

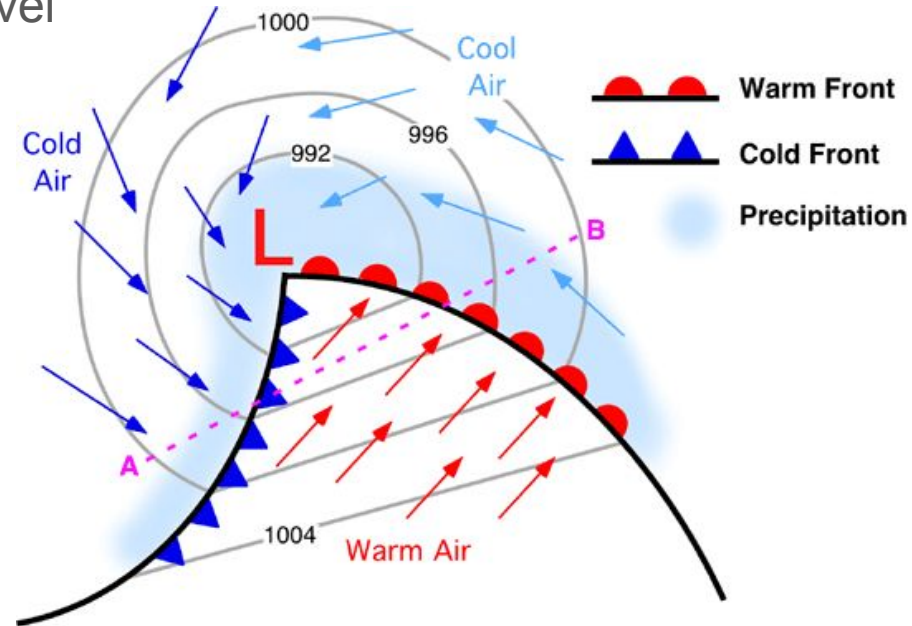


Unique Ways to Create Interesting Weather

Ian Stearns

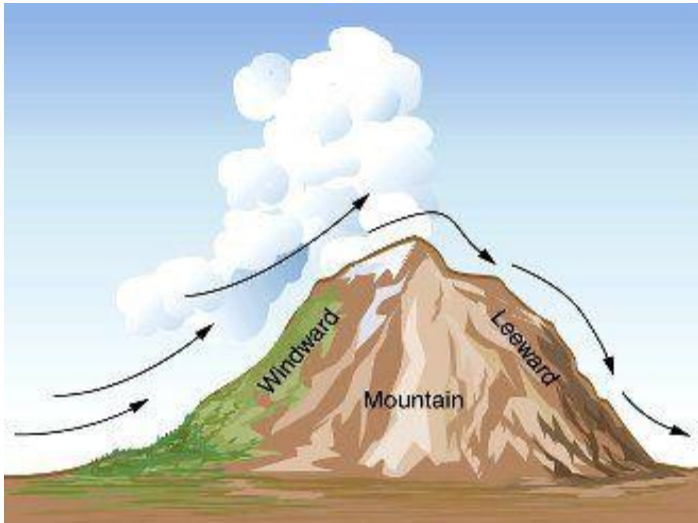
Traditional Methods We Study

- Fronts, Midlatitude Cyclones, Upper-level Divergence, surface convergence, etc.
- These sources are very important to study, as they drive most of the weather we observe
- But, for interesting weather, you only really need two things
 - Rising air
 - Moisture



Lifting air? How about a mountain?

- Orographic Lifting
 - Rain Shadow Effect
 - Foehn Wind
 - Lenticular Clouds

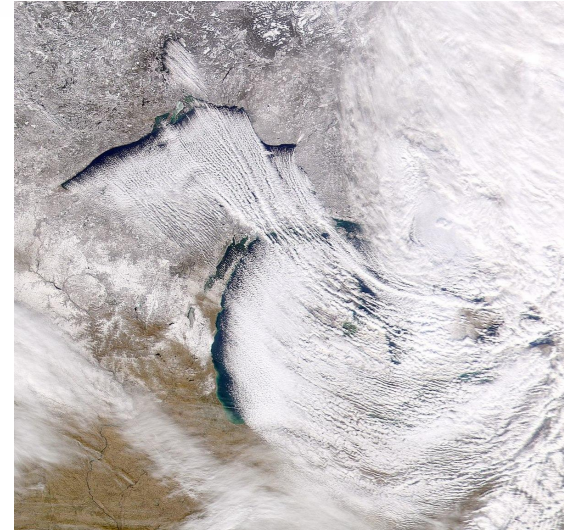
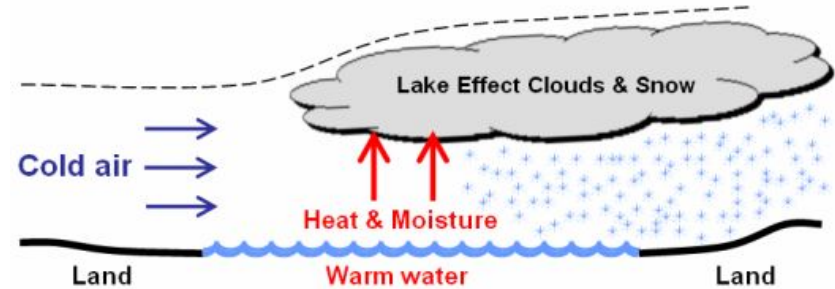


Lake Effect Snow

1. Very Cold air is advected over warmer lake water
2. Due to the tight temperature gradient, lots of moisture is added to the air
3. Surface convergence on the other shoreline causes air to rise
4. Lots and lots and lots of snow

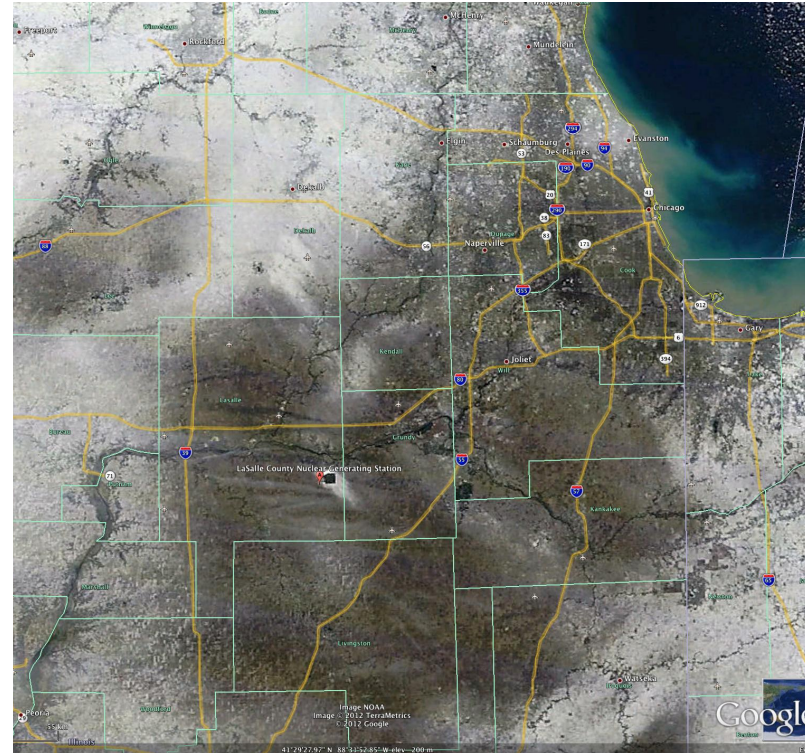
Occurs often in great lakes region, particularly associated with Lakes Michigan and Superior

Lake Effect Snow Conceptual Model



Nuclear Cooling Pond Effect Snow?

- Same principle: cold air advection over a very warm cooling pond can cause snow downwind
- Generally a very narrow band, but can produce substantial amounts of snow

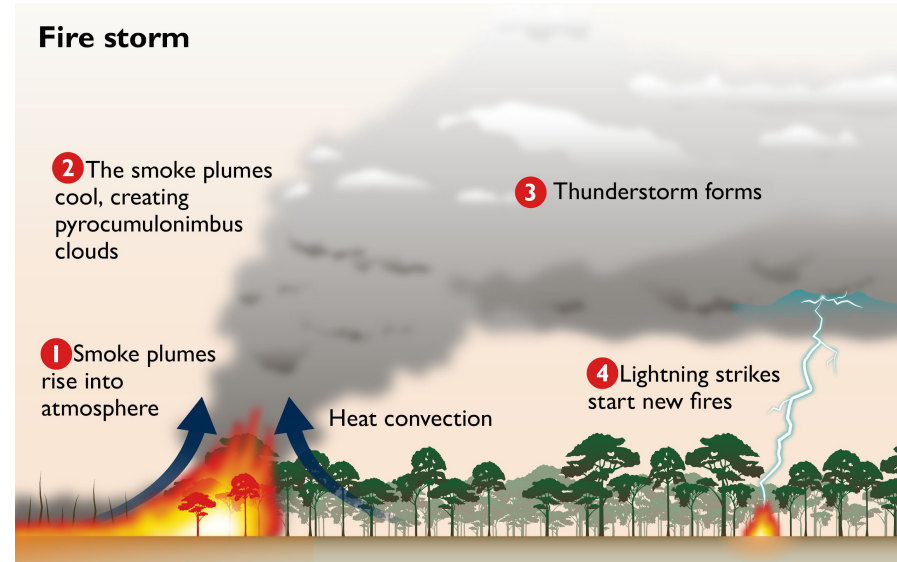


Ingredients for Thunderstorms

- Ideal T-Storm Conditions?
 - Really hot unstable air
 - Moisture aloft
 - All of that warm, moist air rising

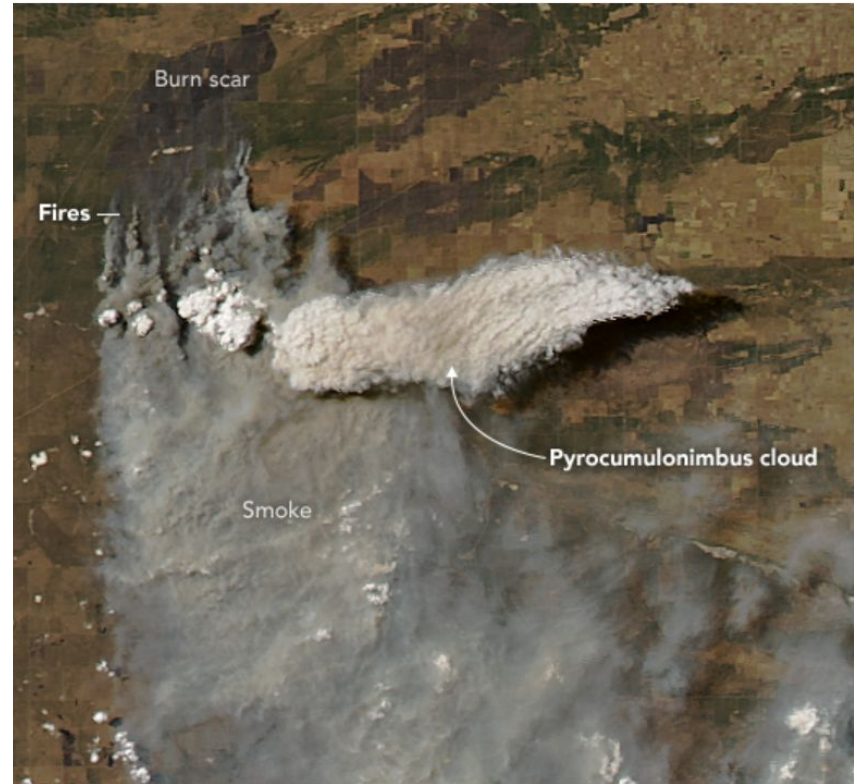
Ingredients for Thunderstorms - Wildfires have them all!

- Ideal T-Storm Conditions?
 - Really hot unstable air
 - Moisture aloft
 - All of that warm, moist air rising
- You have essentially just described a wildfire
 - Wildfires generate tons of heat, warming the air, which then rises
 - Creates inflow and an updraft, just like a normal thunderstorm



Pyrocumulonimbus Clouds

- Results in the creation of a “fire storm” fueled by a wildfire
- But won't the rain put it out?
 - No
 - Often times, it's so hot that the water evaporates before reaching the ground
 - Results in downbursts, creating conditions that spread the fires
 - These storms can last for days
- Lightning will strike other, non-burning areas, and create additional fires, as well



Volcanic Lightning and Hail

- In storms, lightning is caused by an exchange of charges between ice and water droplets moving through the storm
- Basically the same process happens with a volcanic eruption
 - Combination of ice and ash exchanging charges similarly to how you generate static electricity with socks and carpet
- Water content of eruptions can also create large hailstones



Medicanes - Like Hurricanes, but smaller!

- More boring name: Mediterranean Tropical-Like Cyclone
- Cyclones that develop in the Mediterranean Sea
 - Particularly in the region between Italy and Greece
- Typically smaller than hurricanes
 - Typically between 70 - 200 km across
 - Max Sustained wind speeds usually between 29 - 110 mph
 - Can be as powerful as a Cat 1 Hurricane
 - 30mph is really slow for a warm-core low

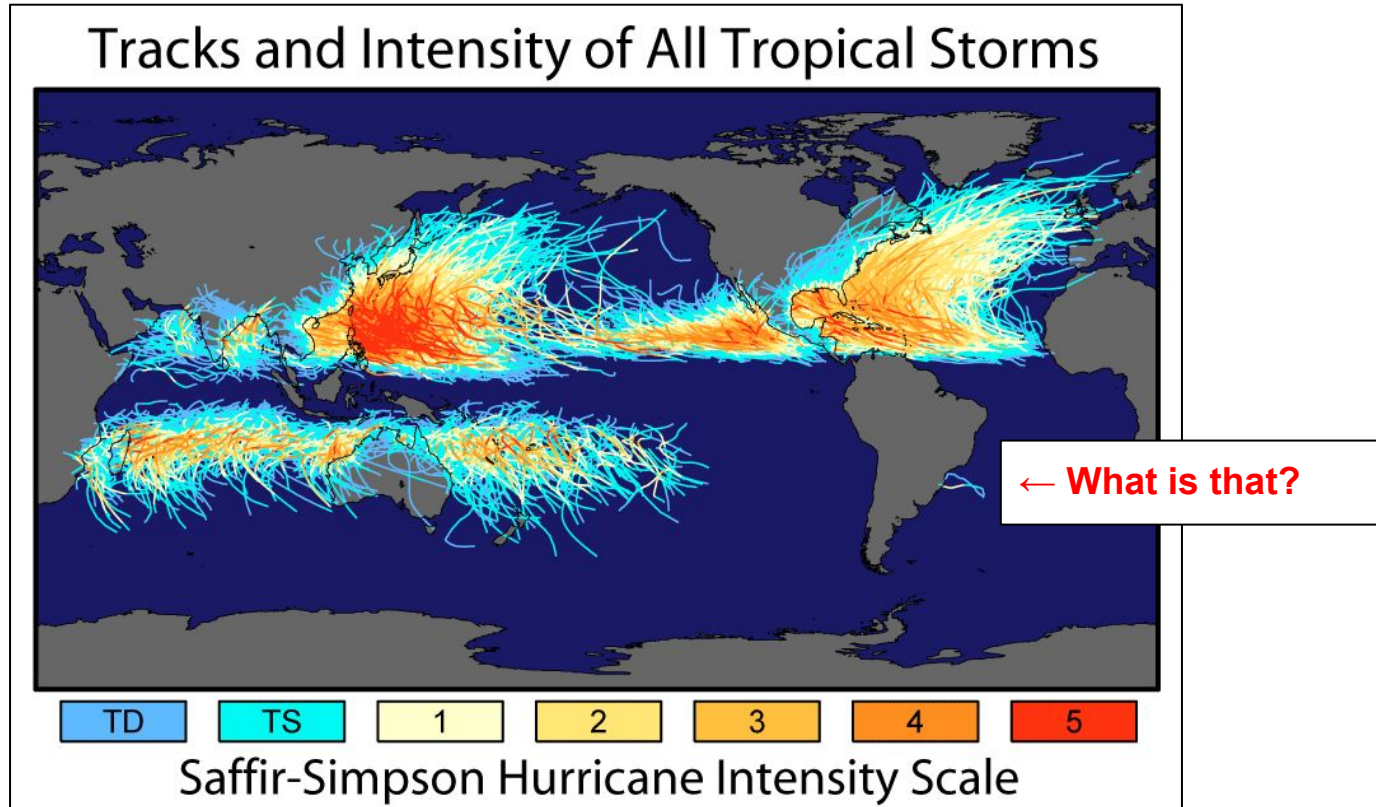


Medicanes - Like Hurricanes, but smaller!

- Despite unusual location, there is really no difference between mediterranean tropical lows and normal ones
 - Form under same conditions (a non-tilted low in an atmosphere with minimal shear)
- Difference, of course, is these conditions are rare in the Medditernean, which is in the midlatitudes and has generally unfavorable geography for tropical cyclone development
- ~1.57 medicanes per year



Speaking of Weird Tropical Storms...



Hurricane Catarina - Hurricane, Or Freak Event?

- On March 25, 2004, a hurricane-like storm hit the southeast coast of Brazil
- Hit as a Category 1
- Southern Atlantic is not a conducive environment for tropical cyclones
 - Typically a lot of wind shear
 - Low sea surface temperatures
- However, anomalous late March conditions happened to be able to support a weak tropical cyclone



Hurricane Catarina - Hurricane, Or Freak Event?

- Origins are not characteristic of most hurricanes
 - A non-tropical cyclone wandered into environment unusually conducive to tropical cyclone development
 - Acquired tropical characteristics, turned west, and hit Brazil
- To date, only tropical cyclone with hurricane-force winds ever to hit the country of Brazil
- Is it a hurricane?
 - Brazilian Government says no
 - Most meteorologists say yes



Bonus! Let's look at some cool clouds!



Roll Cloud (Volutus Cloud)



Hole Punch Clouds (Fallstreak Hole)



Kelvin-Helmholtz Clouds



Thanks for Listening!

Questions?