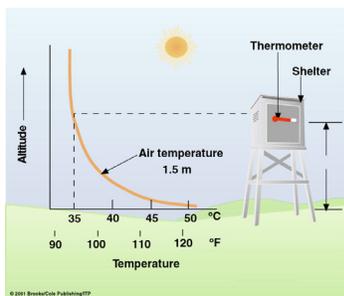


Chapter 3, Part 2

Daily Temperatures

Daytime Warming

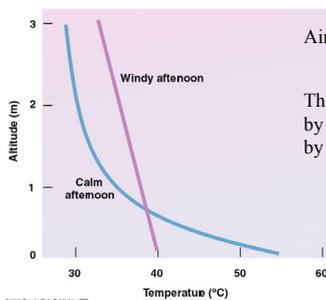


The atmosphere does not absorb much solar radiation.

The sun heats the ground which in turn heats the air above the ground.

Notice the difference in temperature between heights of 1.5 m and 0 m.

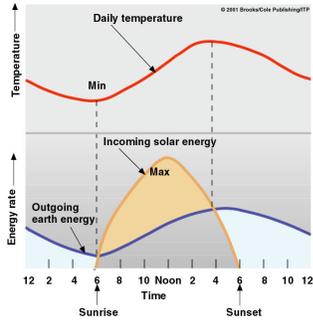
Conduction and Convection



Air is a poor conductor of heat.

The atmosphere heats primarily by convection (calm) or by forced convection (windy).

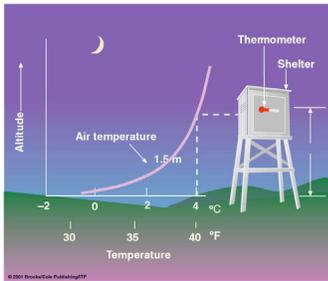
Daily Maximum and Minimum Temp.



Note that the maximum temperature does not occur where there is maximum incoming solar radiation.

See U.F. weather station.

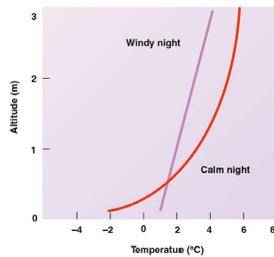
Nighttime Cooling



Both the ground and air radiate infrared energy, but the ground is a much better radiator.

Consequently, the ground is cooler leading to a **radiation inversion**.

Nighttime Radiation Inversion



Radiation inversion is larger on:

- Windless nights
- Long nights
- Clear nights
- Dry nights.

Protecting Crops from Cold



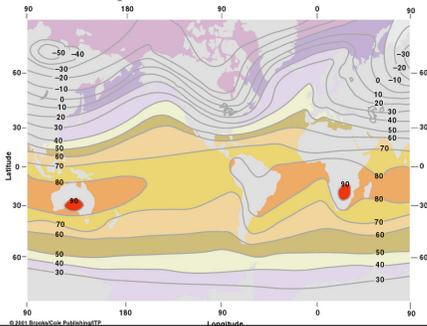
- Orchard heaters
- Wind machines
- Water (flooding)
- Water (spraying)

Controls of Temperature

- The most important factors in determining temperature are
 1. Latitude
 2. Land and water
 3. Ocean currents
 4. Elevation

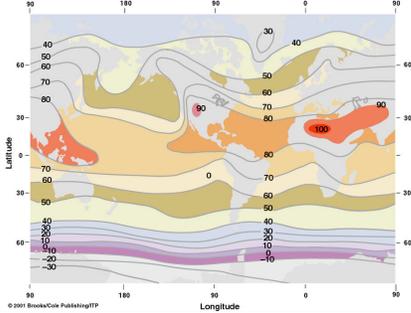
Average Air Temp. in January

Map of **isotherms** at sea level.



Average Air Temp in July

Map of isotherms near sea level.



Daily Air Temperature Data

- Daily (or diurnal) range of temperature = difference between daily maximum and minimum temperature. Largest in clear, dry regions, e.g., desert.
- Mean daily temperature = average of daily maximum and minimum temperature.
- Mean monthly temperature = average of mean daily temperatures for that month.

Annual Air Temperature Data

- Annual range of temperature = difference between the average temperature of the warmest and coldest months. Largest in middle of continents at higher latitudes.
- Mean (average) annual temperature = average of monthly average temperatures.

Example of Temperature Data



Use of Temperature Data

- Heating degree-day = subtract mean temperature from 65°F.
- Cooling degree-day = 65°F minus mean temperature.
- Growing degree-day = mean temperature minus base temperature for that crop, e.g., 40°F for wheat and 60°F for cotton.

Annual Cooling Degree-days in thousands of °F



Air Temp. and Human Comfort

- Wind increases heat loss from the body leading to the wind-chill factor.
- For example, when the air temperature is 35°F and the wind is blowing at 30 mph, the wind-chill equivalent temperature is 4°F.

Types of thermometers

- Liquid-in-glass thermometers
- Maximum thermometer
- Minimum thermometer
- Electrical thermometers
- Radiometers (infrared sensors)
- Thermograph and bimetallic thermometers

Summary

- During the day, the sun warms the ground which in turn warms the air.
- At night the ground loses heat more rapidly than the air leading to a radiation inversion.
- The temperature is controlled by latitude, land and water, ocean currents, and elevation.
- Temperature data can be used for estimating heating, cooling, growing, and human comfort.
