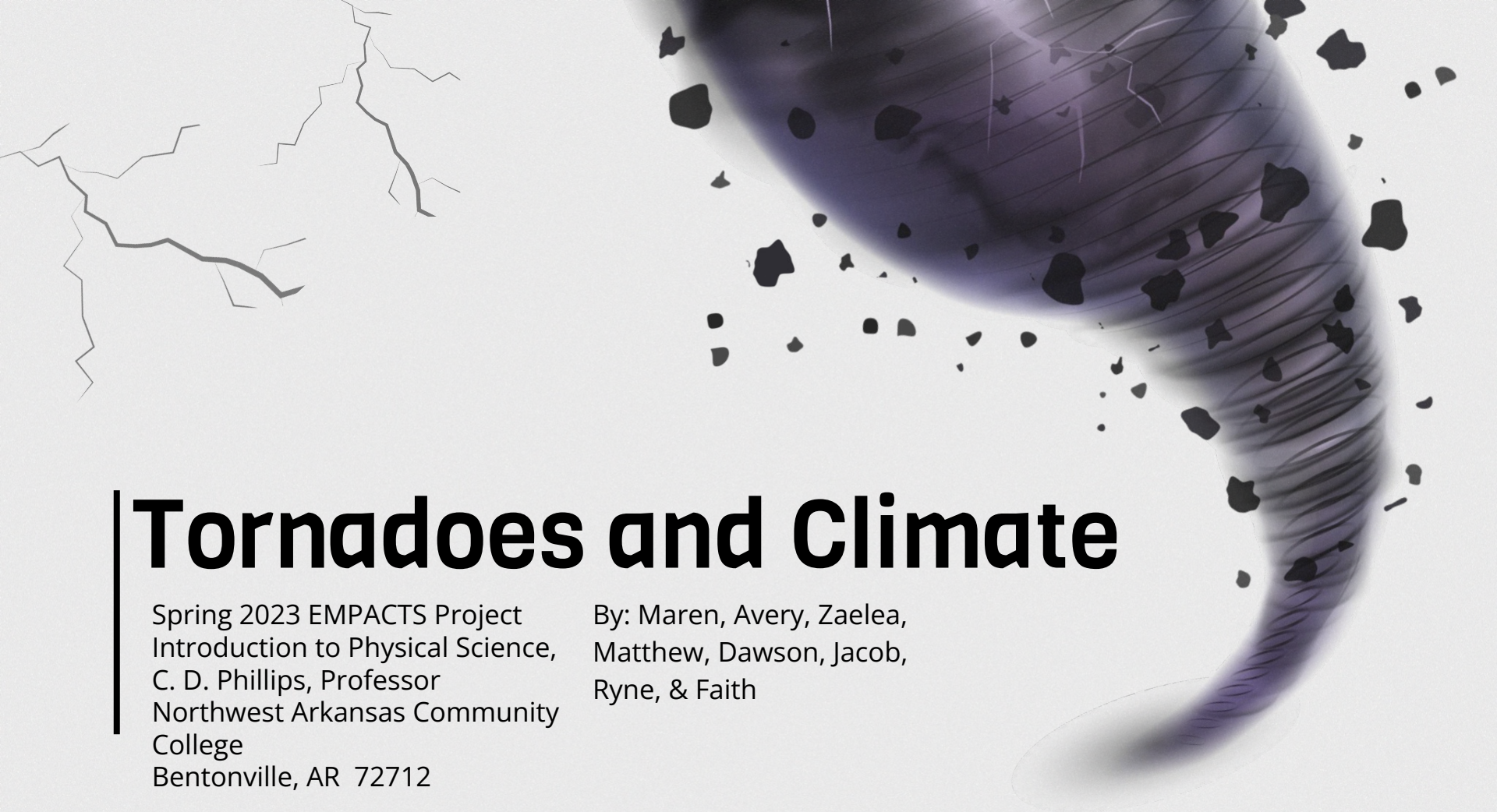

Tornadoes and Climate

Spring 2023 EMPACTS Project
Introduction to Physical Science,
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Climate vs. Weather

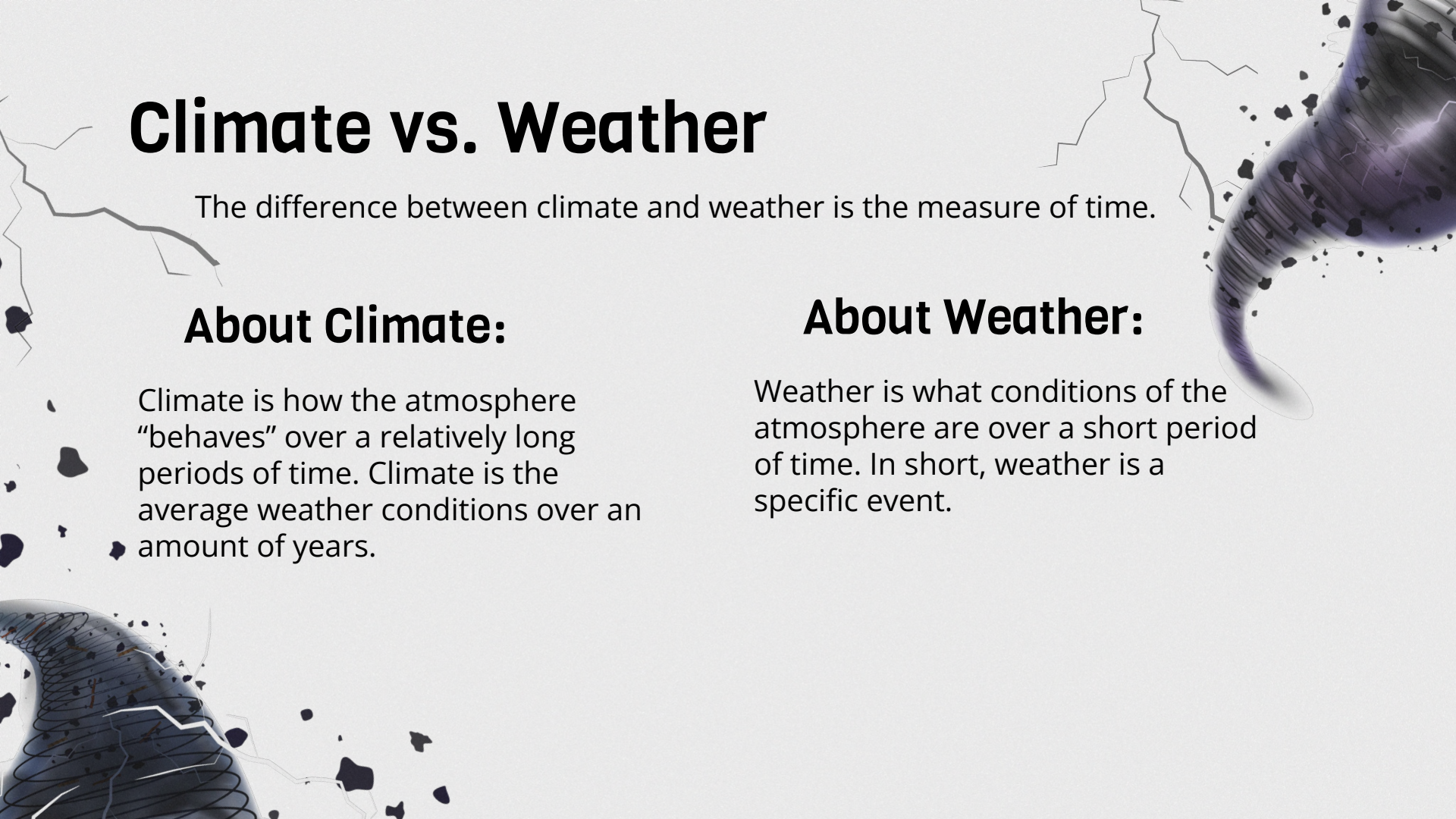
The difference between climate and weather is the measure of time.

About Climate:

Climate is how the atmosphere “behaves” over a relatively long periods of time. Climate is the average weather conditions over an amount of years.

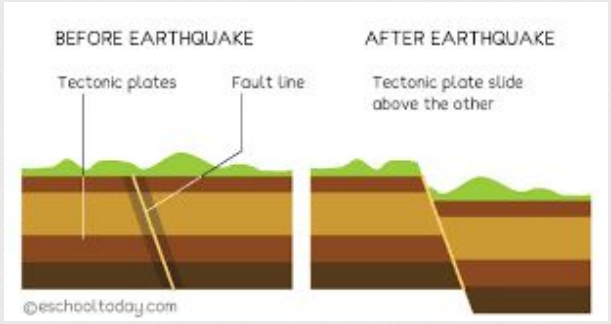
About Weather:

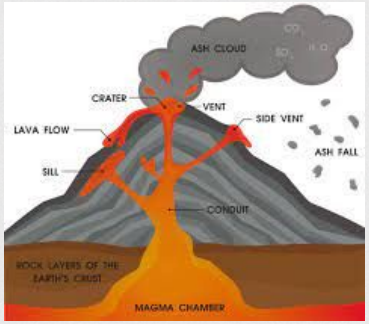
Weather is what conditions of the atmosphere are over a short period of time. In short, weather is a specific event.

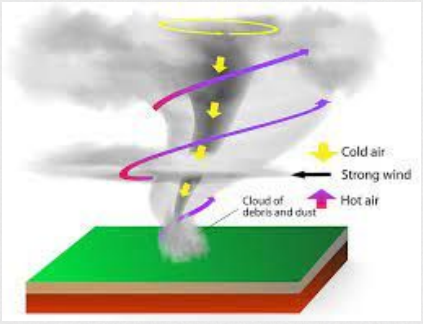


What is Climate Change?

A simple definition of climate change is, “long-term shifts in temperatures and weather patterns. Such shifts can be natural, due to changes in the sun’s activity or large volcanic eruptions” (United Nations). United Nations goes on to describe how in the past climate change has been mostly from natural causes. Some natural causes are earthquakes, volcanoes, tornados, and more. Now days, climate change has been affected by humans as well as natural disasters.





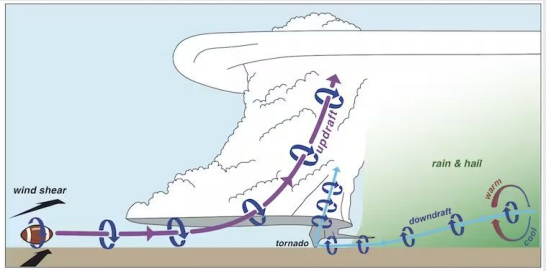


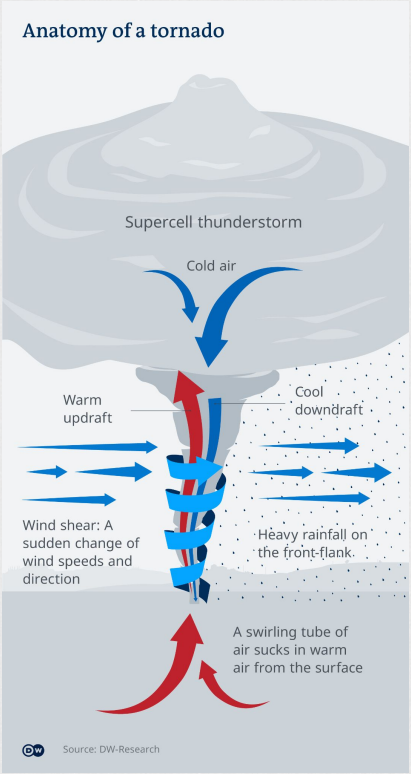
How does Climate Change affect tornado formations?

Climate changes affect how tornadoes and when tornadoes present themselves. There is no particular temperature at which tornadoes form. It is more about what the surface temperature is in relation to the temperature higher up in the atmosphere and the relative humidity levels near the surface.

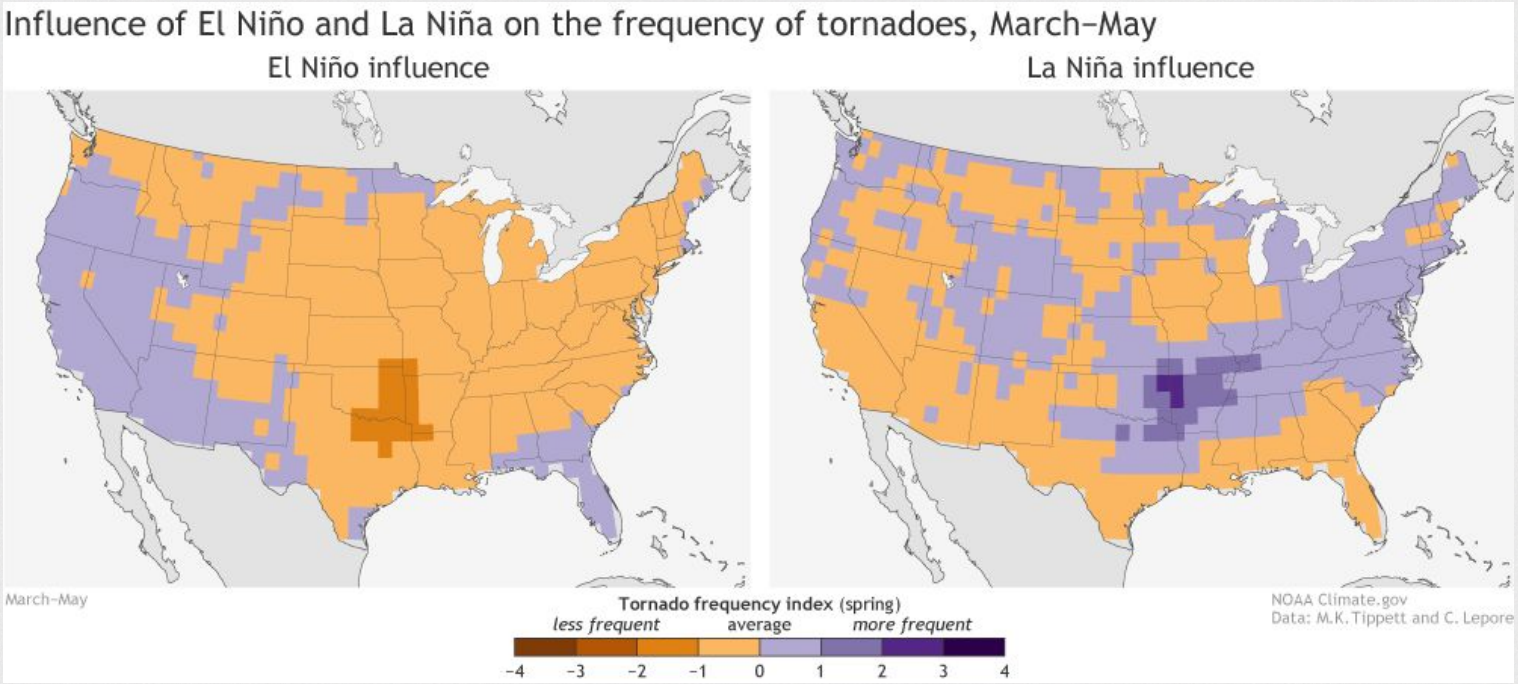
Ingredients that lead to tornadoes are warm moist air near the ground, with cooler dry air aloft and wind shear - a change in wind speed and/or direction with height.

Due to climate change wind shear has been expected to decrease. Higher levels of shear means bigger difference in wind speeds.

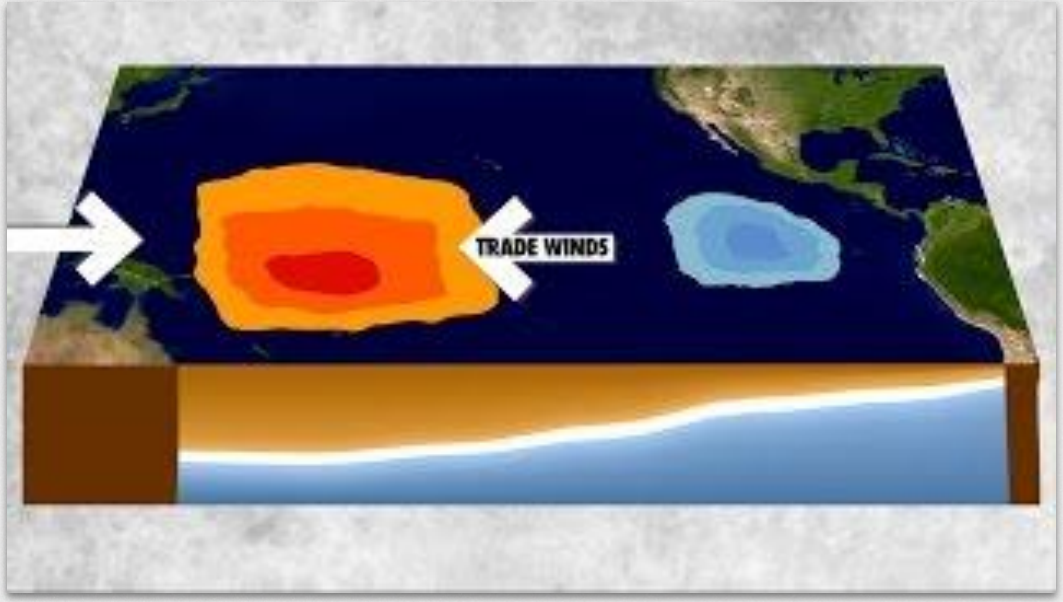




Climate and the distribution of Tornadoes in the US

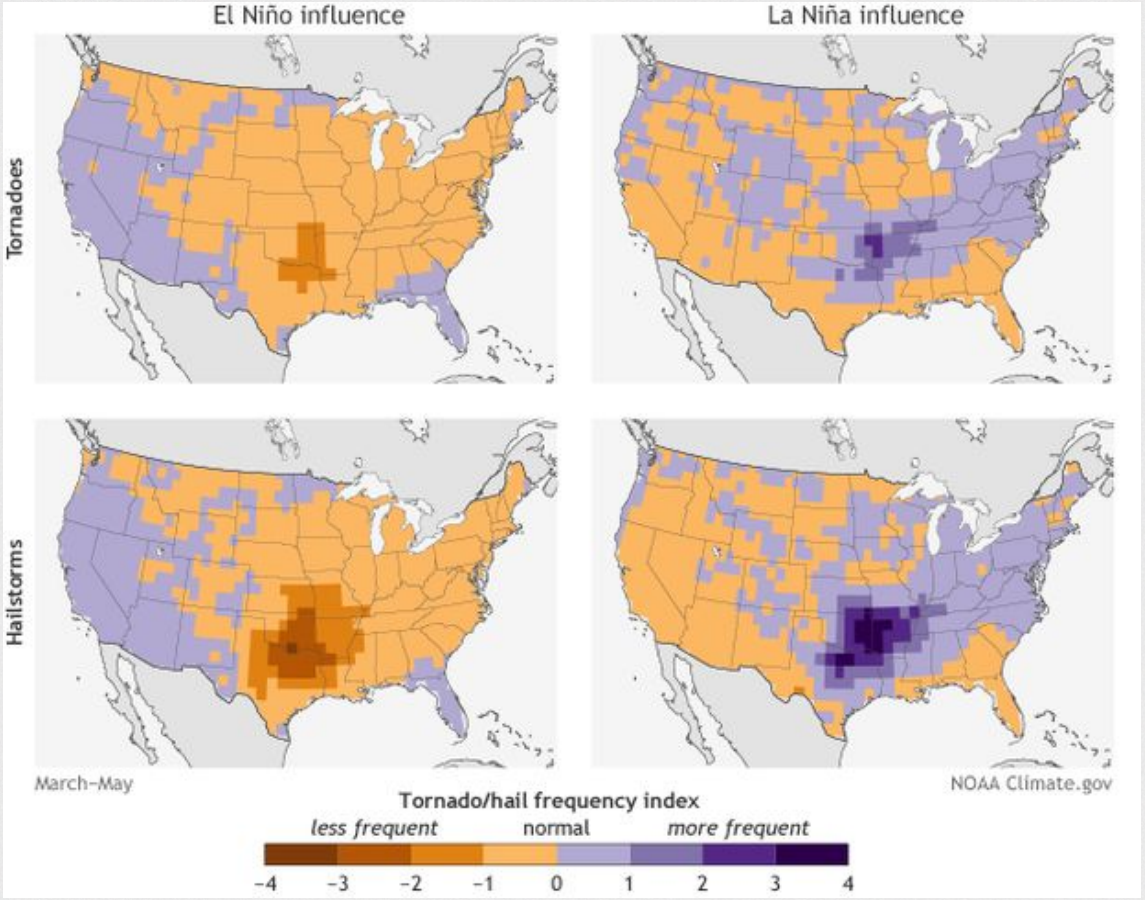


How Does El Nino and La Nina Effect the Jet Stream: What causes the Rotation?



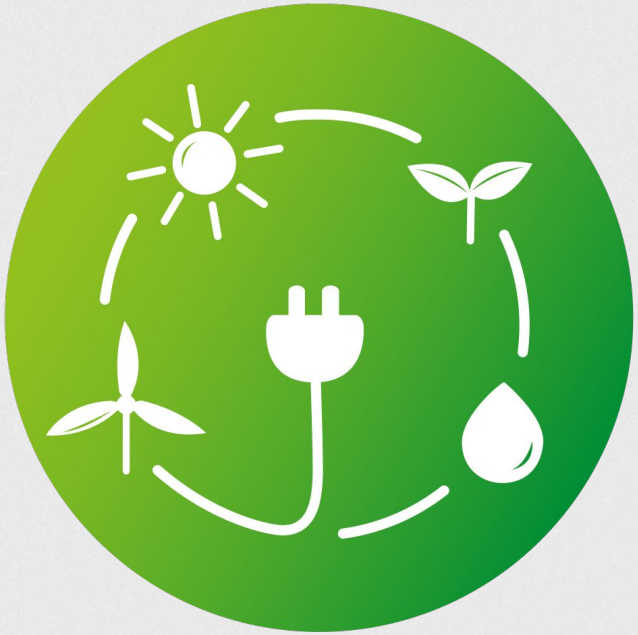
El nino pushes warm trade winds towards the U.S. and La nina pushes the warm wind back across the Pacific bring cooler winds into America. El nino and La Nina trade wind changes that happen in the winter months can give us clues to what mixtures of humid and cold tornado conditions might form in the spring.

El Nino and La Nina effect on the Jet Stream



Tornado Alley shifts west and east

Solutions to Climate Change



Our climate is affected by high levels of CO2. These levels can cause dangers to our environment. The United Nations give out solutions to keep the environment in a better condition. They say...

1. Keep the energy you use in your home at a minimum. Replace gas appliances with electric.
2. Don't buy things from stores that aren't environmental friendly.
3. Use renewable energy to help power things like windmills, solar panels, or water movement.
4. Recycle things so nothing is going to waste.
5. Buy more electric cars so gas isn't being released as much as it is now.

How Do Tornadoes Affect Our Lives?

One of the major problems of tornadoes is simple– they cause a lot of damage. They destroy houses, buildings, and anything that crosses it path. The high winds from the tornadoes inflict most of the initial damage. Tornadoes vary in strength each dependant on the circumstances of which the tornado is formed.

A website says, “All tornadoes produce damage, but the most violent ones can cause automobiles to become airborne, rip homes to shreds, and turn broken glass and other debris into lethal missiles. The biggest tornado threat to human beings is from flying debris in the wind” (National Weather Service).

Different Types of Tornadoes

Rope Tornado- They are the smallest kind of tornado and they have a curvy, rope-like shape. They usually get more intense as they tighten and narrow.

Cone Tornado- They are wider at the base than a rope tornado and wider where it meets the thunderstorm. They cause more destruction that a rope tornado.

Wedge Tornado - A tornado that is as wide at the ground as it is tall. They are often very violent and rank from EF-4 to EF-5.

Multi-vortex Tornado - They have two or more funnels or debris clouds at the same time, can be extremely destructive.

Waterspouts- A column of wind formed over a body of water. There are two types of waterspouts, tornadic and fair-weather. **Tornadic** waterspouts create rough water, lightning, and large hail. **Fair-weather** waterspouts form along the base of cumulus clouds and aren't linked with thunderstorms.They develop upward from the water and usually don't move very much.

Enhanced Fujita Scale

How to read the Enhanced Fujita scale

EFU	No surveyable damage	Wind speed: N/A	The intensity of a tornado cannot be determined due to a lack of information
EF0	Light damage	Wind speed: 65–85 mph (29–37 m /s)	Tornadoes break windows, tear roof tiles, move light objects, damage light buildings, rip out small trees from the ground, and tear branches off
EF1	Moderate damage	Wind speed: 86–110 mph (38–49 m/s)	Tornadoes overturn cars and mobile homes, bring down telephone poles; tear siding and roof tiles off houses or roofs, destroy barns
EF2	Considerable damage	Wind speed: 111–135 mph (50–61 m/s)	Tornadoes tear the roofs off frame houses and damage their interiors, completely destroy weak structures, uproot small and medium-sized trees.
EF3	Severe damage	Wind speed: 136–165 mph (62–74 m/s)	Tornadoes displace large vehicles; tear down the roofs and exterior walls of frame houses, blow out windows of large and high buildings; uproot and fall all trees
EF4	Devastating damage	Wind speed: 166–200 mph (75–89 m/s)	Tornadoes throw cars into the air and move trains off railroad tracks; completely destroy light buildings; and chop down large trees
EF5	Incredible damage	Wind speed: >200 mph (>90 m/s)	Tornadoes move cars and other vehicles hundreds of yards; sweep away small buildings, leave serious damage on large buildings; tear out plants and trees

EF – Enhanced Fujita scale Color chart — Windy.app WINDY.APP

The enhanced Fujita scale is used to give a tornado a rating based on the estimate of the amount of damage and predicted wind speeds.

Our Demo

Demo Info

Materials Needed

- Failed tornado machine
- 3 siding pieces of cardboard
- Plastic wrap
- Styrofoam beads
- Miniature structures (If needed)
- Leaf blower
- Small fan
- Fine mesh sheet
- Any other debris
- Box fan

Steps Needed for Demo to be Functional

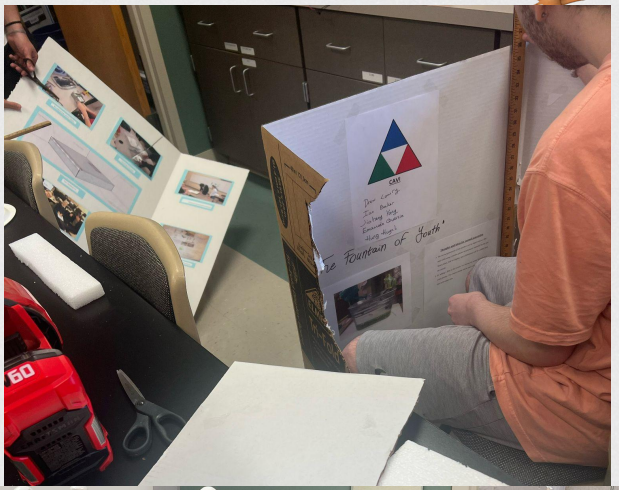
- Install the 3 cardboard sides
- Cut intake holes as needed
- Install fine mesh grate over the air intake
- Replace intake fan on top with small fan and make as air tight as possible with duct tape
- Install leaf blower in bottom hole
- Add in styrofoam beads and debris or structures
- Seal in the chamber with plastic wrap and tape

How to Work

- Turn on box fan
  - Watch for any loss of air intake around edges
- Turn on leaf blower
  - This may sometimes be too much airflow, at which point you should pulse the leaf blower

Teamwork

Critical Thinking Skills



Problem solving

Final Result

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