08.Clouds2

Monday, January 31, 2011
2:26 PM

Admin:

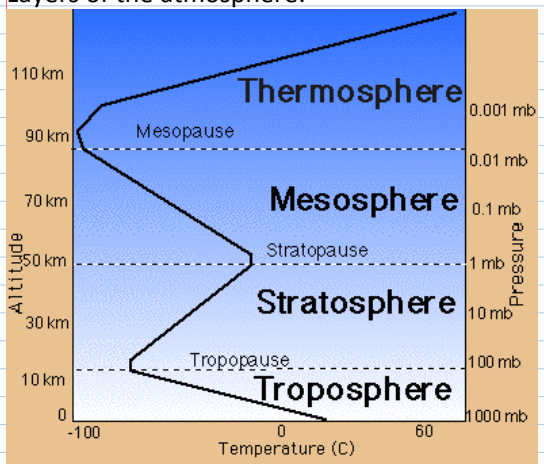
Schedule

Pushing back a little. Meet your teams on Tuesday.

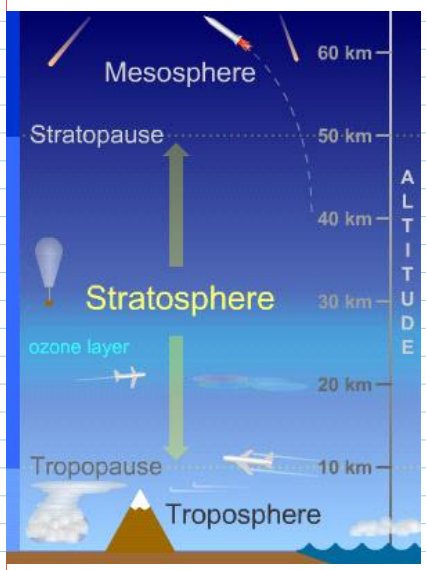
Maybe push Clouds 1 due date to Thursday- depends on progress today.

One last GW image to discuss

Layers of the atmosphere:



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



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

All weather happens in troposphere.

Driven by what happens at 500 mb level.

O_3 absorbs sunlight, heats stratosphere

Warm over cold

Less dense over more dense = STABLE. Hold that thought.

Back to SCALES; how big….

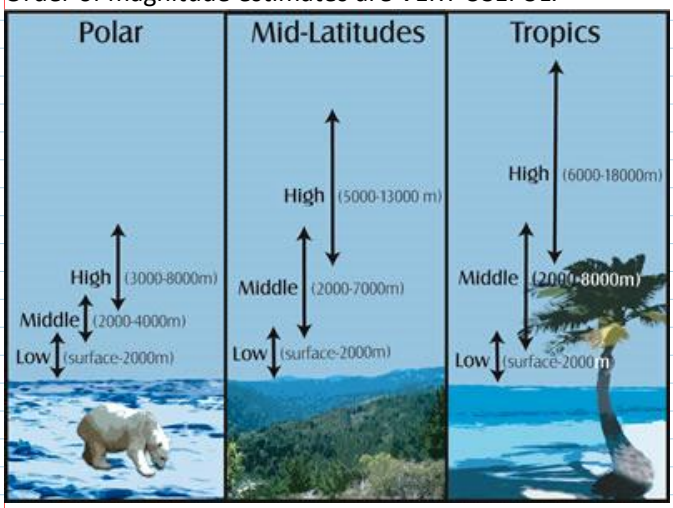
How big is this?

Do you estimate in metric or in English units?

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

http://www.wolframalpha.com/input/?i=10+km+in+miles

Order of magnitude estimates are VERY USEFUL.



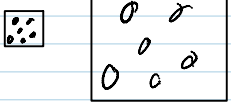
colder, denser
shorter atm.

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

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

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



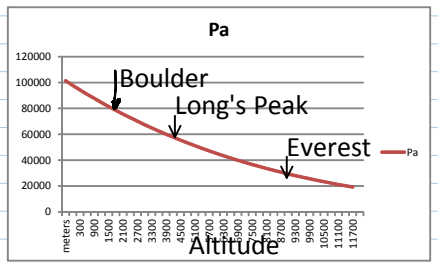
In expanding, it *does work* on its neighbors
Loses internal energy; cools.
= Conservation of Energy
NOT the Ideal Gas Law

Piston/cylinder

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



1 ATM =
1 bar =
1000 mb
14 psi
101 kPa

Actual temperature profile in the TROPOSPHERE
Comes from *sounding data*; weather balloons

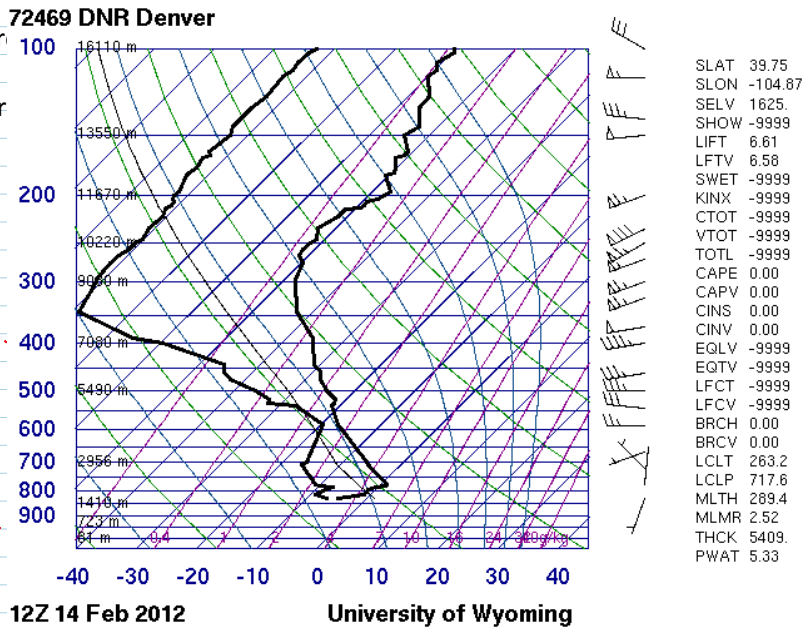
Modern radiosondes measure or calculate the following variables:

- 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
YOU will do this for the date of your image

Pressur
in
millibar



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

Definitions

Temperature in c

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 adiabatically
Angle/curve blue	Moist, saturated adiabatic lapse rate
Purple	Lines of constant mixing ratio; absolute humidity for saturation.
Heavy black	Right line is temperature profile. Left line is dew point
Light black	Adiabat starting at the top of the boundary layer

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