Clouds and More Clouds
AOSC 200

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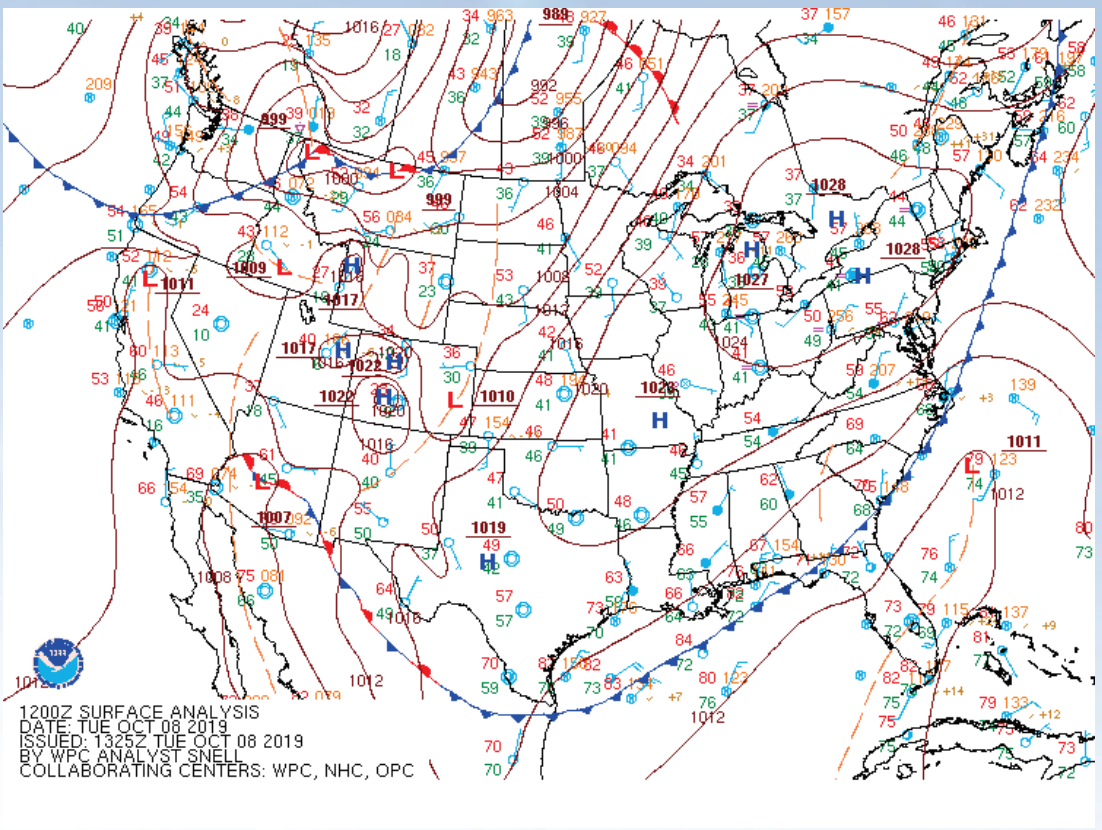
Class Web Site: http://www.atmos.umd.edu/~tcanty/aosc200

Topics for today:

How to make clouds pt 2.

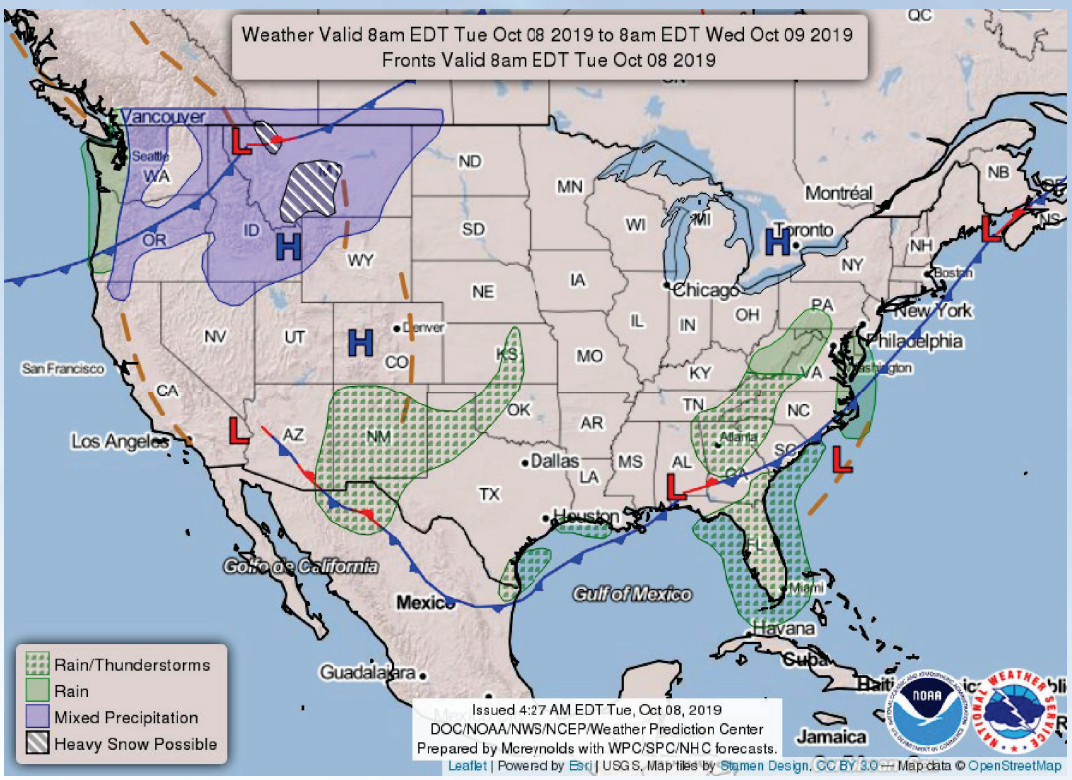
Lecture 13
Oct 8 2019

Current Weather



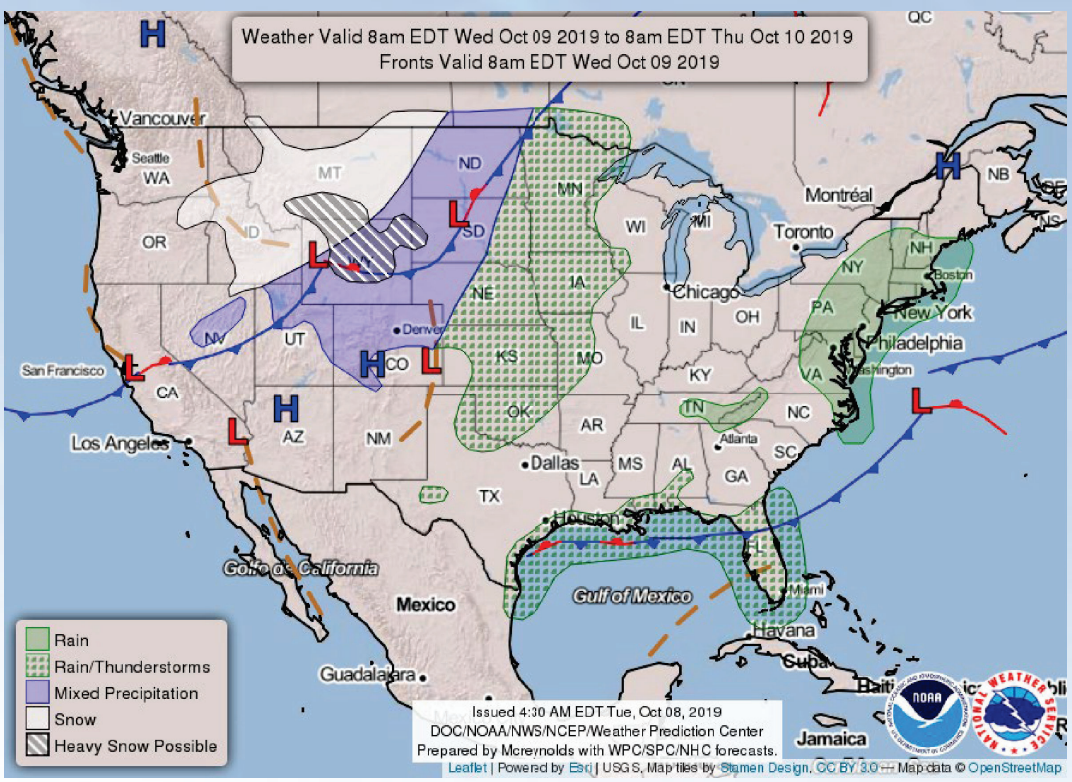
http://www.wpc.ncep.noaa.gov/sfc/namussfcwbg.gif

Today's Forecast



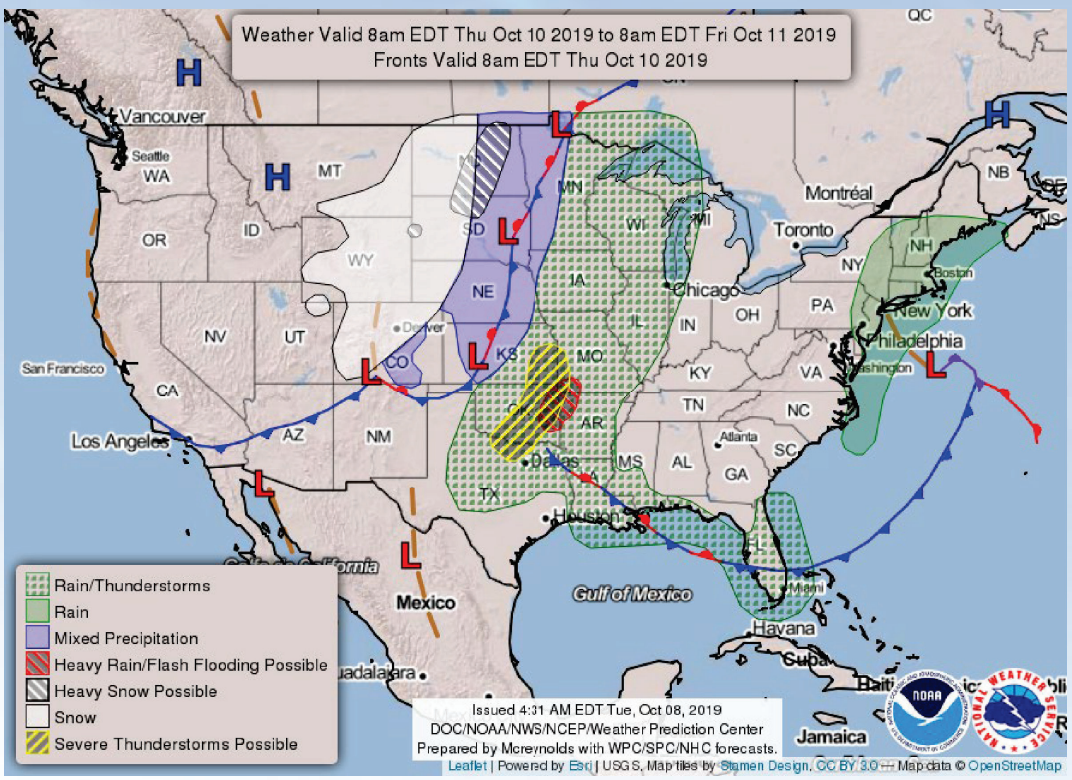
http://www.hpc.ncep.noaa.gov/national_forecast/natfcst.php

Tomorrow's Forecast



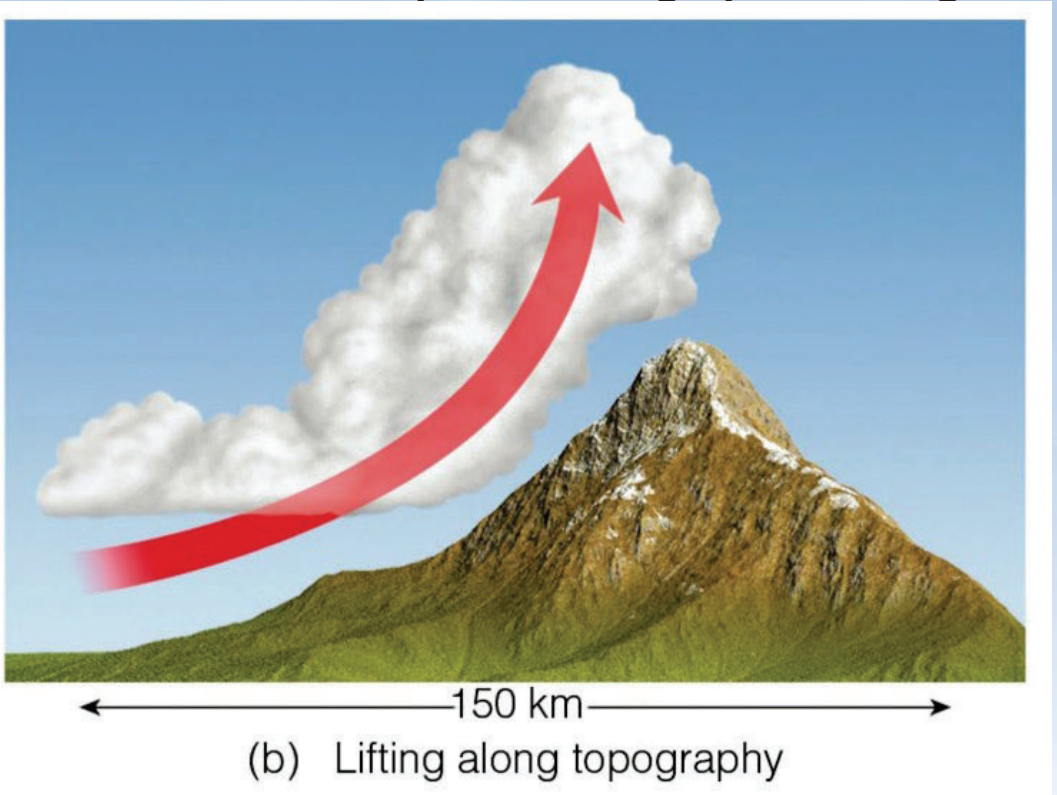
http://www.hpc.ncep.noaa.gov/national_forecast/natfcst.php

Thursday's Forecast



http://www.hpc.ncep.noaa.gov/national_forecast/natfcst.php

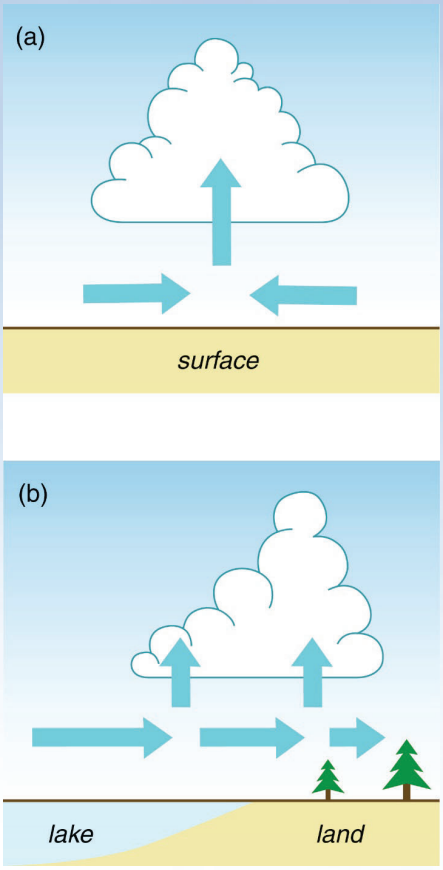
Cloud Development: Orographic Lifting



Air is forced up the side of a mountain and cools as it rises

Fig 5.10: ***Essentials of Meteorology***

Cloud Development: Convergence

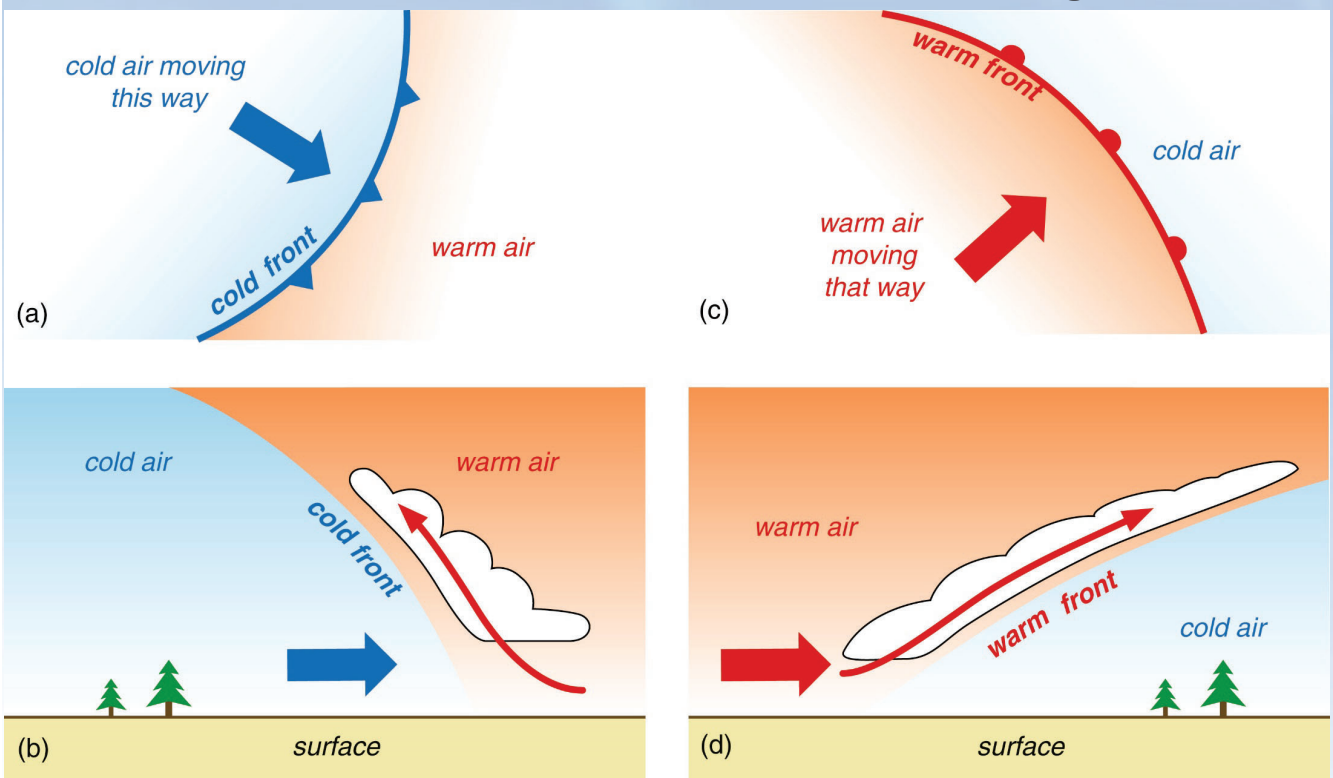


When wind meets from different directions, the air in between has no place to go but up

When the leading edge of the wind slows down, the wind behind "piles up"

Fig 6.11 *Weather: A Concise Introduction*

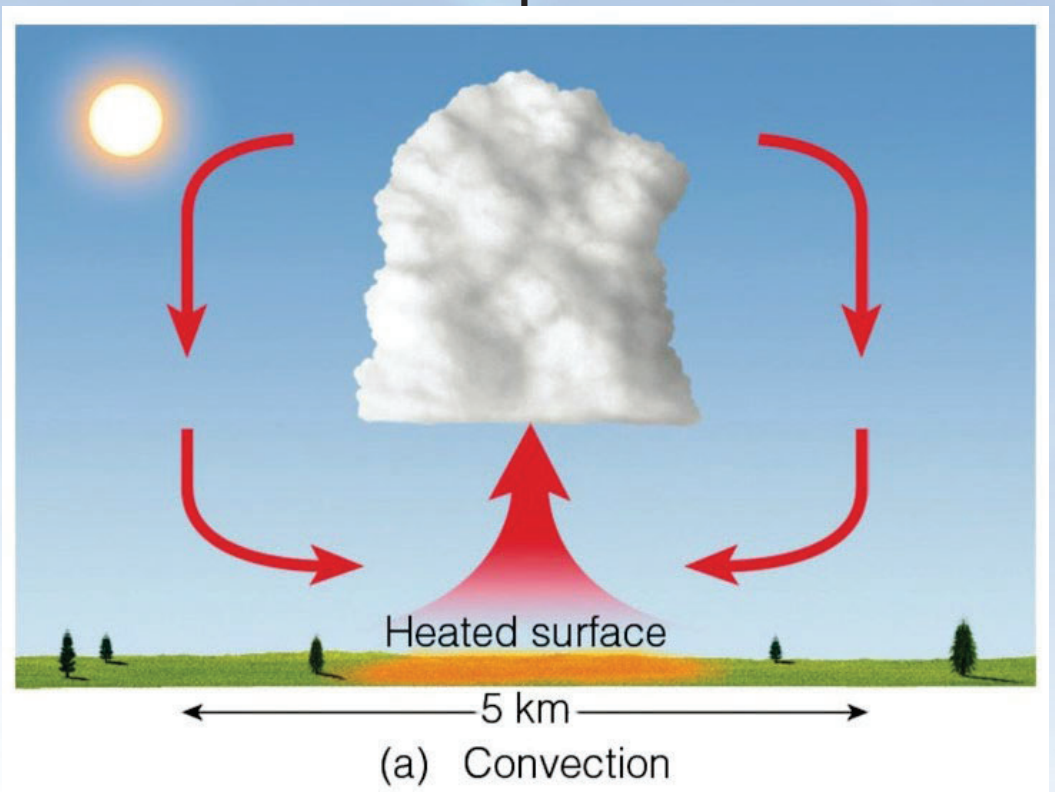
Cloud Development: Frontal Lifting



Warm air will ride up over cold air

Fig 6.12 *Weather: A Concise Introduction*

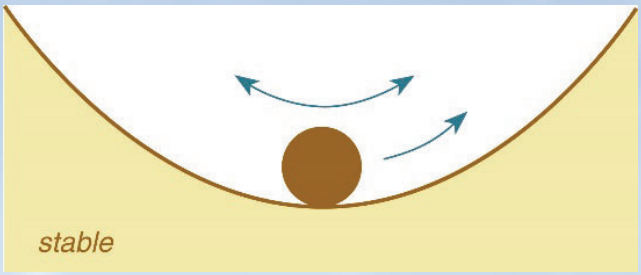
Cloud Development: Convection



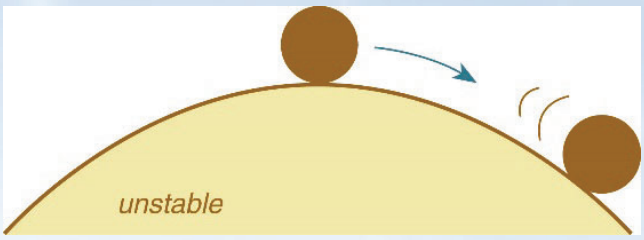
As surface air is warmed by the sun, it becomes less dense and rises

Fig 5.10: ***Essentials of Meteorology***

Stability vs. Instability



In a stable atmosphere, air won't rise unless something forces it up

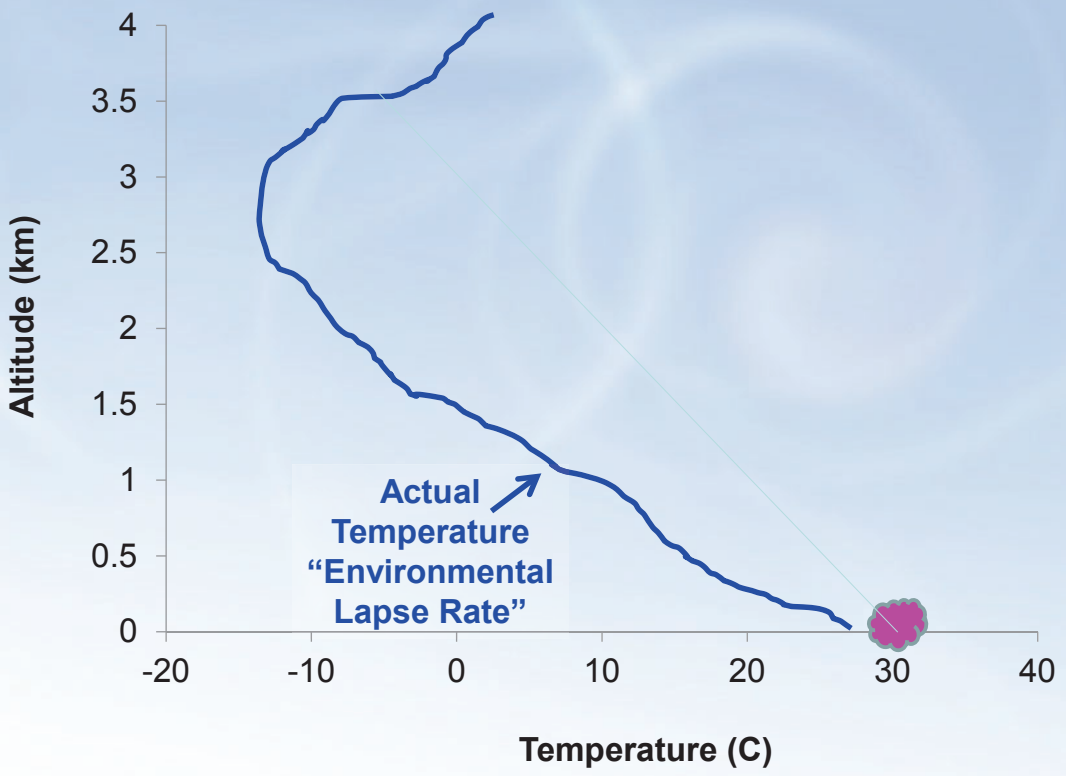


In an unstable atmosphere, air can rise on its own through convection

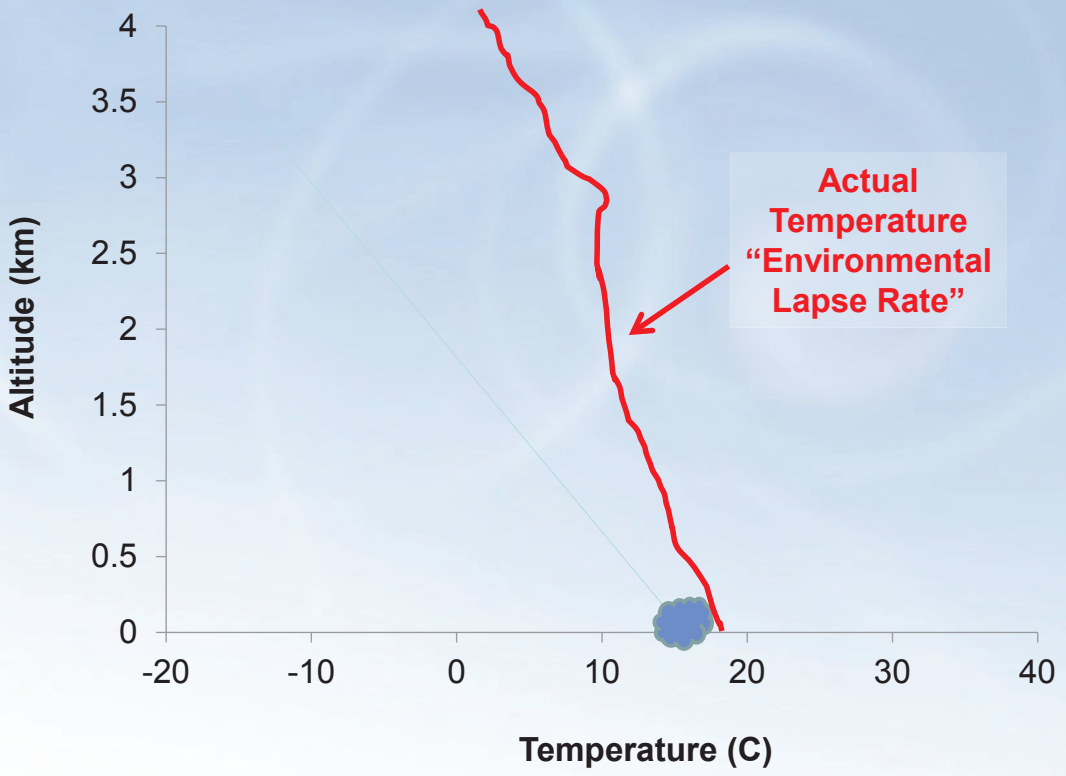
In an conditionally unstable atmosphere the air will rise on its own but it needs a push first.

Fig 6.5.1-4 *Weather: A Concise Introduction*

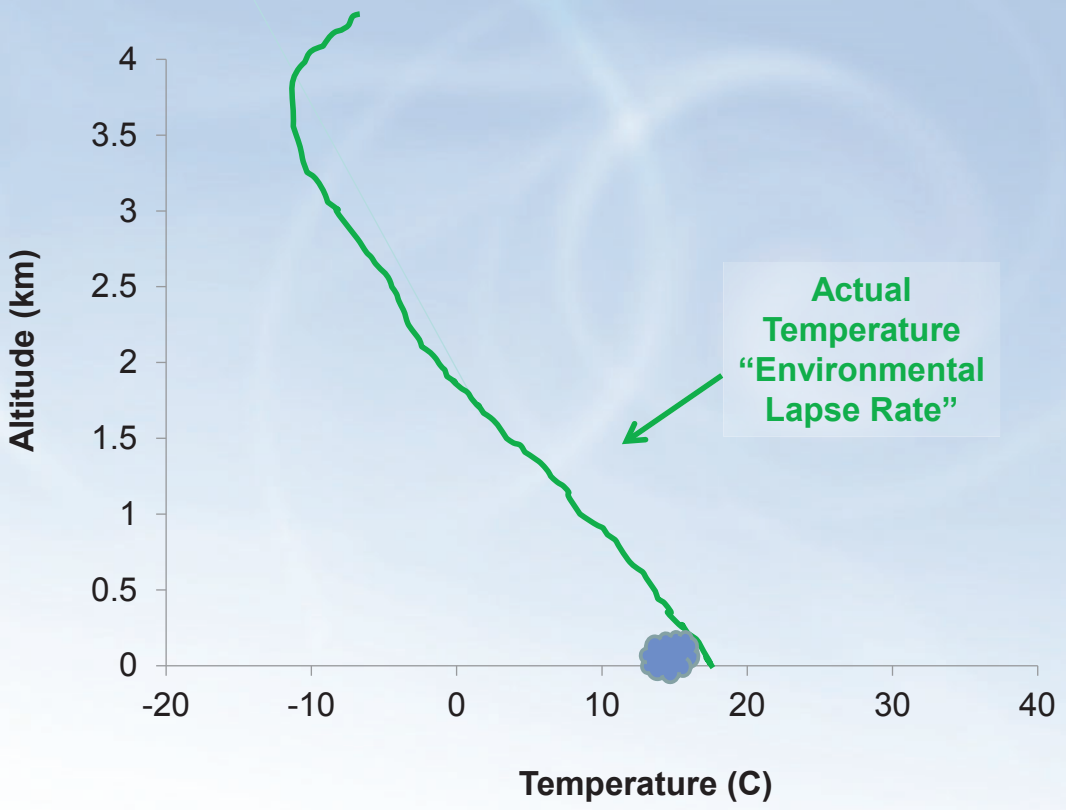
Lapse Rate: Unstable Atmosphere



Lapse Rate: Stable Atmosphere



Lapse Rate: Conditionally Unstable Atmosphere



Putting it all together

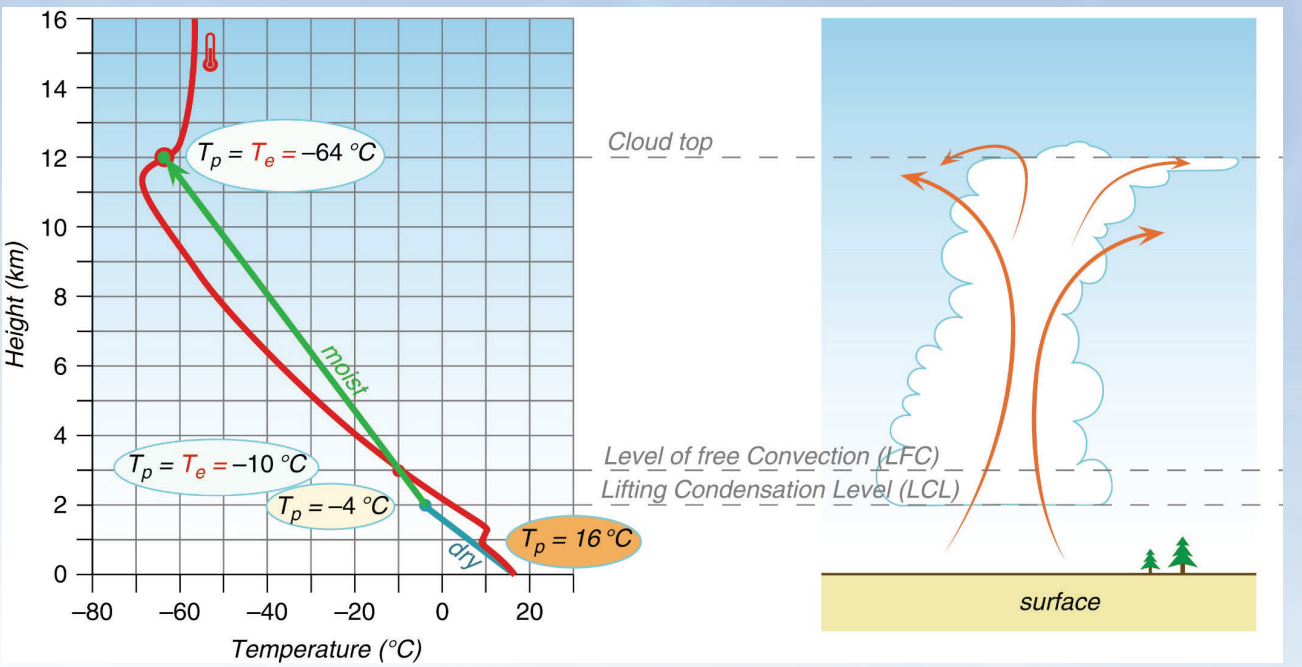


Fig 6.22 Weather: A Concise Introduction

Clouds!!!

Stratus – Layer
Cumulus – heap or pile
Nimbus – rain
Alto – high
Cirrus – ringlet or curling

TABLE 4.2 Approximate Height of Cloud Bases Above the Surface for Various Locations

CLOUD GROUP	TROPICAL REGION	MIDDLE-LATITUDE REGION	POLAR REGION
High Ci, Cs, Cc	20,000 to 60,000 ft (6000 to 18,000 m)	16,000 to 43,000 ft (5000 to 13,000 m)	10,000 to 26,000 ft (3000 to 8000 m)
Middle As, Ac	6500 to 26,000 ft (2000 to 8000 m)	6500 to 23,000 ft (2000 to 7000 m)	6500 to 13,000 ft (2000 to 4000 m)
Low St, Sc, Ns	surface to 6500 ft (0 to 2000 m)	surface to 6500 ft (0 to 2000 m)	surface to 6500 ft (0 to 2000 m)

Clouds come in three altitude categories…

Table 4.2: ***Essentials of Meteorology***

Clouds!!!

TABLE 4.1 The Four Major Cloud Groups and Their Types

1. High clouds
   - Cirrus (Ci)
   - Cirrostratus (Cs)
   - Cirrocumulus (Cc)
2. Middle clouds
   - Altostratus (As)
   - Altocumulus (Ac)
3. Low clouds
   - Stratus (St)
   - Stratocumulus (Sc)
   - Nimbostratus (Ns)
4. Clouds with vertical development
   - Cumulus (Cu)
   - Cumulonimbus (Cb)

…but there are 4 major cloud groups in total

Table 4.1: ***Essentials of Meteorology***

Clouds!!!

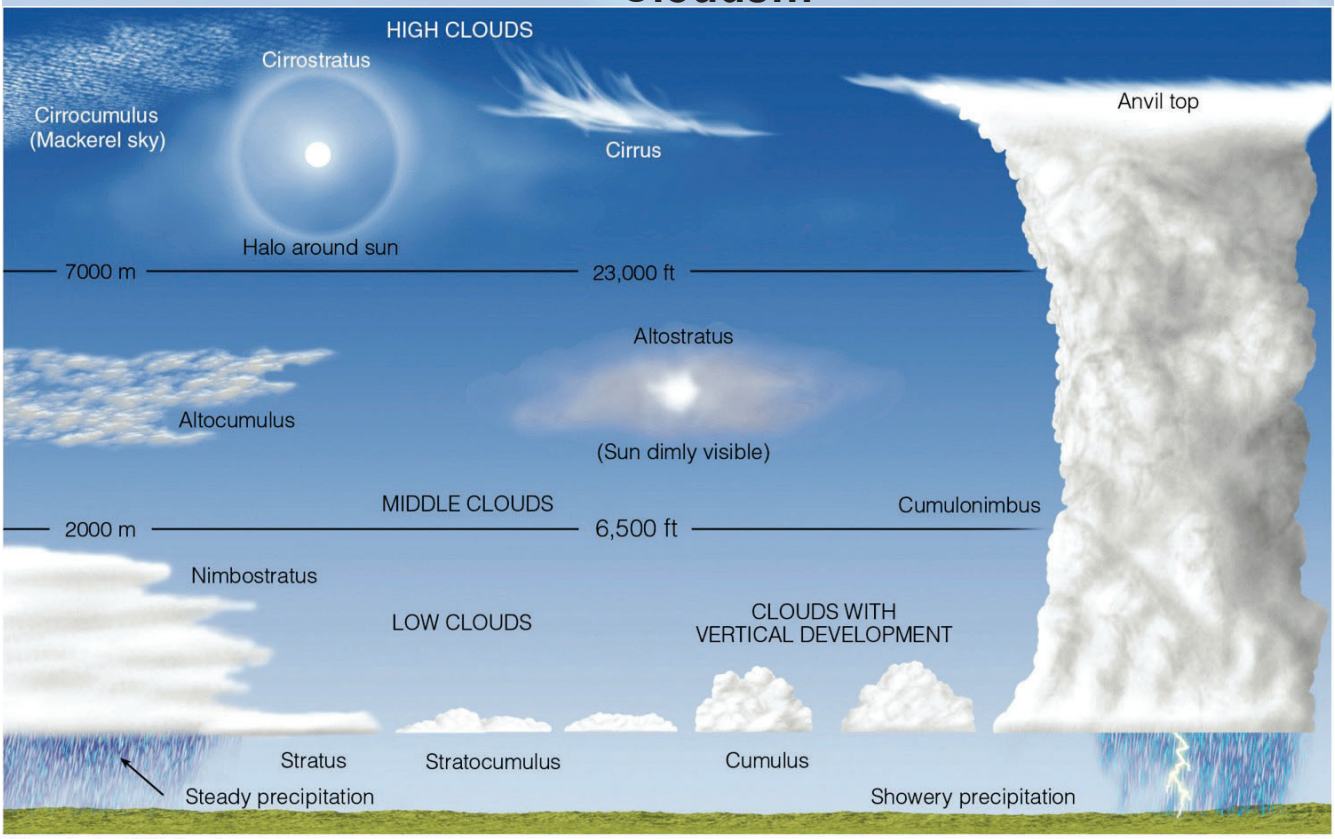
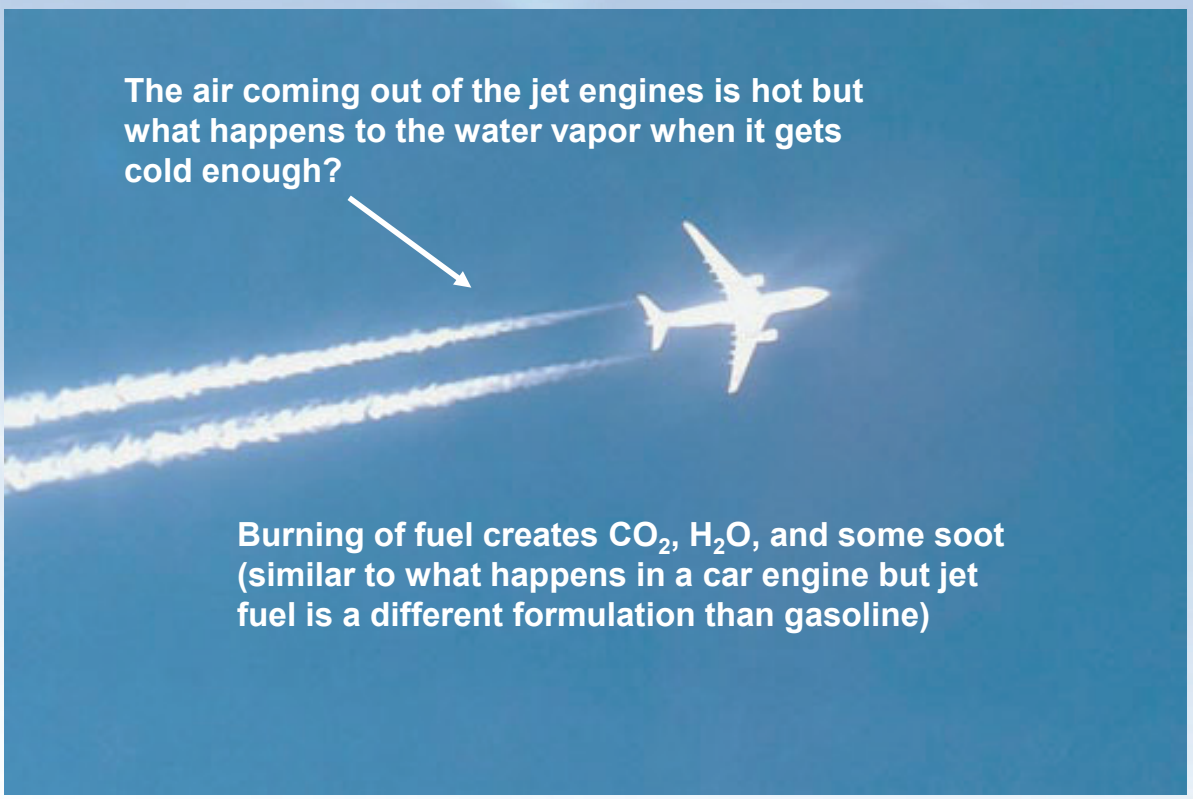


Fig 4.36: ***Essentials of Meteorology***

Contrails (not “chemtrails”)

Contrails



http://ngm.nationalgeographic.com/contrails

Contrails: what can they tell us about the upper air?

Can you think of a reason some contrails would disappear quickly while others hang around for a while?

If the air is dry (low humidity) the contrail will evaporate and disappear. The drier the air, the more quickly the contrail disappears.

If the air already has enough moisture in it then the contrail may stick around for a while, get moved around by wind patterns, and maybe create more clouds.