAPE)
- e. Convective Inhibition (CIN)