08.Clouds2

Saturday, February 05, 2011
6:46 PM

Today: More Clouds
Meet your team

Jer Thorp on data visualization, Weds., Feb. 19th at 4pm in ATLAS 100.
http://www.colorado.edu/atlas/speakerseries/
Jer's projects lie at the intersections of science, digital art and design. His talks look at ways to make data more human and how data can be visualized in different contexts.

More info:

- Tedx Vancouver: Make Data More Human (2011; 17 minutes)
- TedEd: Visualizing the World's Twitter Data (2013; 5 minutes)
- Biographical info on Jer Thorp can be found here.

http://www.youtube.com/watch?v=njSssHvWj30#t=1m59s
Ebru

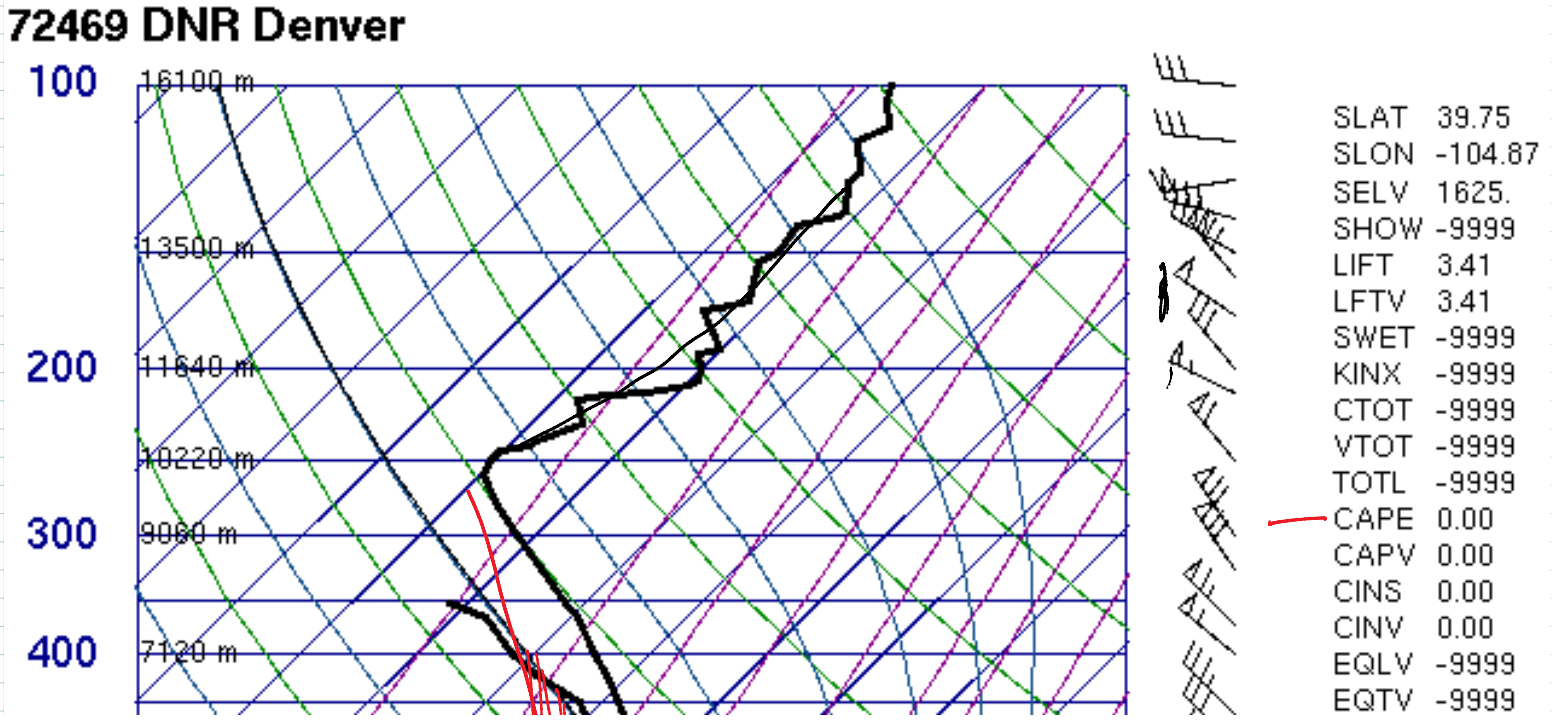
Skew-T continued

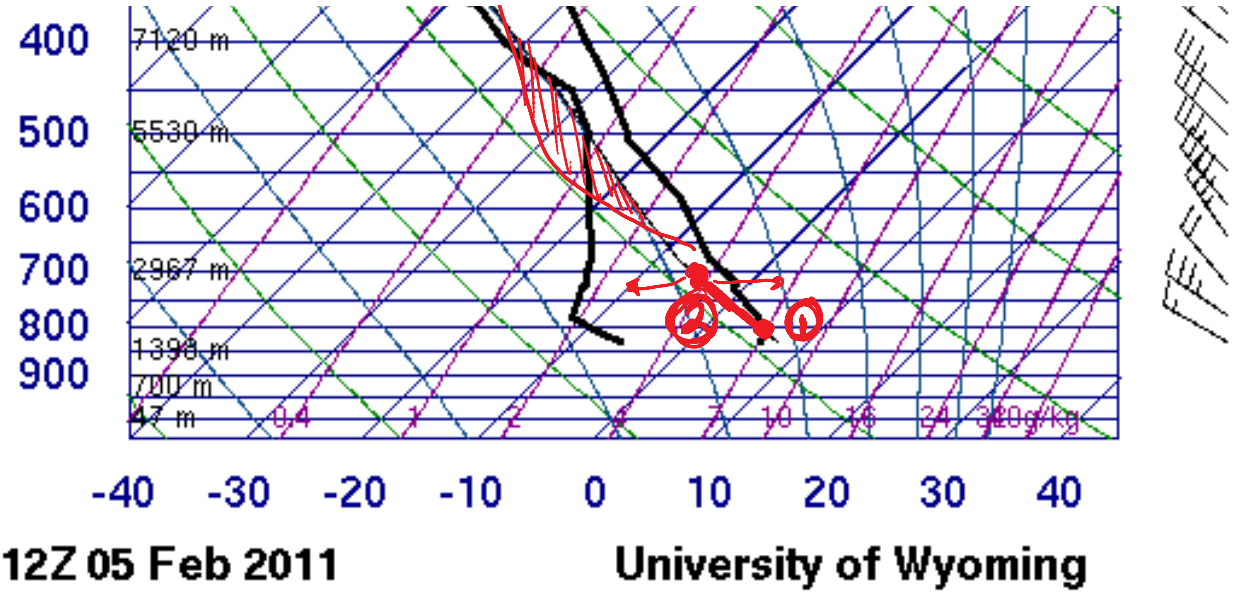
NO VERTICAL GRID?

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#





1 Starting parcel

2 Raise it, cool it adiabatically (move up along the adiabat), perturb the system

Check it, is my parcel warmer or cooler than the actual neighboring parcels?

i. Cooler; more dense, wants to sink again, go back to origin STABLE

ii. Warmer; less dense, wants to keep going up! UNSTABLE

Can start at any point on the actual temperature line. Go parallel to the adiabats. Choose dry adiabat (green) if below likely cloud level or wet (blue, saturated) if in a cloud.

Stable clouds = flat STRATUS type

Unstable clouds = puffy CUMULUS family

Atmosphere is all stable if CAPE = 0 Convective Available Potential Energy

Has unstable layers if CAPE > 0. Thunderstorms if CAPE > 500 or so.

What was the surface weather on a given day?

http://weatherspark.com/#!graphs;a=USA/CO/Boulder

Awesome weather archive.

Skew-T Times: Zulu world clock, =Greenwich mean time GMT

12Z, Feb 14 = ~6 am Feb 14 here

00Z, Feb 15 = ~6 pm Feb 14 here

Where are clouds? Where temperature is close to dew point, i.e. where the two heavy black lines come together.

Also, kink towards more steep in T line suggests clouds at that level.

Condensation = warming (like evaporation = cooling on your skin)

Skew-T download tips:

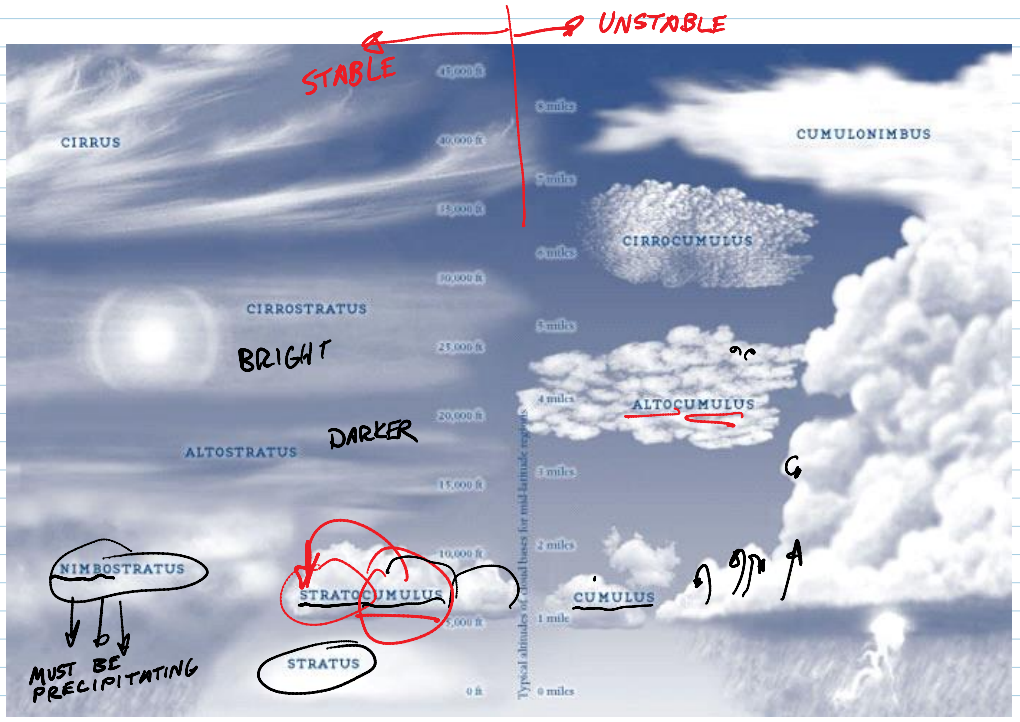
1. Choose correct date. 12z Feb X is the 6 am sounding, 00z X+1 is the 6 pm sounding for date X
2. Choose plot, not text
3. Will open in next browser tab

http://weather.uwyo.edu/upperair/sounding.html

Clouds = droplets or ice MOVING UPWARDS

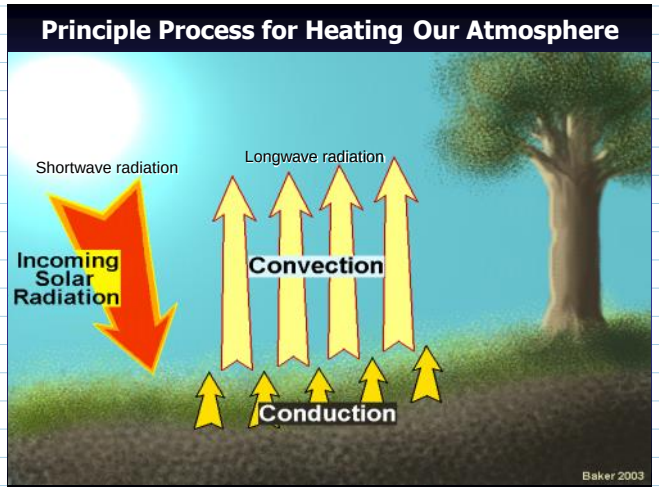
Lift mechanisms:
1. Instability
2. Orographics: terrain, mountains
3. Synoptic scale weather systems. Both at warm and cold fronts; cold air pushes under in a cold front, warm air overruns in a warm front.
4. Convergence: shoreline temperature differences

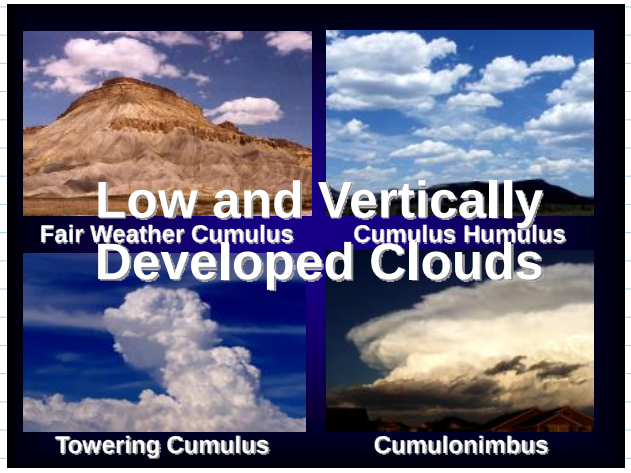
1. Instability driven clouds

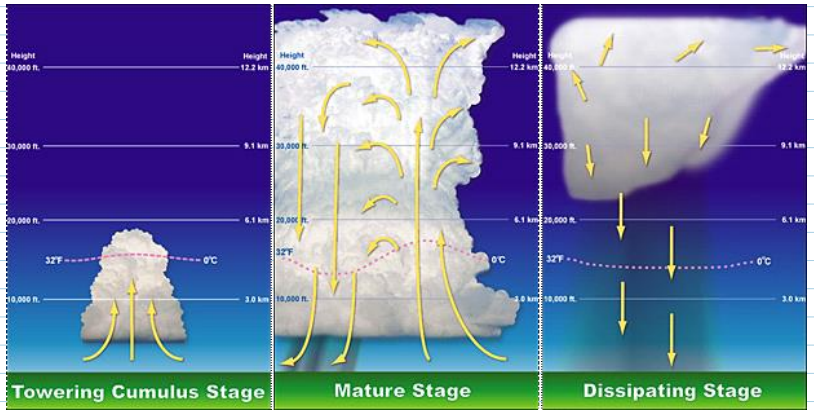


Clouds classified by
A. Structure: stratus = flat layers, cumulus = clumps
B. Base height: (2km)
   a. low: up to 6500 ft (above ground, not from sea level) and vertically developed (includes cumulonimbus)
   b. middle: 6500 to 23,000 ft (2-7km)
   c. high: 16,000 to 45,000 OVERLAP (4.9-14km)
      Cirrostratus: bright, no observable thickness, thin, uniform veil
      Altostratus: darker, may have noticeable thicker regions

http://cloudappreciationsociety.org/collecting/ Classification guide, one of many







http://www.k3jae.com/wxstormdevelopment.php

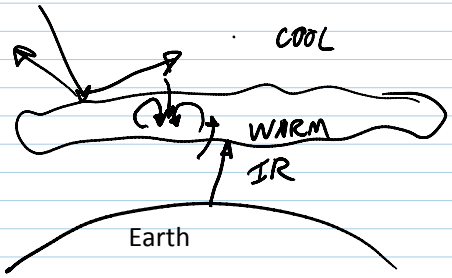
Dark ground (plowed field etc.) can create local hot spot, starting a thermal. Mountain uplift can also trigger start of cycle.

ZACH
EYH
Vortices

Stratocumulus
Formation mechanisms:

1) Cumulus joined together, caused by an inversion, a stable layer that stops upward convection
2) Stratus broken up. Top reflects UV, visible light, cools (maybe radiates IR to space). Bottom absorbs IR from the earth, warms

Cool on top, warm on the bottom = unstable, wants to turn over, breaking up stratus layer.



Partial rule of thumb
Cumulus = from instability; local uplift
Stratus = more stable, from widespread uplift

These are GENUS

For info on Species, Varieties and Accessory Clouds, see http://cloudappreciationsociety.org/collecting/about-cloud-classifications/

Interesting book on how clouds were first classified and named ~1804, by Luke Howard
Richard Hamblyn, *The Invention of Clouds: How an Amateur Meteorologist Forged the Language of the Skies* (Picador, 2002).