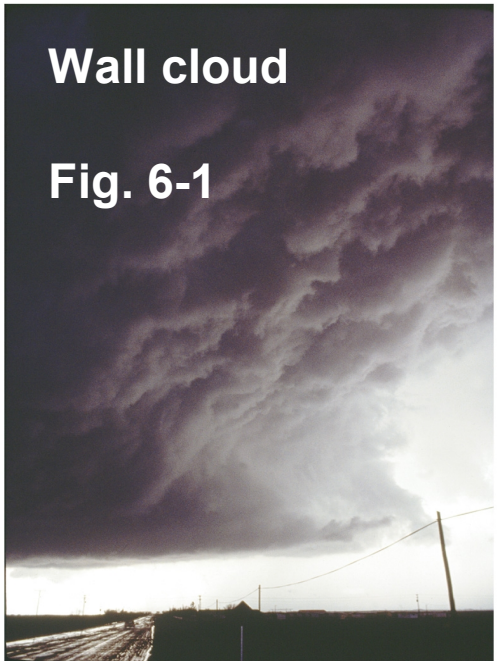
Goal for today: finish Ch 6.

17 Oct., 2011

- Quiz 2 mean score 9.3/15 (12 students scored 13 or higher)
- some students' UA email addresses are failing temporarily or permanently

Dr. Myers' lecture covered how the static stability of the atmosphere can be assessed (layer by layer) by comparing ELR with benchmarks (the DALR & SALR)



Today we cover

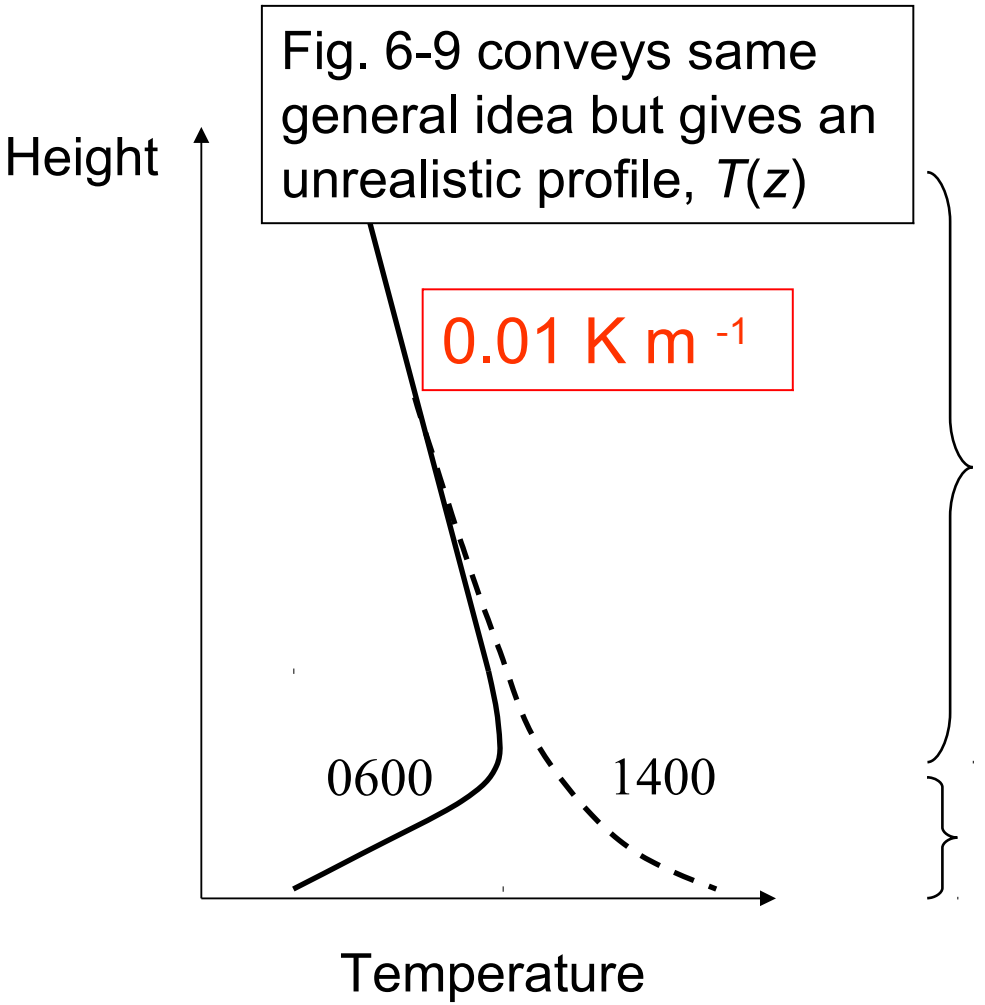
- factors that alter the ELR

- cloud classification/identification**

Books have been written for the amateur on weather forecasting based on cloud observation (and there is a WikiHow site). Recognizing cloud type can sometimes help you diagnose likely weather in the short term (hours).

Factors influencing the ELR

1. Surface heating & cooling



Neutral layer (ELR=DALR) is destabilized due to heating from below

Nocturnal ground-based inversion is eroded by the addition of daytime heat

Factors influencing the ELR

2. “Advection”

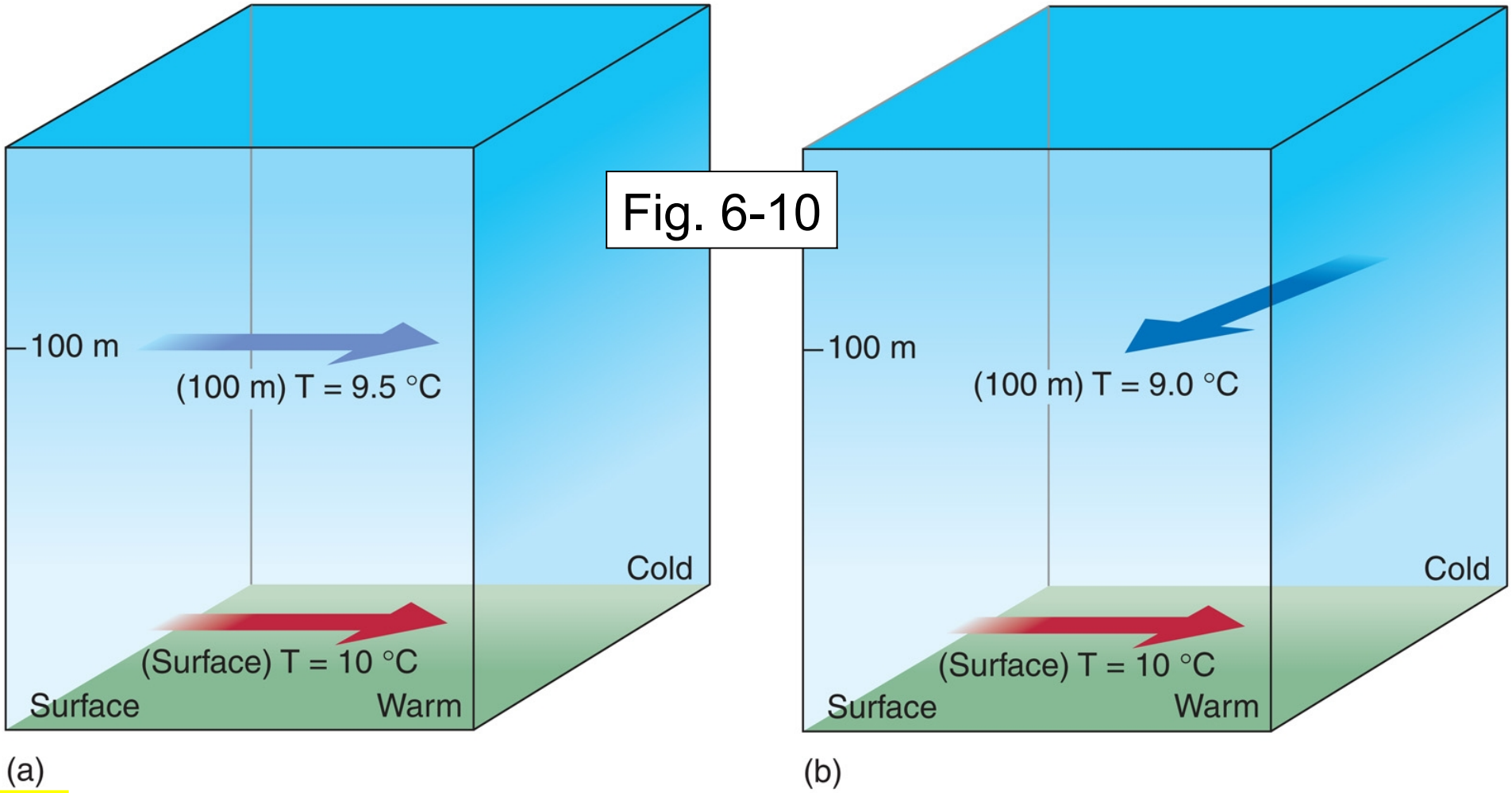


Fig. 6-10

Factors influencing the ELR

3. “Airmass change”

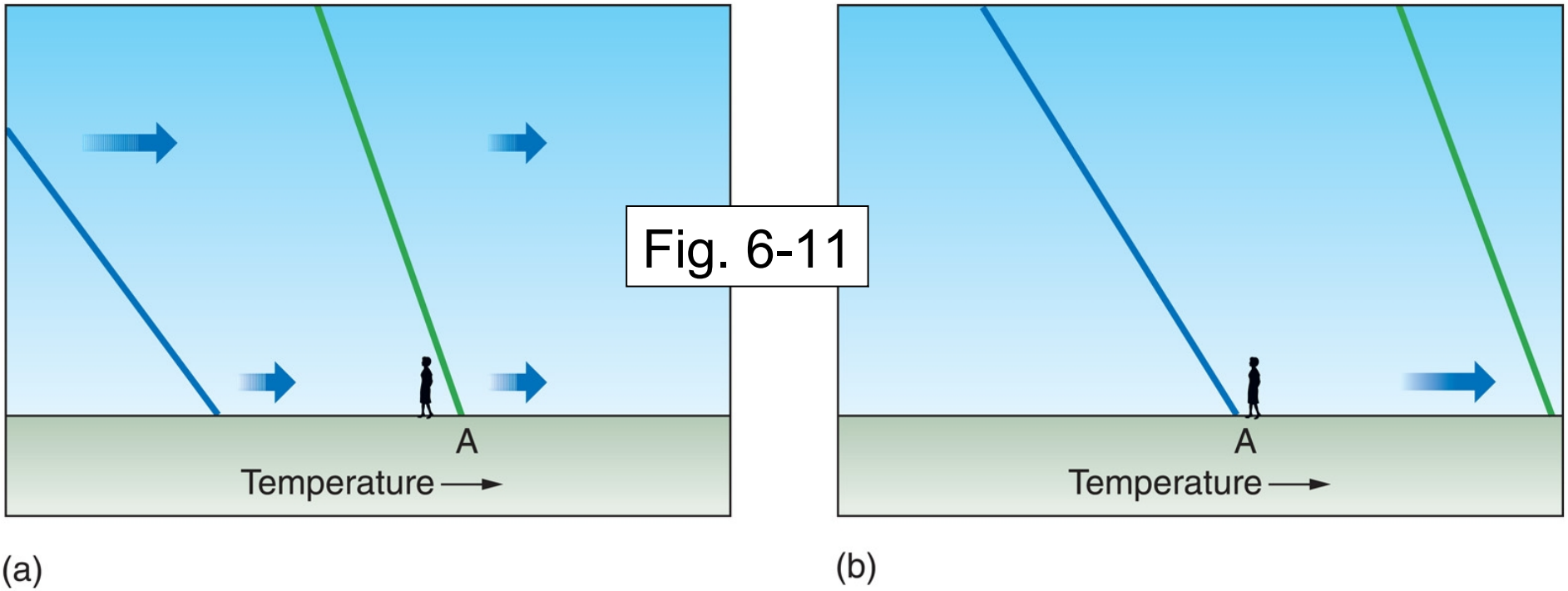


Fig. 6-11

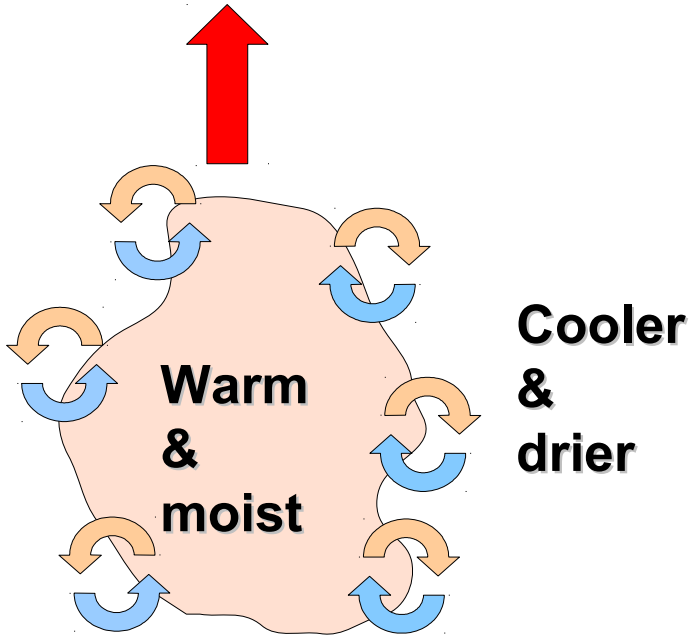
(a) (b)

“The atmosphere has a strong tendency to be arranged into large areas distinguished by small horizontal differences in temperature and humidity. These so-called airmasses maintain their temperature and moisture characteristics as they move from one place to another” (p177)

What limits the ascent of a rising parcel?

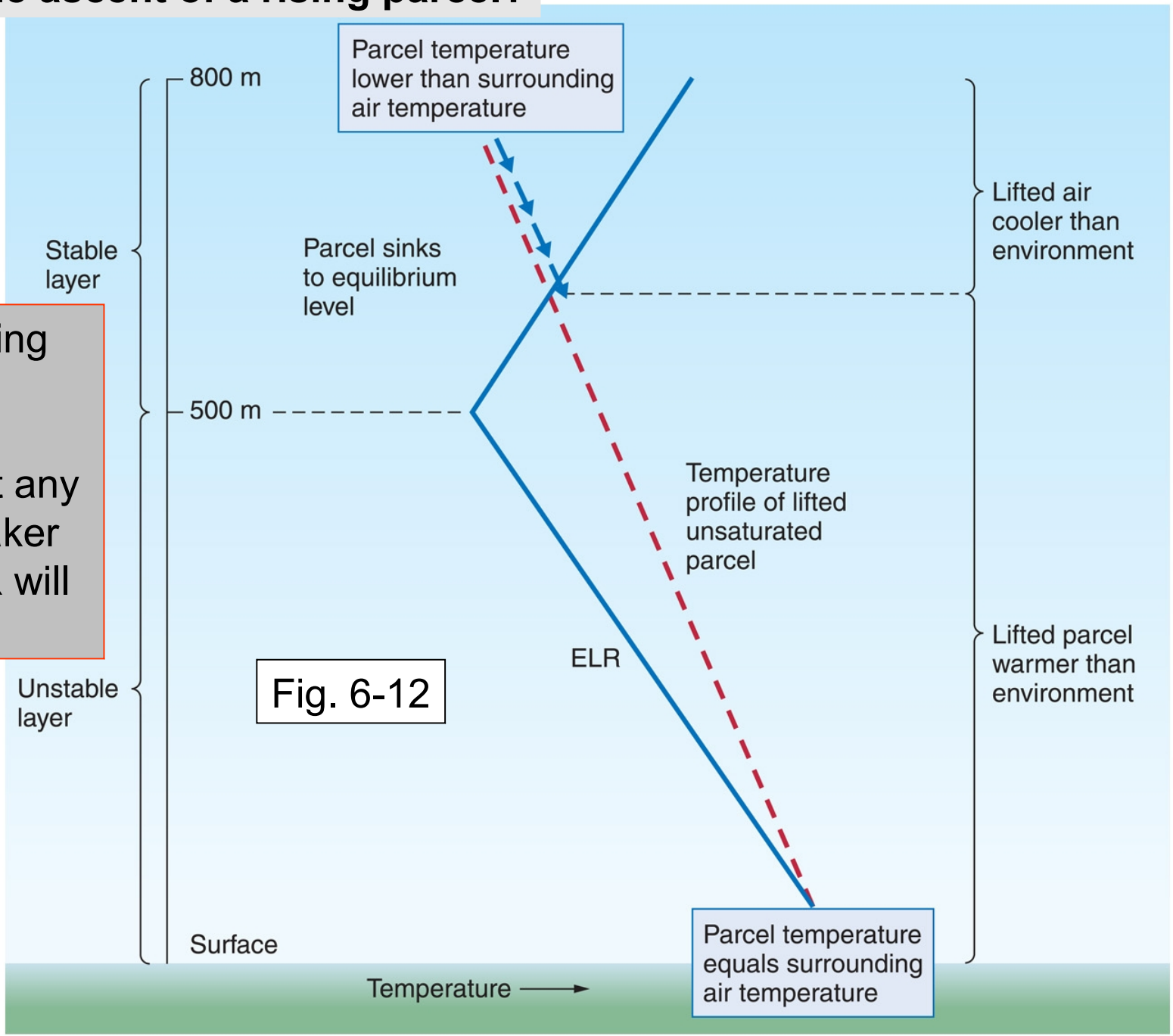
• entrainment (i.e. mixing) of unsaturated environmental air into the rising parcel – may result in evaporation of water droplets, cooling the parcel

• ascent of the parcel into a stable layer



What limits the ascent of a rising parcel?

Here the capping stable layer is shown as an inversion – but any lapse rate weaker than the SALR will do the job…

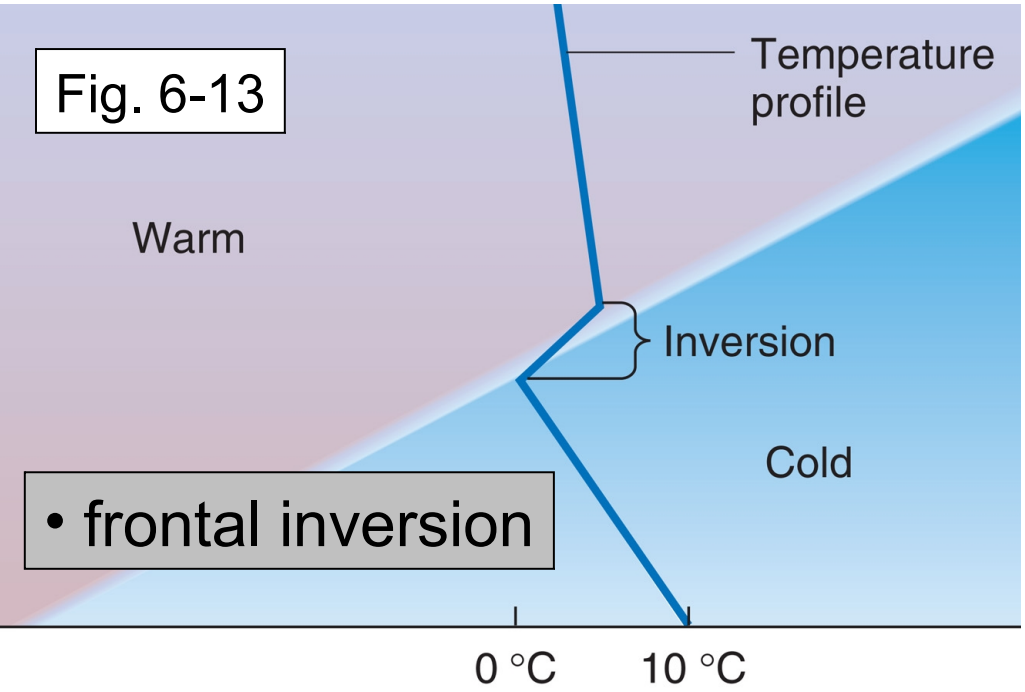


Types of inversions

• radiation inversion

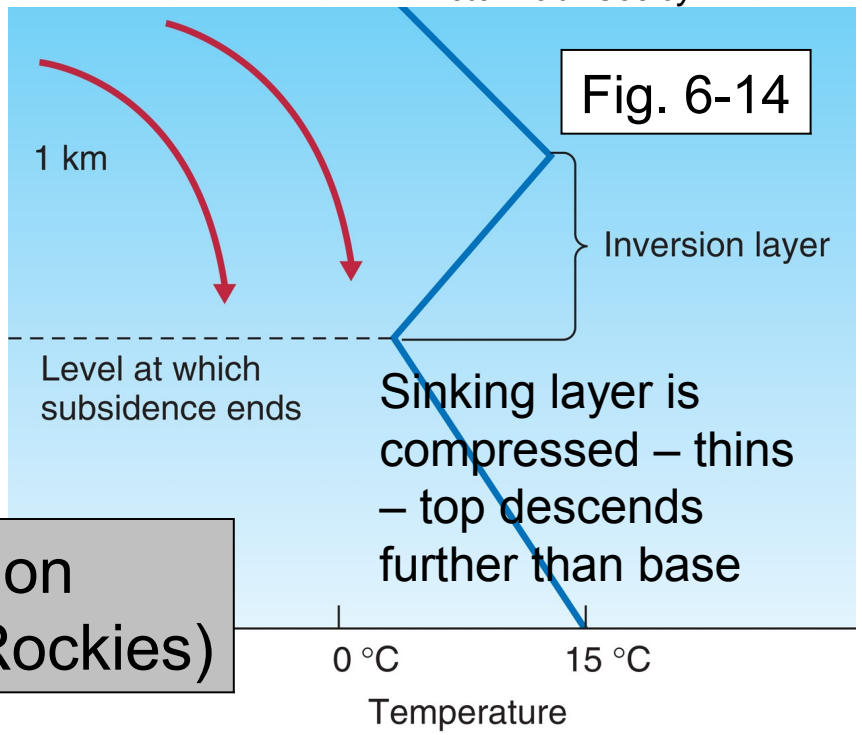
Photo :Keith Cooley

Fig. 6-13



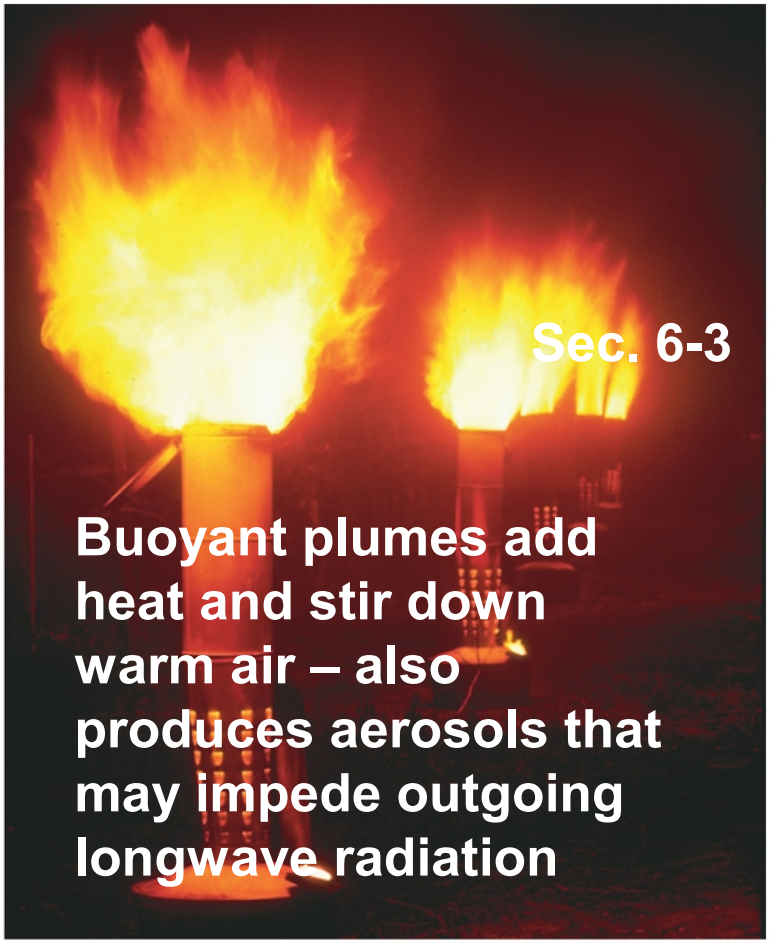
• frontal inversion

Fig. 6-14



• subsidence inversion (common in lee of Rockies)

Methods to induce nocturnal mixing and prevent freezing of valuable crop



Another method is to spray liquid water on the crop/leaves; its freezing releases latent heat and a mix of water and ice will be at the freezing point. This keeps the fruit within a few degrees of 0°C, but there is the danger of excessive weight (damage). This is a method that does not depend on existence on an inversion so could protect against "advection frost", albeit for a limited period of time

CLOUD

"concentration of suspended droplets and/or ice crystals in air well above the surface" (p157, 5th edition)

Luke Howard's four basic cloud forms:

stratus	**sheet-like**	**(Latin - "layer")**
cumulus	**puffy**	**("heap") vertical development**
cirrus	**wispy**	**("curl of hair") … high, cold; thin, ice**
nimbus	**raining**	**("violent rain")**

… others described by combining basic types, and considering their height (low/mid/high), depth (vertical development) and causal origin

TABLE 6–1 Ten Principal Cloud Types

HIGH CLOUDS (HEIGHTS GREATER THAN 6000 M)		
Cirrus (Ci)	Ice crystals	Thin, white, whispy clouds resembling mares' tails.
Cirrostratus (Cs)		Extensive, shallow clouds somewhat transparent to sunlight, producing a halo around the Sun or Moon.
Cirrocumulus (Cc)		High, layered cloud with billows or parallel rolls.
MIDDLE CLOUDS (HEIGHTS BETWEEN 2000 M AND 6000 M)		
Altostratus (As)	Mostly liquid droplets	Extensive, watery, layered cloud. Allows some penetration of sunlight but Moon or Sun appears as bright spot within cloud.
Altocumulus (Ac)		Shallow, mid-level cloud containing patches or rolls. Generally more opaque and having less distinct margins than cirrocumulus.
LOW CLOUDS (BELOW 2000 M)		
Stratus (St)	Weak lift	Uniform layer of low cloud ranging from whitish to gray.
Nimbostratus (Ns)		Low cloud prouducing light rain. Produces darker skies than altostratus.
Stratocumulus (Sc)		Low-level equivalent to atltocumulus.
CLOUDS WITH VERTICAL DEVELOPMENT (MAY EXTEND THROUGH MUCH OF ATMOSPHERE)		
Cumulus (Cu)		Detached billowy clouds with flat bases and moderate vertical development. Sharply defined boundaries.
Cumulonimbus (Cb)		Clouds with intense vertical development with characteristic anvil. May be tens of thousands of meters thick. Appear very dark when viewed from below.

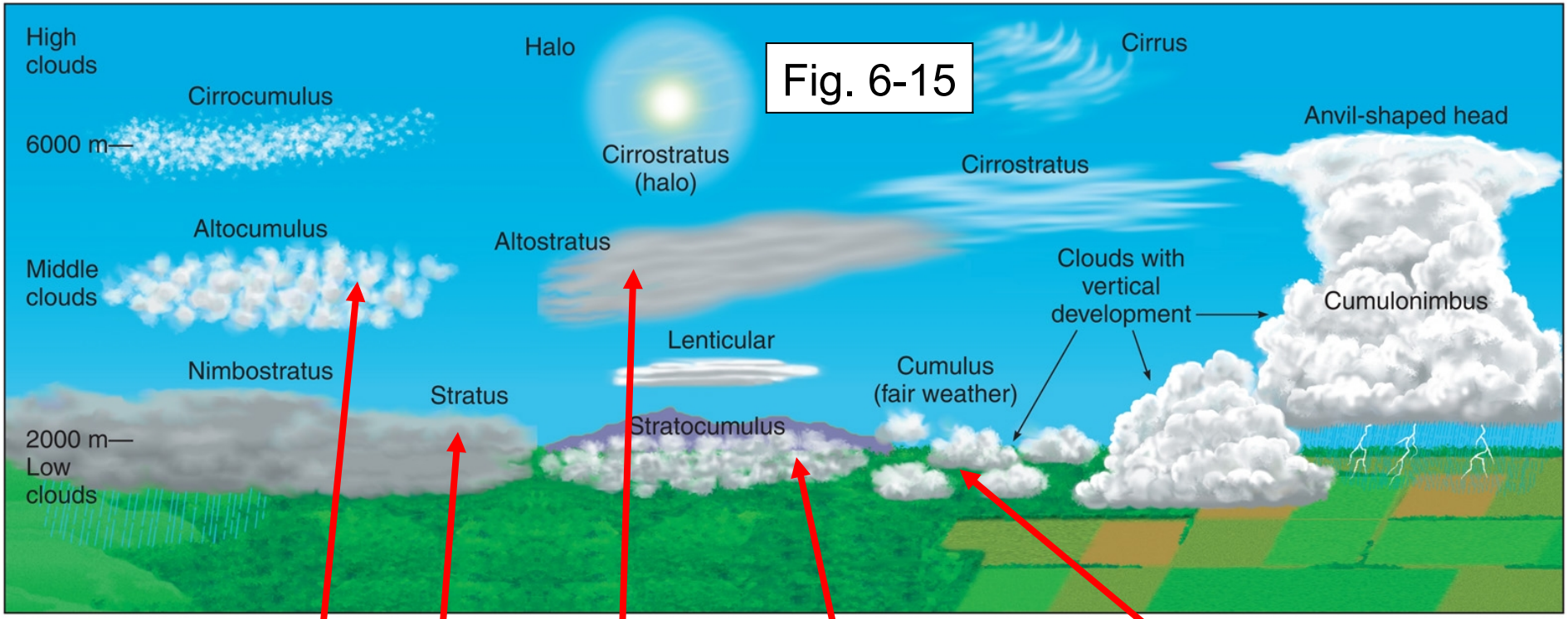
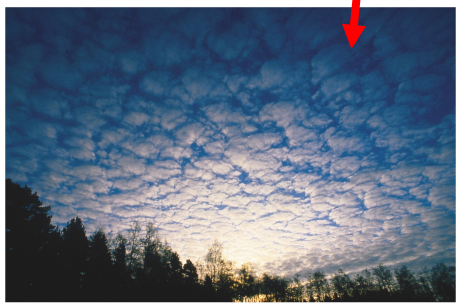
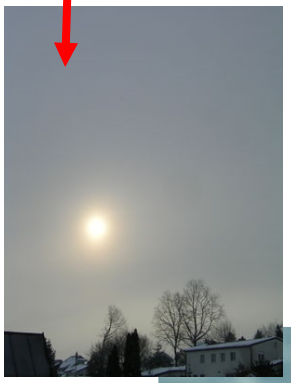
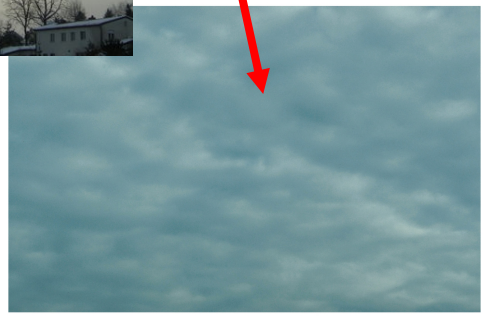
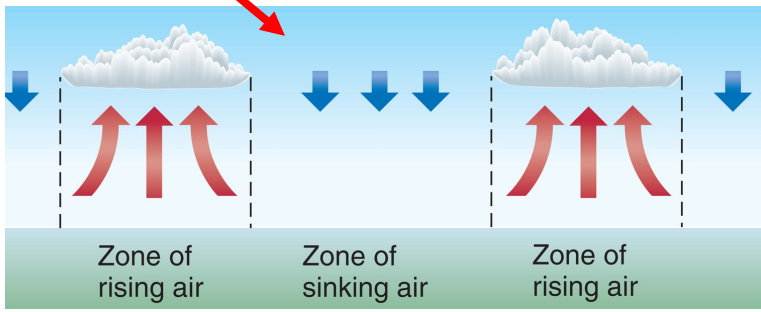

High clouds
Cirrocumulus
6000 m—
Halo
Cirrostratus (halo)
Cirrus
Anvil-shaped head
Cirrostratus
Altocumulus
Middle clouds
Altostratus
Clouds with vertical development
Cumulonimbus
Lenticular
Nimbostratus
Stratus
Cumulus (fair weather)
Stratocumulus
2000 m—
Low clouds

Fig. 6-15








Zone of rising air
Zone of sinking air
Zone of rising air