In this course...

I. Brief introduction to the atmosphere
II. Overview of the Earth System
III. Survey of the atmosphere:
    1. Dynamics
    2. Thermodynamics
    3. Weather systems: Extratropical
    4. Chemistry
    5. Cloud processes
    6. Boundary layer
    7. Radiative transfer
    8. Remote sensing with radar
    9. Weather Systems: High latitude and tropical
    10. Numerical weather prediction
    11. Climate dynamics
IV. Useful research tools in atmospheric science

Thermodynamics

I. Ideal Gas Law
II. Moist thermodynamics
III. First Law of Thermodynamics
IV. Thermodynamic diagrams
V. Second Law of Thermodynamics

Thermodynamics

I. Ideal Gas Law
   1. 5 forms
   2. New constants
   3. Virtual temperature

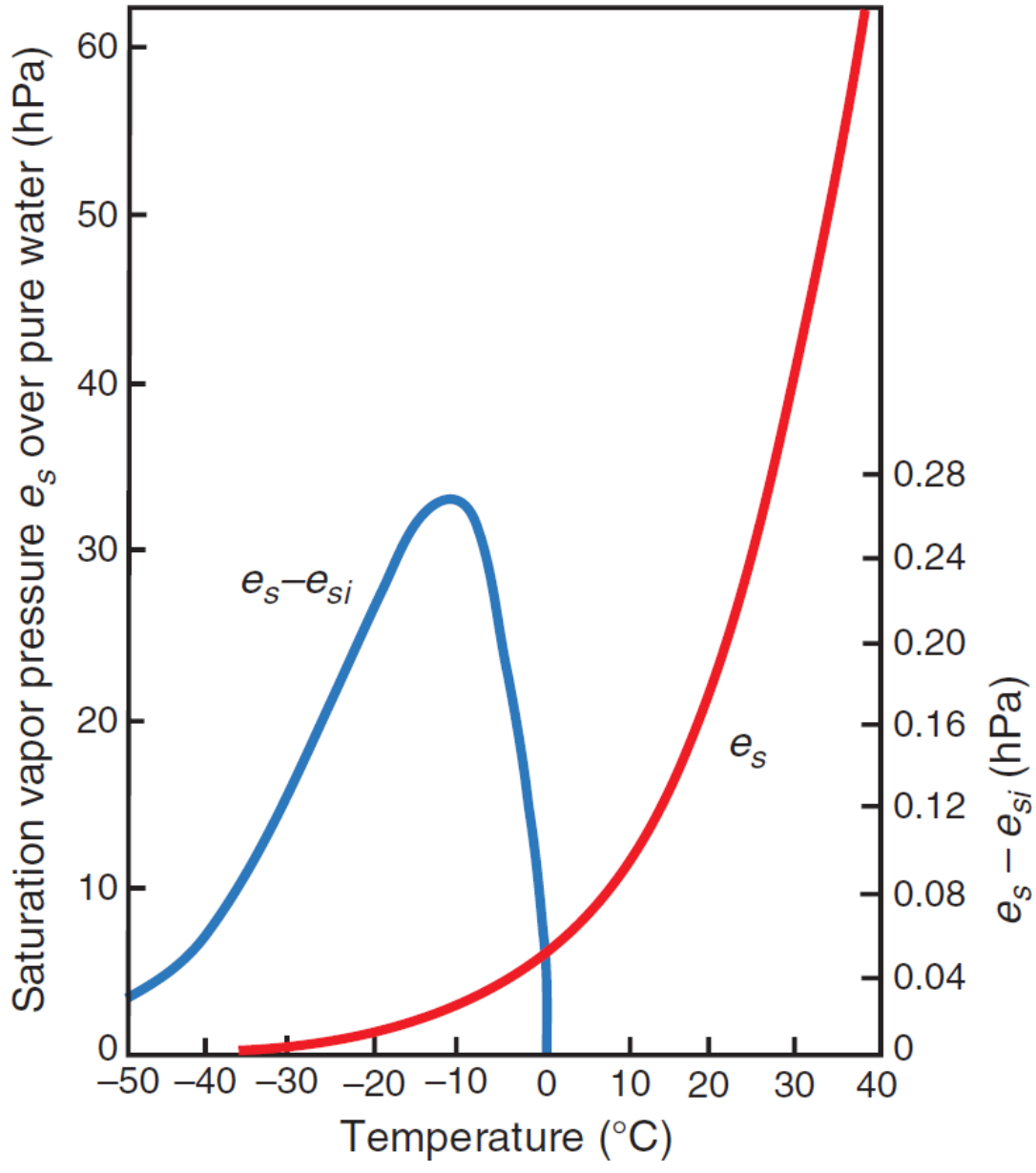
II. Moist thermodynamics
   1. Vapor pressure, mixing ratio, specific humidity
   2. Saturation vapor pressure
   3. Relative humidity, dewpoint temperature

III. First Law of Thermodynamics
   1. Specific heats, enthalphy
   2. Dry and moist static energy
   3. Atmospheric lapse rates

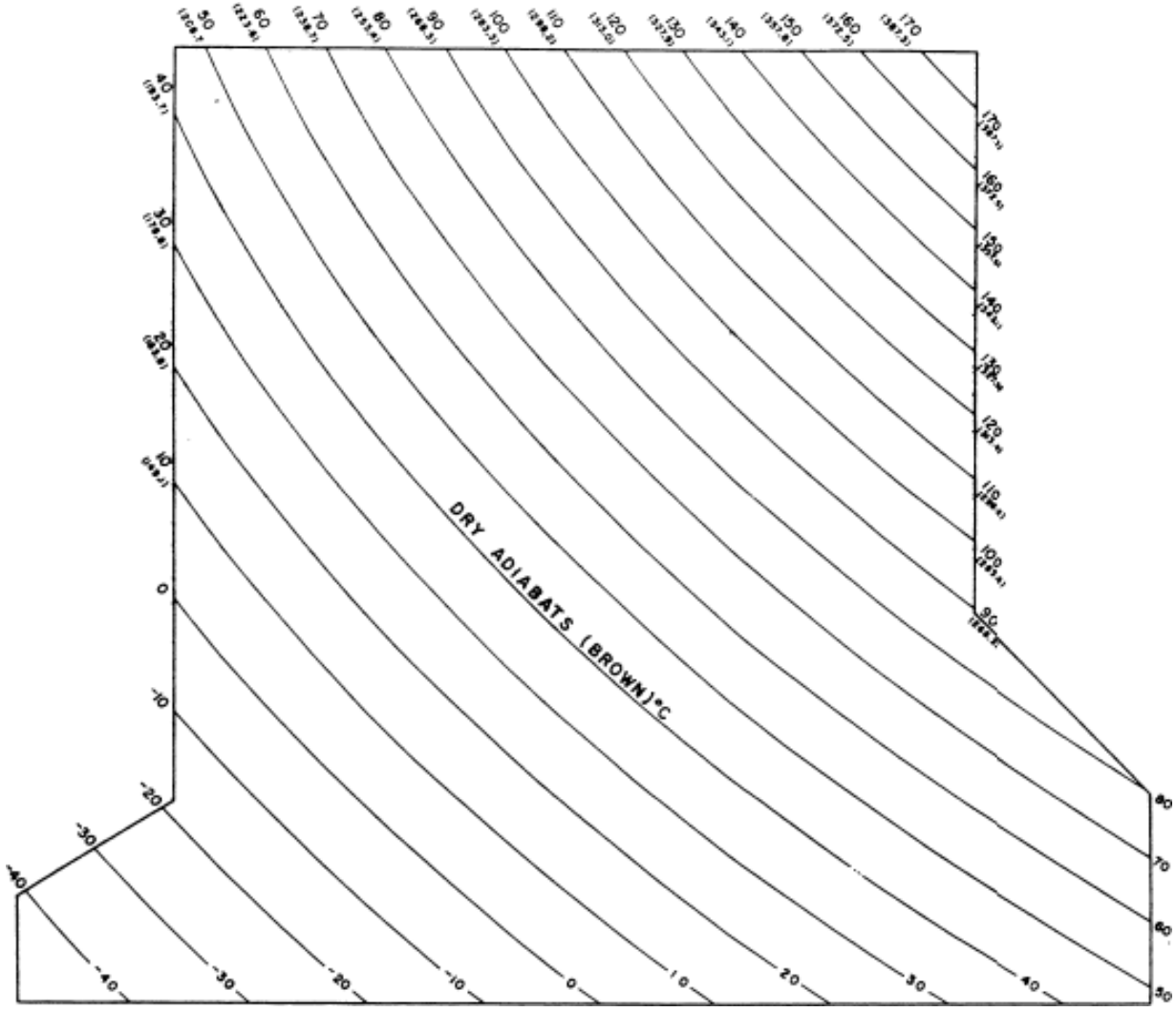
IV. Thermodynamic diagrams

V. Second Law of Thermodynamics
   1. Carnot cycle

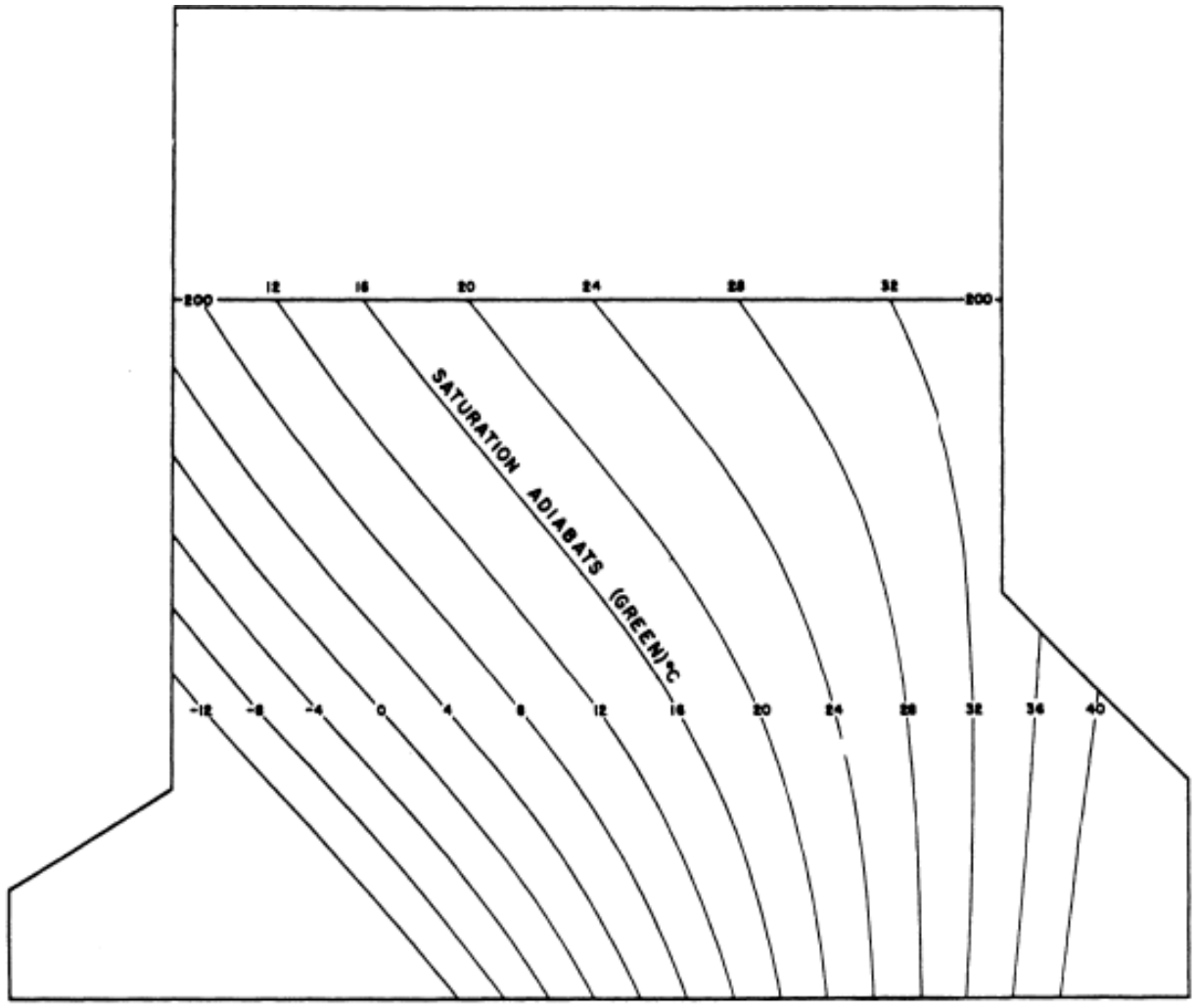
Variations with temperature of e_s and e_{si}



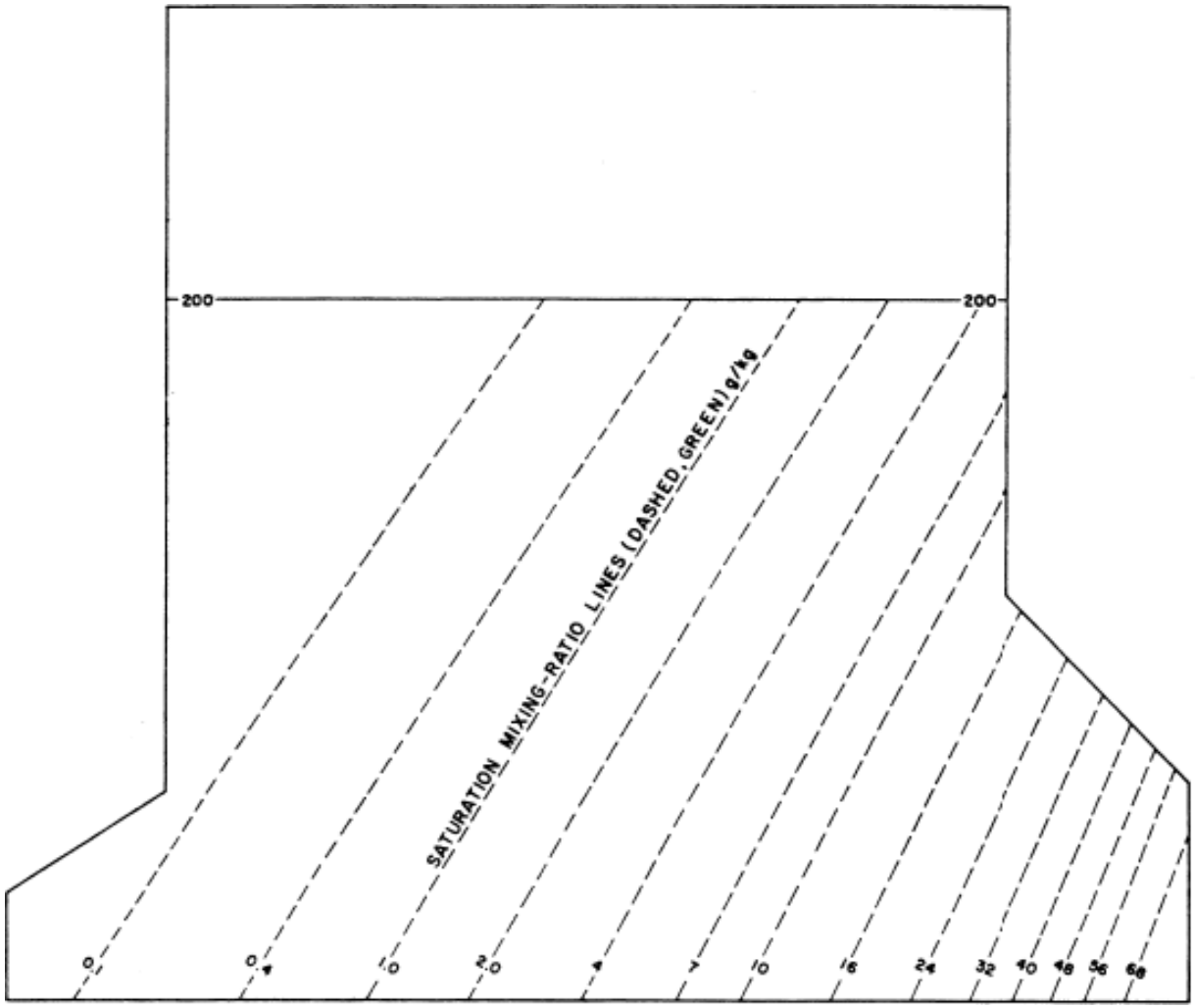
Skew T-log p: Dry adiabats



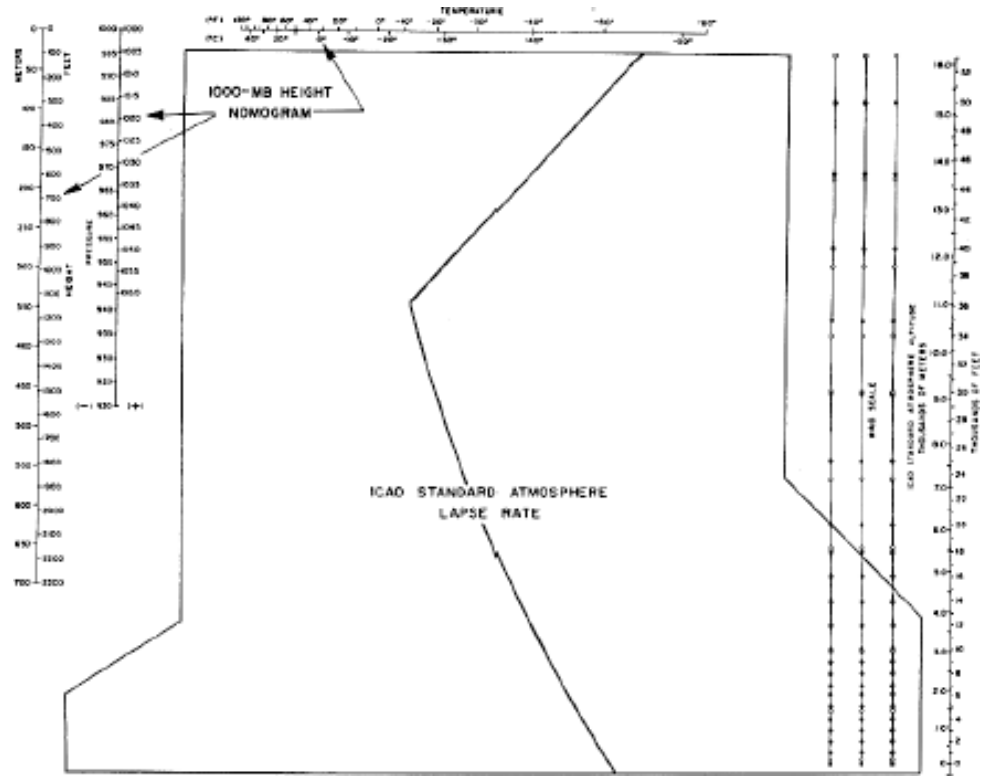
Skew T-log p: Moist adiabats



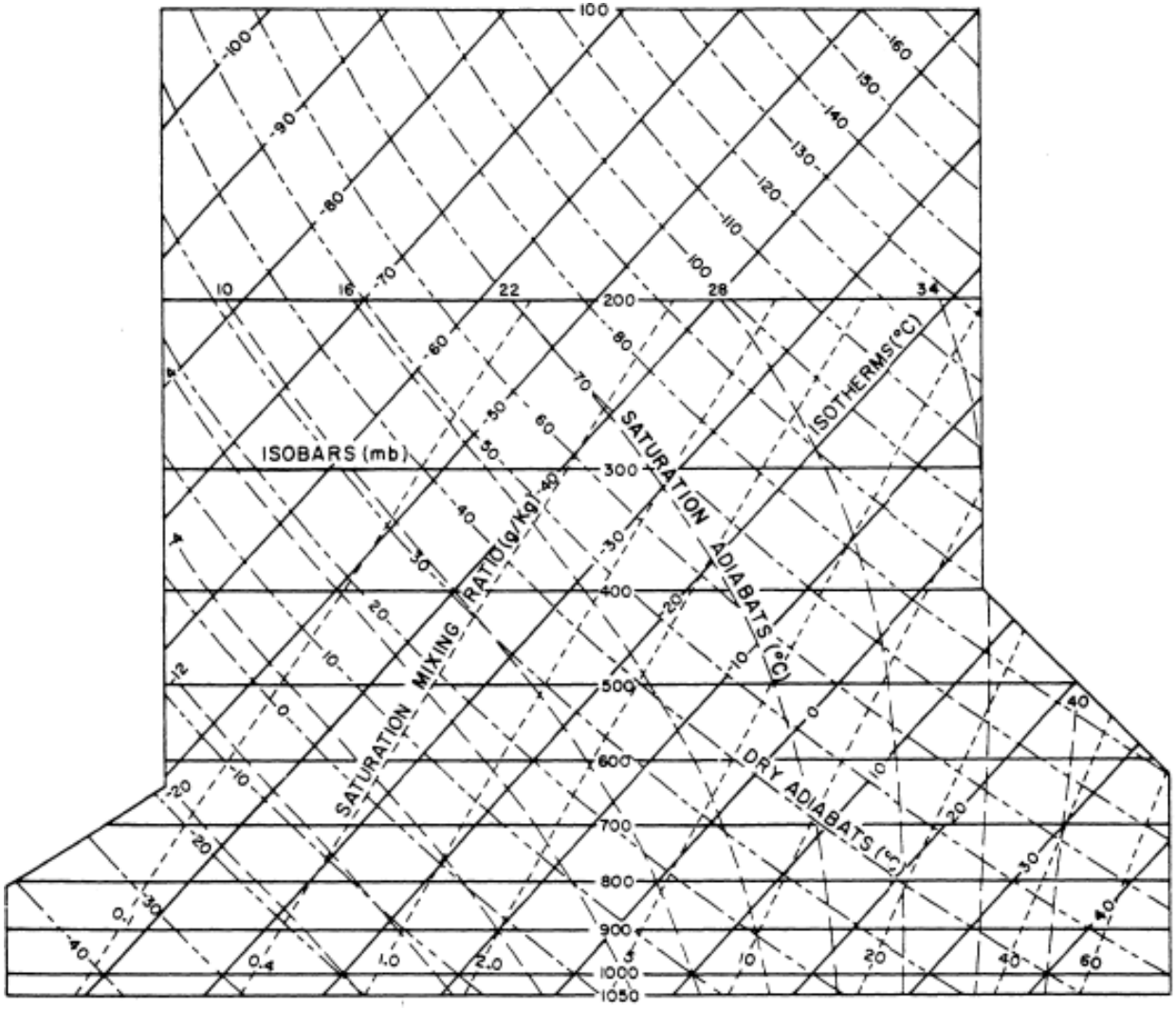
Skew T-log p: Moist adiabats



Skew T-log p: International Civil Aviation Organization (ICAO) Standard Atmosphere



Skew T-log p


ISOBARS (mb)
ISOTHERMS(°C)
SATURATION ADIABATS (°C)
DRY ADIABATS (°C)
SATURATION MIXING RATIO (g/kg)
100
200
300
400
500
600
700
800
900
1000
1050

Skew T-log p: Plotting data

Balloons are sent up from specific weather stations around the world at the same time (00 and 12 UTC) each day and report temperature, relative humidity, and wind. The instruments measure barometric pressure, and thus report data at various pressure levels.

Mandatory levels. Levels where a report is required: Surface, 1000-mb, 850-mb, 700-mb, 500-mb, 400- mb, 300-mb, 250-mb, 200-mb, 150-mb, 100-mb, 70-mb, 50-mb, 30-mb, 20-mb, 10-mb, 7-mb, 5-mb, 3-mb, 2-mb, 1-mb

Significant levels. Levels other than the mandatory levels which are required for the reasonable accurate reproduction of a pressure, temperature, or dewpoint profile. Usually it represents a change in the slope of the profile.

Carnot Cycle