08.Clouds1

Monday, January 31, 2011
2:26 PM

Admin:
Schedule

Pasted from <http://www.colorado.edu/MCEN/flowvis/course/index.html>

Need a laptop for critiques? LaMark Taylor has some old ones for checkout. Say you are from Flow Vis. ITLL 2b36
From William and Lisa:

http://prophotorental.com

The company is based in Boulder off Walnut. The rates are a little step at $60/day for a Canon EOS 1D Mk IV body for a minimum of four days, with price decreasing with a longer rental period. However they have a nice selection of lens, camera bodies, and accessories. They carry Canon, Nikon, and Olympus.
They are located downtown at 1401 Walnut St. Its hard to find the actual office, but they are in the basement. When you get off the elevator, its all the way to the left at the end.

They said that instead of making reservations online, rather we should call them to reserve equipment because they do special two-day rentals for locals. This is their number:
(303) 588-6799
If you pickup on Friday afternoon and return it Monday morning before noon it will count as a two day rental. Also, they give a 15% discount for students.

GW comments are now all in the GW discussion.

## CLOUDS

Learning Objectives:

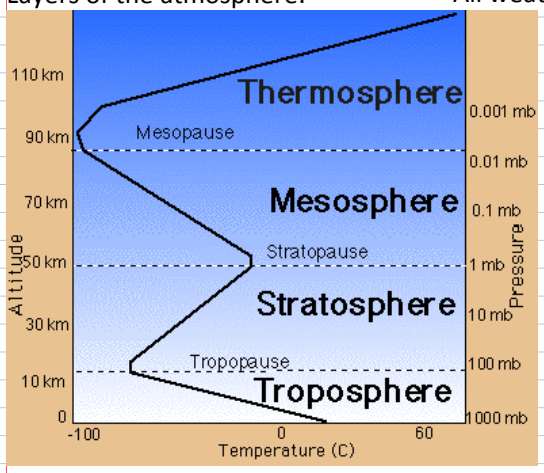
1. Be able to identify cloud types
2. Describe air motion and atmospheric stability that govern the appearance of basic cloud types.
3. Interpret weather data with respect to likely clouds, including Skew-T plots and wind soundings.

Best clouds physics book, easy read:
Gavin Pretor-Pinney, *The Cloudspotter's Guide* (Perigee/Penguin, 2006).
Next, (for free)
Thomas Carney et al., *AC 00-57 Hazardous Mountain Winds and Their Visual Indicators*

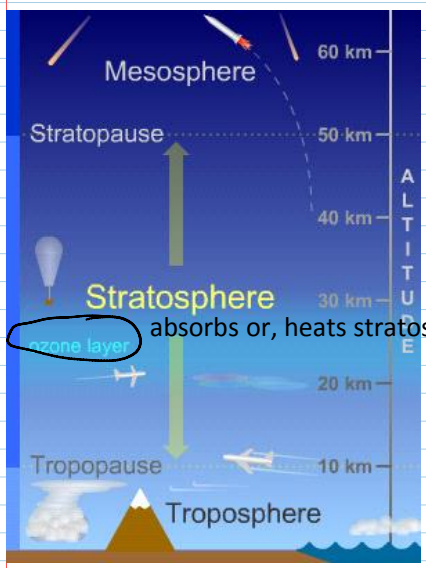
(Federal Aviation Administration, 1997), http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/0/780437D88CBDAFD086256A94006FD5B8?OpenDocument.

Following info partially adapted from Mike Baker, local NOAA Weather Service forecaster.

Layers of the atmosphere: All weather happens in troposphere.




http://www.aerospaceweb.org/question/atmosphere/atmosphere/layers.gif



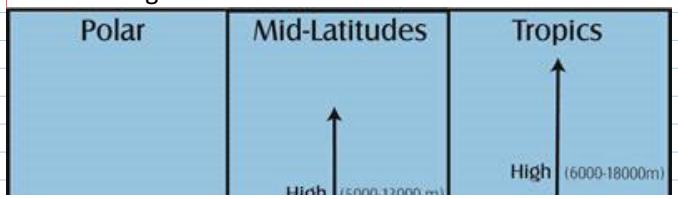

absorbs or, heats stratospheric

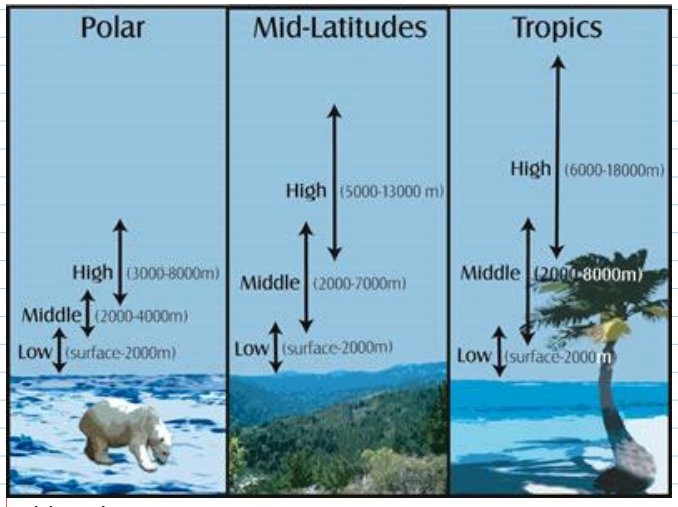
http://www.windows2universe.org/earth/Atmosphere/stratosphere.html

6-7 30xb

< Minute paper: In your head, 10 km = X miles, = Y thousand feet.
Be approximate, 1 sig fig.

Order of magnitude estimates are VERY USEFUL.






colder, denser
shorter atm.

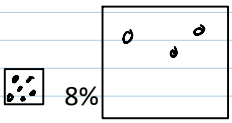
Height of atm goes with seasons too; higher in summer with hot air.

Temperature change with altitude:
Minute paper in groups: *Why* is it colder on top of a mountain than at the foot?

i.


Start with pressure profile in atmospheric column: highest at surface, decreases going up.
Comes from hydrostatics; gravity balanced by pressure.

Consider a parcel of air (imaginary little cube).
Same temperature as its neighbors.
Reduce its pressure, while allowing no heat transfer.
It expands = *adiabatic* expansion
In expanding, it *does work* on its neighbors
Loses internal energy; cools.
= Conservation of Energy



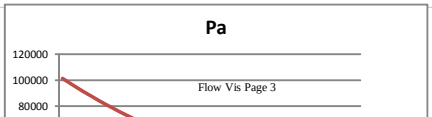

piston Icy LINDER

Rising parcels expand and therefore cool.

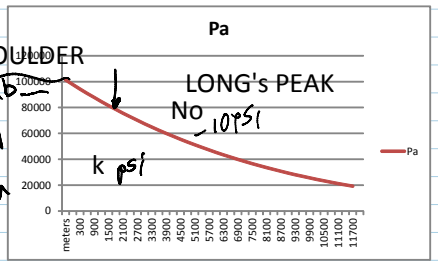
Vice versa is true too; descending parcels get compressed (work is done on them) and warm up.

Pressure profile in the atmosphere
http://www.engineeringtoolbox.com/air-altitude-pressure-d_462.html

| ATM



IBA BOULDER




Temperature profile in the TROPOSPHERE

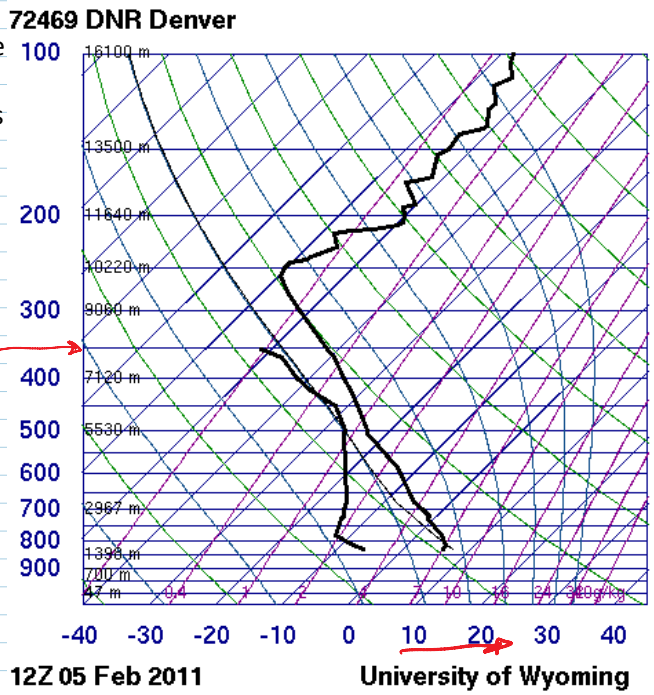
Comes from *sounding data*; weather balloons

Modern radiosondes measure or calculate the following variables:

- Pressure
- Altitude
- Geographical position (Latitude/Longitude)
- Temperature
- Relative humidity
- Wind (both wind speed and wind direction)
- Cosmic ray readings at high altitude

Pasted from <http://en.wikipedia.org/wiki/Radiosonde>

Here's what it looks like: SKEW-T
http://weather.uwyo.edu/upperair/sounding.html




Pressure in millibars

Temperature in c

| | |
|---|---|
| SLAT | 39.75 |
| SLON | -104.87 |
| SELV | 1625. |
| SHOW | -9999 |
| LIFT | 3.41 |
| LFTV | 3.41 |
| SWET | -9999 |
| KINX | -9999 |
| CTOT | -9999 |
| VTOT | -9999 |
| TOTL | -9999 |
| CAPE | 0.00 |
| CAPV | 0.00 |
| CINS | 0.00 |
| CINV | 0.00 |
| EQLV | -9999 |
| EQTV | -9999 |
| LFCT | -9999 |
| LFCV | -9999 |
| BRCH | 0.00 |
| BRCV | 0.00 |
| LCLT | 260.8 |
| LCLP | 642.2 |
| MLTH | 296.0 |
| MLMR | 2.36 |
| THCK | 5483. |
| PWAT | 5.93 |

http://weather.uwyo.edu/upperair/indices.html#CAPE

Definitions

NO VERTICAL GRID?

So many lines! How many kinds?

Horizontal blue Constant pressure

NO VERTICAL GRID?

So many lines! How many kinds?

| | |
|---|---|
| Horizontal blue | Constant pressure |
| Angled blue | Constant temperature; isotherm. Angle ↗ SKEW T |
| Angle/curve green | Dry adiabat. A dry parcel will follow this temperature line if cooled |
| Angle/curve blue | adiabatically |
| Purple | |
| Heavy black | |
| Light black | |

Basics: http://www.theweatherprediction.com/thermo/skewt/
Skew T Mastery: https://www.meted.ucar.edu/loginForm.php?urlPath=mesoprim/skewt#