I. Distribution of temperatures
    1. Cooler in polar areas
    2. Warmest at tropics in continental areas
    3. Warmness follows the direct rays of Sun: as it travels from tropic to tropic throughout year
    4. Oceanic currents warm western side of ocean basins, and the continents adjacent to them
    5. Oceanic currents cool eastern side of ocean basins and the continents adjacent to them.

II. Latent heat of water
    1. Latent means hidden
    2. Requires heat to melt ice or evaporate water—
        1) no change in water temperature as it occurs
        2) cools environment in area of evaporation or melting
    3. As water condenses from vapor in air, releases this heat to environment—keeps temperature up
    4. Heat also released as water freezes from liquid or from vapor in air (frost)

III. Saturation of air with water
    1. Air at 25^{o}C can hold 20 grams of water per kilogram of air—amount varies with temperature
    2. Description of air in terms of its 'relative humidity,
        1) comparison of how much water it has to how much it could hold at that temperature
        2) can change relative humidity by changing temperature, or by changing water content
    3. relative humidity of 100% is saturated—
        1) usually reached by cooling the air
        2) temperature at which the air becomes saturated is called 'dew point temperature'
            a) excellent measure of actual water content of air
            b) air with less moisture has lower dew-point temperature than air that has more
        3) measure humidity with temperature of dew point by evaporation cooling
            a) cause evaporation of water on thermometer bulb—measure lowest T
            b) compare to environment temperature and use tables to determine RH, DP
        4) determine dew-point temperature by condensation cooling with ice in beaker
    4. as air reaches saturation, continued cooling can only occur with release of moisture
        1) absolute amount of moisture decreases as condensation occurs
        2) condensation into clouds, rainfall, dew releases latent heat to environment

IV. Adiabatic temperature change
    1. Temperature of gases changes with volume and pressure of gas
    2. DRY air changes at 10^{o}C/1000 m—decreases as pressure decreases
    3. Air that is saturated with water changes at ~6^{o}C/1000 m
        1) Air cools with pressure decrease
        2) Gets to the 'dew point' temperature and water begins to condense
        3) Condensation releases heat, which keeps temperature from declining as fast

V. Atmospheric stability is the interplay between the environmental lapse rate and the adiabatic lapse rate

1. Several causes of initial lifting of air
    1) CONVECTION: Heating by radiation from Earth surface—reduces density, air goes up
    2) OROGRAPHIC: Forced upward over barriers by wind currents
    3) Air mass interaction—
        a) FRONTAL: warmer air mass rises over cooler air mass
        b) CONVERGENCE: intertropical convergence zone, polar front, etc.
2. Differences in temperature of environment and the rising air packet determine stability
    1) If adiabatic cooling makes air cooler than environmental temperature, it is stable
    2) If adiabatic cooling leaves air warmer than the environment, it is unstable:
    3) it keeps rising without need for continued application of the original cause of lifting
    4) often this is created by cloud formation: release of latent heat of condensation